

TOSHIBA

PRODUCT GUIDE

High-Frequency Semiconductors



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High-Frequency Semiconductor Devices

Thank you for using Toshiba semiconductor devices. As you know, semiconductor products are widely applied in both home and industrial uses. This catalog covers transistors, diodes, and cell packs in small packages used in mobile communications. For details, see the individual technical datasheets.

C O N T E N T S

1. Recommended Products by Application(4 to 15 page)

1-1	High-Frequency Devices for AM Tuners	4
1-2	High-Frequency Devices for FM Tuners	5
1-3	High-Frequency Devices for TV and VTR Tuners	6
1-4	High-Frequency Devices for CATV Converters	8
1-5	High-Frequency Devices for SHF 2nd Converters	9
1-6	High-Frequency Devices for 800-MHz Band Analog and Digital Cellular Phones	10
1-7	High-Frequency Devices for PDC (1.5 GHz)	11
1-8	High-Frequency Devices for 900-MHz, 2.4-GHz and 5.8-GHz Band Cordless Phones	12
1-9	High-Frequency Devices for Global Positioning System (GPS) LNB Dawn Converters	13
1-10	2.4-GHz Wireless LAN and Bluetooth	14
1-11	High-Frequency Devices for FRS, GMRS	15

2. Product Line-up(16 to 36 page)

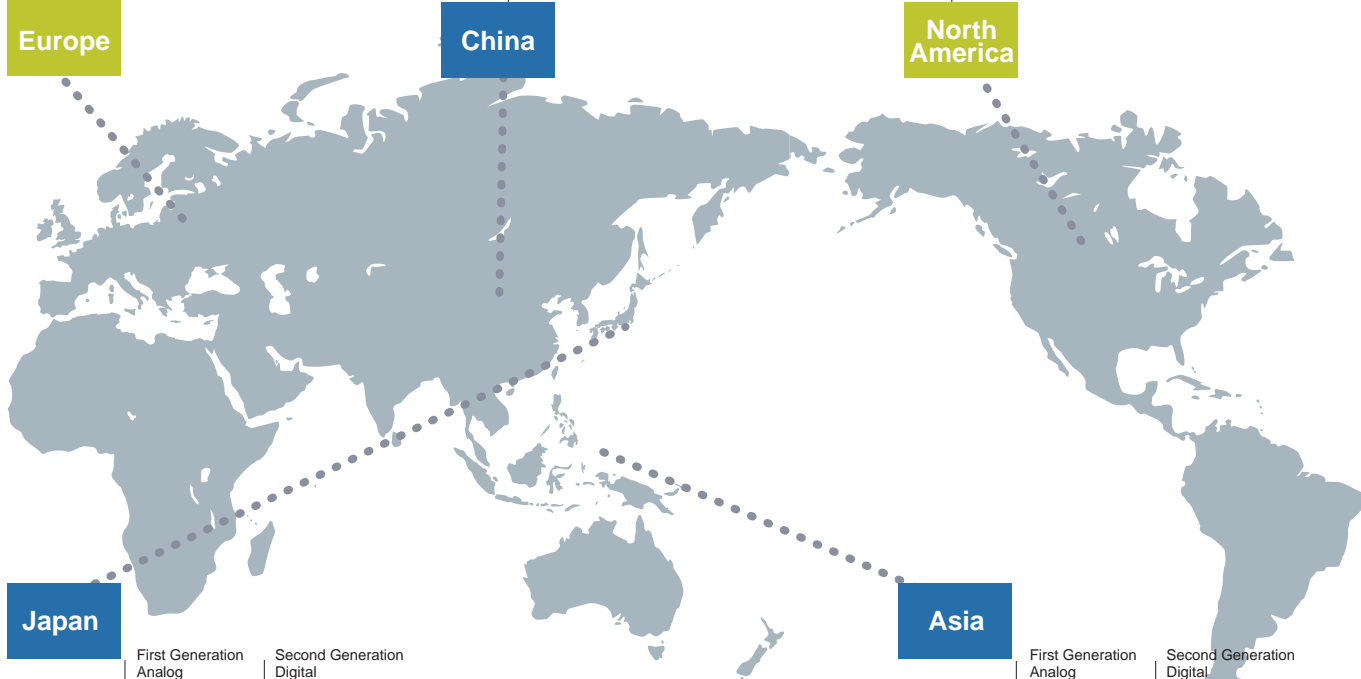
2-1	Microwave Transistors	16
2-2	FETs	29
2-3	Diodes	30
2-4	High-Frequency Cell Packs (MMIC)	35

3. High-Frequency Power Devices(37 to 40 page)

4. Package Dimensions(41 to 47 page)

Regional Mobile Communications Systems

	First Generation Analog	Second Generation Digital	First Generation Analog	Second Generation Digital	First Generation Analog	Second Generation Digital
Cellular	NMT TACS	GSM GPRS DCS1800 W-CDMA	TACS	GSM GPRS N-CDMA CDMA2000	AMPS	TDMA CDMA PCS CDMA2000
Cordless	CT0 CT1	DECT	45/48MHz 900MHz	DECT PHS 900MHz 2.4GHz	46/49MHz 900MHz	2.4GHz 5.8GHz SST PACS 2.4GHz 5.8GHz



	First Generation Analog	Second Generation Digital
Cellular		PDC-800MHz PDC-1.5GHz CDMA2000 W-CDMA
Cordless	Low Power Cordless	PHS

	First Generation Analog	Second Generation Digital
Cellular	TACS AMPS	GSM CDMA2000
Cordless	CT0	CT2 DECT PHS

Cellular System Comparison

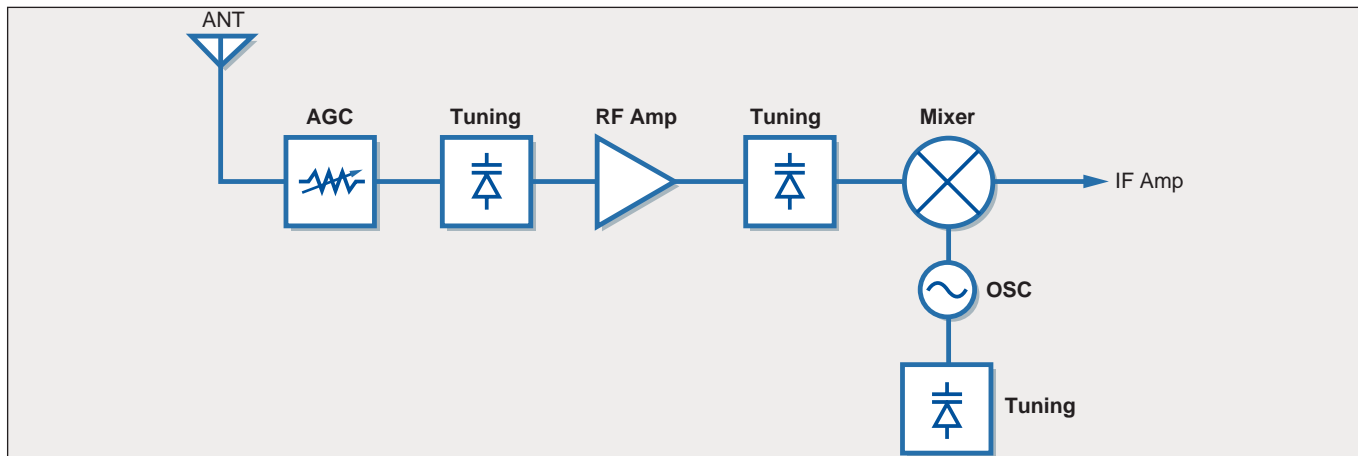


Cordless System Comparison

	AMPS	GSM	PDC 900MHz 1.5GHz	TDMA (IS-136)	CDMA (IS-95)	MC-CDMA (US solution)	W-CDMA	PHS	DECT
Frequency	TX:824-849 RX:869-894	TX:880-915 RX:925-960	TX:940-960 1477-1501 RX:810-830 1429-1453	TX:824-849 RX:869-894	TX:824-849 RX:869-894 J-CDMA TX:887-925 PX:832-870	2GHz band	2GHz band TX:1920-1980 RX:2110-2170	1895-1918	1880-1900
Access Method	FDMA	TDMA	TDMA	TDMA	CDMA	CDMA	CDMA	TDMA	TDMA
Duplex Method	FDD	FDD	FDD	FDD	FDD	FDD	FDD	TDD	TDD
Modulation Method	FM	GMSK	$\pi/4$ DQPSK	$\pi/4$ DQPSK	TX:QPSK RX:OQPSK	TX:HPSK RX:QPSK	TX:HPSK RX:QPSK	$\pi/4$ DQPSK	GFSK
Sound Coding Method		RPE-LTP	PSI-CELP VSELP	VSELP	Variable rate QCELP			ADPCM	ADPCM
Carrier Interval	30kHz	200kHz (Interleave)	25kHz (Interleave)	30kHz (Interleave)	1.25MHz	5MHz (1.25MHzX3)	5MHz	300kHz	1728kHz
Transmit Output		to 2W (Class 4)	to 800mW (Portable Type)	to 600mW (Class 3/4)	200mW to 1W (Portable Type)		to 250mW (Portable Type)	10mW(Average) 100mW(Peak)	10mW(Average) 250mW(Peak)
Transfer Speed			9.6kbps		14.4/64kbps	384kbps	384kbps	32/64/128kbps	
No. of Channels / Frequency		8	6(Half rate) 3(Full rate)	3				4	12

1. Recommended Products by Application

1-1 High-Frequency Devices for AM Tuners



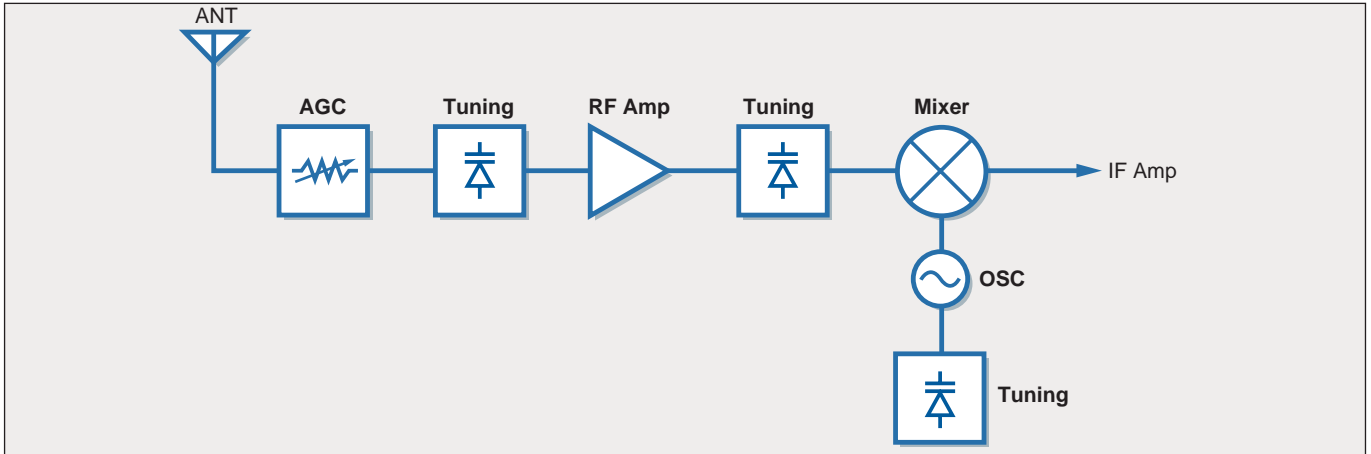
Application	Type	Package	Part Number	
AGC	PIN diode	Single	S-MINI	1SV128
			USC	1SV271 1SV307
			ESC	1SV308 JDP2S01E JDP2S04E
			TESC	JDP2S01T JDP2S02T
		Double	S-MINI	1SV172
			SMQ	1SV237
			USM	1SV252
			USQ	1SV312 JDP4P02U

Application	Type	Package	Part Number
Tuning	Tuning varicap	MINI	1SV102 1SV149-B
			FM8

Application	Type	Package	Part Number
Mixer	Bipolar transistor	TO-92	2SC380TM 2SC941TM
			MINI
		S-MINI	2SC2715 2SC2716

Application	Type	Package	Part Number
AGC	Bipolar transistor	MINI	2SC2458
		S-MINI	2SC2712
RF Amp	J-FET	TO-92	2SK709
		MINI	2SK710
		S-MINI	2SK711
		USM	2SK1875
	Multi-chip transistor	SMV	HN3G01J

1-2 High-Frequency Devices for FM Tuners



Application	Type	Package	Part Number	
AGC	PIN diode	Single	S-MINI	1SV128
			USC	1SV271 1SV307
			ESC	1SV308 JDP2S01E JDP2S04E
			TESC	JDP2S01T JDP2S02T
			USQ	1SV312 JDP4P02U
		Double	S-MINI	1SV172
			SMQ	1SV237
			USM	1SV252
			USQ	1SV312 JDP4P02U
			USQ	1SV312 JDP4P02U

Application	Type	Package	Part Number	
Tuning	Tuning varicap diode	Double	MINI	1SV101
			S-MINI	1SV225 1SV228 JDV3C11
	AFC varicap diode	Single	S-MINI	1SV160

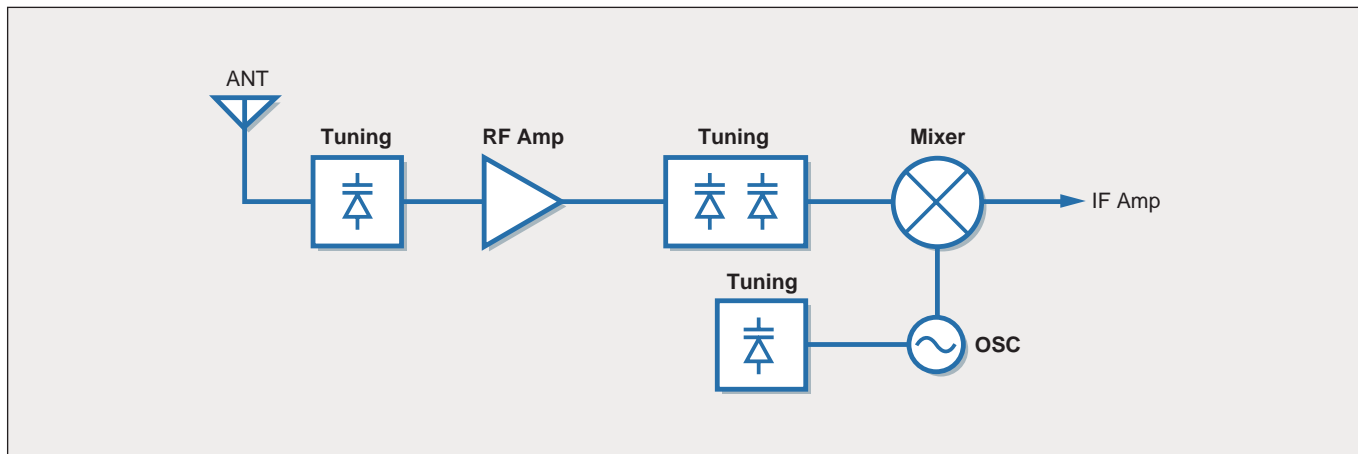
Application	Type	Package	Part Number
RF Amp	Dual gate MOSFET	SMQ	3SK195
			3SK225
			3SK226
		USQ	3SK257
			3SK258
			3SK258
	Single gate MOSFET	MINI	2SK241
		S-MINI	2SK302
		USM	2SK882
		SMQ	2SK1771
		USM	2SK881
	Bipolar transistor	MINI	2SC2668
		S-MINI	2SC2714
		USM	2SC4215
		USM	2SC4215
J-FET	MINI	2SK161	
		2SK192A	
	S-MINI	2SK211	
		2SK210	
		2SK881	

Application	Type	Package	Part Number
Mixer	Dual gate MOSFET	USQ	3SK260
		MINI	2SC2668
	Bipolar transistor	S-MINI	2SC2714
		USM	2SC4215
		SSM	2SC4915

Application	Type	Package	Part Number
OSC	J-FET	MINI	2SK192A
		S-MINI	2SK210
	Bipolar transistor	MINI	2SC2668
			2SC2995
		S-MINI	2SC2714
			2SC2996
		USM	2SC4215
		SSM	2SC4915

1. Recommended Products by Application

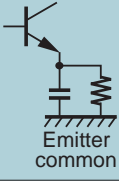
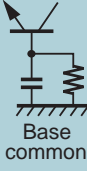

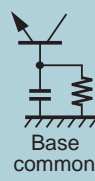
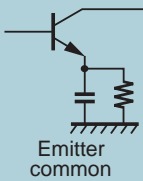
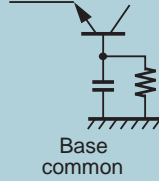
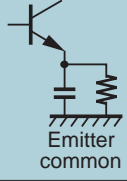

1-3 High-Frequency Devices for TV and VTR Tuners



Application	Type	Band	Package	Part Number			
Tuning	Tuning varicap diode	Wide-band VHF	USC	1SV215	1SV217	1SV262	1SV288
			ESC	1SV231	1SV232	1SV269	1SV302
				1SV282	1SV290		
		S-MINI (double type)	1SV283	1SV303			
			1SV242				
	UHF	USC	1SV214				
ESC		1SV278					
AFC diode	VHF to UHF	USC	1SV216				
RF Amp	Dual gate FET	VHF (wide-band)	SMQ	3SK195	3SK225		
			USQ	3SK226	3SK292		
		UHF	SMQ	3SK259	3SK257	3SK258	3SK294
			USQ	3SK199	3SK207	3SK232	3SK291
		USQ	3SK256	3SK249	3SK293		
Mixer	Dual gate FET	VHF and wide-band VHF	USQ	3SK260	3SK259		
	Schottky diode	UHF	S-MINI	1SS295 (double)			
			USC	1SS315			
			TESC	JDH2S01T			
		SSM	JDH3D01S* (double)				
		fSC	JDH2S01FS				

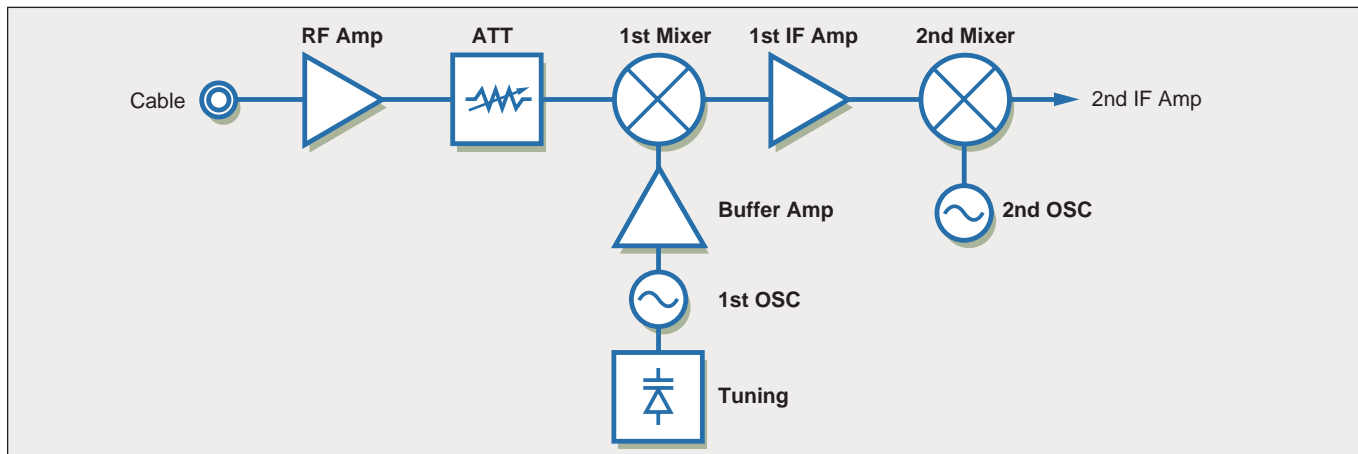
*: New

Application	Type	Band		Internal Connection	Package	Part Number
Tuning	Band switch	Single	VHF and wide-band VHF	—	USC	1SS314
					ESC	1SS381
					sESC	JDS2S03S
		Double		Anode common	S-MINI	1SS269
					USM	1SS268
					USM	1SS313
Cathode common	USM	1SS312				
	SSM	1SS364				

Application	Type	Band	Circuit Diagram	Package	Product No.
RF Amp	Bipolar transistor	VHF		USM	2SC4249
				SM	2SC3122
		UHF		USM	2SC4244
				SMQ	2SC4214
OSC	Bipolar transistor	VHF (Wide-band)		USM	2SC4251 2SC4246 2SC4252
				S-MINI	2SC3124 2SC3121
		UHF		USM	2SC4246
				S-MINI	2SC3121
				USM	2SC4247
				S-MINI	2SC3547A
Mixer	Bipolar transistor	VHF (wide-band)		USM	2SC4250 2SC4245
				S-MINI	2SC3123 2SC3120
				USM	2SC4253 2SC4251 2SC4246
				S-MINI	2SC3125 2SC3124 2SC3121
		UHF		S-MINI	2SC3120 2SC3862
				S-MINI	2SC3547A
				USM	2SC4245
				USM	2SC4247

1. Recommended Products by Application

1-4 High-Frequency Devices for CATV Converters



Application	Type	Package	Part Number	
RF Amp	Bipolar transistor	SMQ	2SC5087	
			MT4S03A	
			MT4S04A	
		USQ	MT4S03AU	
			MT4S04AU	
			MT4S100U	
			MT4S101U	
			MT4S102U*	
		TESQ	MT4S104U*	
			MT4S100T	
			MT4S101T	
			MT4S102T*	
ATT	PIN diode	S-MINI	1SV128	
			USC	1SV271
				1SV307
			ESC	1SV308
		JDP2S01E		
		TESC	JDP2S04E	
			JDP2S01T	
		Double	JDP2S02T	
			S-MINI	1SV172
			SMQ	1SV237
USM	1SV252			
USQ	1SV312			
TESQ	JDP4P02U			
1st Mixer	Schottky diode	S-MINI	1SS154	
			fSC	JDH2S01FS
		Double	S-MINI	1SS271
			SSM	JDH3D01S*
			1st IF Amp	Bipolar transistor
MT3S04A				
SMQ	MT4S03A			
	MT4S04A			
	MT4S06			
	MT4S07			
USQ	MT4S03AU			
	MT4S04AU			
	MT4S06U			
	MT4S07U			
	Si dual gate MOSFET	SMQ		3SK199
				3SK232
3SK291				
USQ		3SK292		
		3SK249		
		3SK293		
3SK294				

*: New

Application	Type	Package	Part Number
2nd Mixer	Schottky diode	SMQ	1SS239
		S-MINI	1SS154(single) 1SS271(double)
	Si dual gate MOSFET	SMQ	3SK199
			3SK232
		USQ	3SK249
	Cell pack	SM8	3SK293
TA4107F			

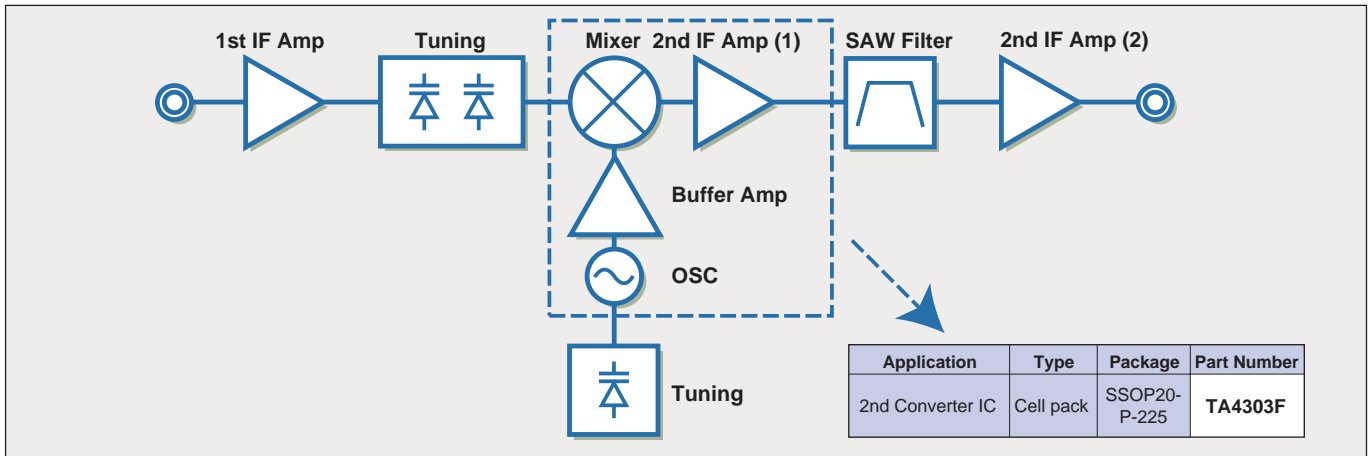
Application	Type	Package	Part Number
Buffer Amp	Bipolar transistor	S-MINI	MT3S03A
			MT3S04A
		SMQ	MT4S03A
			MT4S04A
		USQ	MT4S06
			MT4S07
USQ	MT4S03AU		
	MT4S04AU		
	MT4S06U		
	MT4S07U		

Application	Type	Package	Part Number
1st OSC	Bipolar transistor	S-MINI	2SC5084
			MT3S03A
		USM	MT3S04A
			MT3S03AU
MT3S04AU			

Application	Type	Package	Part Number
Tuning	Tuning varicap	USC	1SV214
		ESC	1SV230
		1SV278	

Application	Type	Package	Part Number
2nd OSC	Bipolar transistor	USM	2SC4246
		S-MINI	2SC3121

1-5 High-Frequency Devices for SHF 2nd Converters



Application	Type	Package	Part Number	
1st IF Amp	Bipolar transistor	SMQ	MT4S03A	MT4S04A
			MT4S06	MT4S07
			2SC5092	
		USQ	2SC5088	2SC5093
			2SC5319	
			MT4S06U	MT4S07U
	MT4S100U	MT4S101U		
	MT4S102U*	MT4S104U*		
	TESQ	MT4S100T	MT4S101T	
		MT4S102T*	MT4S104T*	

Application	Type	Package	Part Number	
Tuning	Preselector and tuning varicap diode	USC	1SV245	1SV287
			JDV2S71U	
		ESC	1SV309	1SV291
			JDV2S71E	

Application	Type	Package	Part Number
Mixer	Bipolar transistor	SMQ	2SC5092
	Schottky diode	S-MINI	1SS154 (Single) 1SS271 (Double)
		SSM	JDH3D01S* (Double)
		fSC	JDH2S01FS
	Cell pack	SM8	TA4107F

*: New

Application	Type	Package	Part Number
2nd IF Amp (1)	Cell pack	SMQ	TA4002F
		SMV	TA4003F

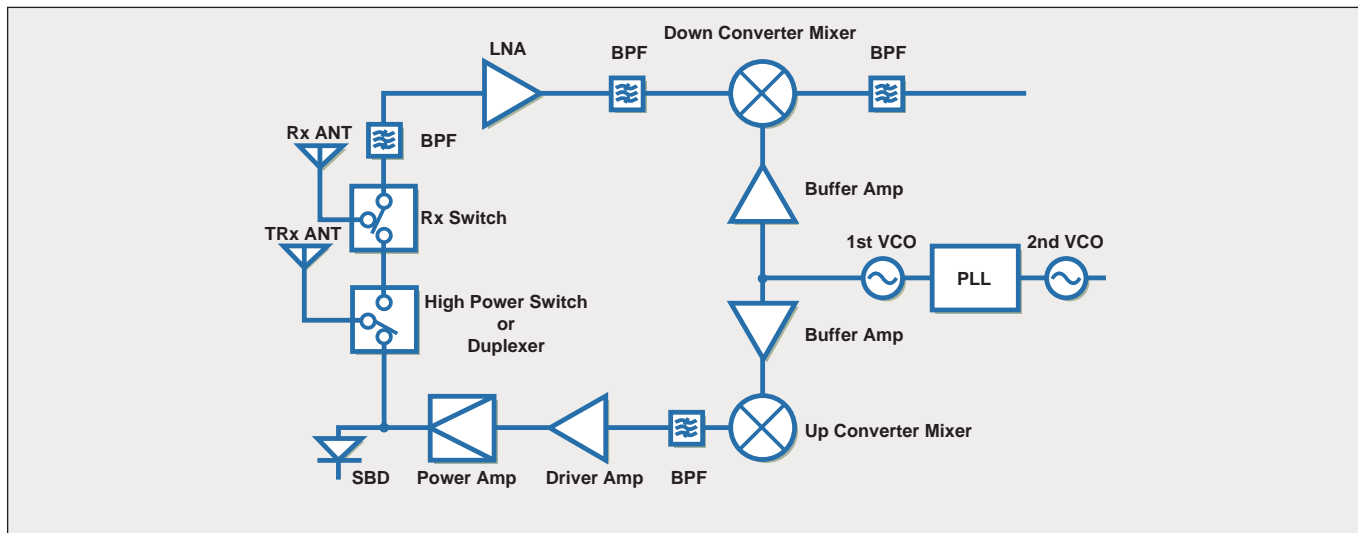
Application	Type	Package	Part Number
2nd IF Amp (2)	Cell pack	SM6	TA4000F
		TU6	TA4017FT
		SM8	TA4018F

Application	Type	Package	Part Number	
Buffer Amp	Bipolar transistor	USQ	2SC5088	2SC5093
			2SC5319	

Application	Type	Package	Part Number
OSC	Bipolar transistor	S-MINI	2SC5089

1. Recommended Products by Application

1-6 High-Frequency Devices for 800-MHz Band Analog and Digital Cellular Phones



Application	Type	Package	Part Number
Power Amp (JAPAN CDMA)	Module	5-6B	S-AU84
		5-4A	S-AU87
Power Amp (US CDMA)	Module	5-6B	S-AU85

Application	Type	Package	Part Number
Power Amp	Si MOSFET	PW-MINI	2SK2854 2SK2855

Application	Type	Package	Part Number
Rx Switch	GaAs Cell Pack	TU6	TG2210FT**
			TG2211FT**
	PIN Diode	fSC	JDP2S02AFS JDP2S05FS*
	Band Switch	sESC	JDS2S03S

**: New **; GaAs

Application	Type	Package	Part Number
Buff Amp	Si Cell Pack	ESV	TA4011AFE
			TA4012AFE

Application	Package Type	USC	TESC	fSC	SSM
		Detector	SBD	ISS315	JDH2S01T

**; double

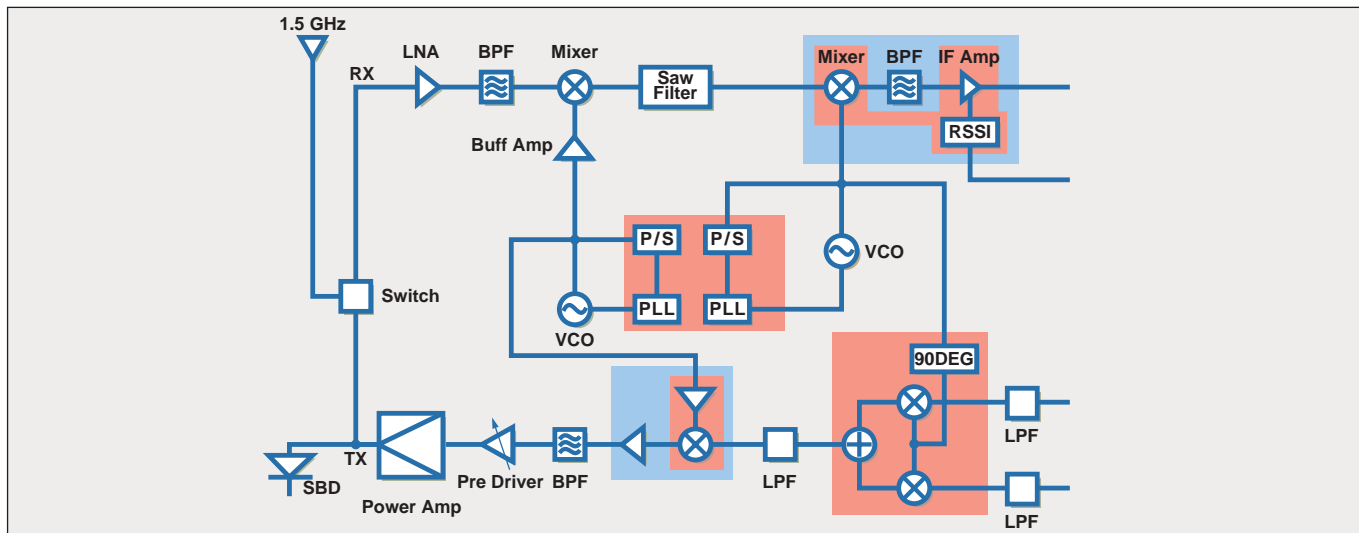
Varicap Diode

Application	Package Type	USC	ESC	sESC	fSC
		VCO	VCD	1SV229 1SV270 1SV276 1SV304 1SV310	1SV279 1SV281 1SV284 1SV305 1SV311

Application	Package Type	TESM	fSM	SMQ	USQ
		LNA, Buff Amp	Bipolar Transistor	2SC5066FT 2SC5086FT 2SC5091FT 2SC5096FT MT3S03AT MT3S06T MT3S07T MT3S14T MT3S17T MT3S18T MT3S35T MT3S36T MT3S37T MT3S38T MT3S40T MT3S41T	MT3S03AFS MT3S06FS MT3S07FS MT3S14FS* MT3S17FS* MT3S18FS* MT3S35FS MT3S36FS MT3S37FS MT3S38FS MT3S40FS MT3S41FS
Mixer	Bipolar Transistor	2SC5066FT 2SC5086FT 2SC5108FT 2SC5111FT		2SC5087	2SC5088
VCO	Bipolar Transistor	2SC5086FT 2SC5464FT 2SC5066FT 2SC5108FT 2SC5111FT MT3S03AT MT3S04AT MT3S05T MT3S06T MT3S07T MT3S08T MT3S11T* MT3S12T* MT3S14T* MT3S18T* MT3S35T MT3S36T MT3S37T MT3S38T MT3S40T MT3S41T MT3S45T	MT3S03AFS MT3S04AFS MT3S05FS MT3S06FS MT3S07FS MT3S08FS MT3S11FS* MT3S12FS* MT3S14FS* MT3S18FS* MT3S35FS MT3S36FS MT3S37FS MT3S38FS MT3S40FS MT3S41FS MT3S45FS		MT4S32U

*: New

1-7 High-Frequency Devices for PDC (1.5 GHz)



Application	Package		TESM	fSM	USQ	TESQ
	Type					
LNA, Buff Amp	Bipolar Transistor		2SC5317FT		2SC5319	
			2SC5322FT			
			MT3S03AT			
			MT3S06T	MT3S06FS	MT4S06U	
			MT3S07T	MT3S07FS	MT4S07U	
			MT3S14T*	MT3S14FS*		
			MT3S17T*	MT3S17FS*		
			MT3S18T*	MT3S18FS*		
			MT3S35T	MT3S35FS		
			MT3S36T	MT3S36FS		
			MT3S37T	MT3S37FS		
			MT3S38T	MT3S38FS		
			MT3S40T	MT3S40FS		
			MT3S41T	MT3S41FS		
					MT4S100U	MT4S100T
			MT4S101U	MT4S101T		
Mixer (down)	Bipolar Transistor		2SC5261FT			
			2SC5317FT			
			2SC5322FT			
			2SC5086FT			
VCO	Bipolar Transistor		MT3S03AT	MT3S03AFS		
			MT3S04AT	MT3S04AFS		
			MT3S05T	MT3S05FS		
			MT3S06T	MT3S06FS		
			MT3S07T	MT3S07FS		
			MT3S08T	MT3S08FS		
			MT3S11T*	MT3S11FS*		
			MT3S12T*	MT3S12FS*		
			MT3S14T*	MT3S14FS*		
			MT3S18T*	MT3S18FS*		
			MT3S35T	MT3S35FS		
			MT3S36T	MT3S36FS		
			MT3S37T	MT3S37FS		
			MT3S38T	MT3S38FS		
			MT3S40T	MT3S40FS		
			MT3S41T	MT3S41FS		
			MT3S45T	MT3S45FS		

**: New

Application	Package		ESC	sESC	fSC
	Type				
VCO	VCD		JDV2S05E	JDV2S05S	JDV2S05FS
			1SV285	JDV2S07S	JDV2S07FS
			1SV305	JDV2S08S	JDV2S08FS
			1SV311	JDV2S09S	JDV2S09FS
			1SV314	JDV2S10S	JDV2S10FS
			1SV329	JDV2S13S	JDV2S13FS

Application	Package		ESV
	Type		
Buff Amp	Si Cell pack		TA4011AFE
			TA4012AFE

Application	Package		TU6
	Type		
RF Switch	GaAs Cell pack		TG2211FT*

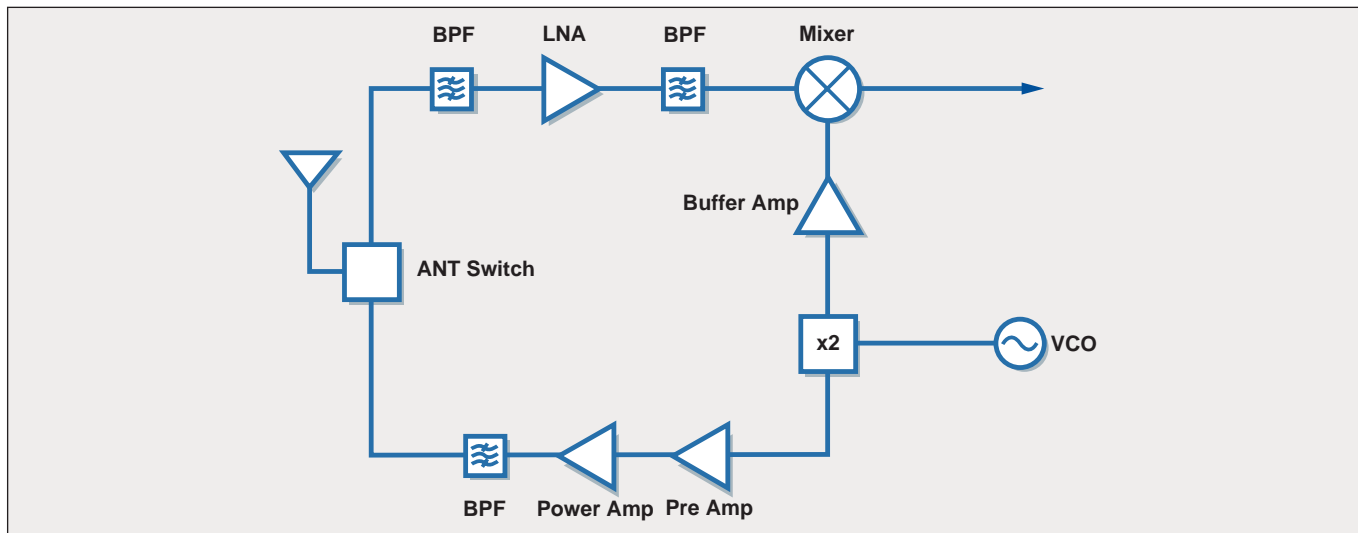
**: GaAs

Application	Package		USC	TESC	fSC	SSM
	Type					
Detector	SBD		1SS315	JDH2S01T	JDH2S01FS	JDH3D01S*

**: New

1. Recommended Products by Application

1-8 High-Frequency Devices for 900-MHz, 2.4-GHz and 5.8-GHz Band Cordless Phones



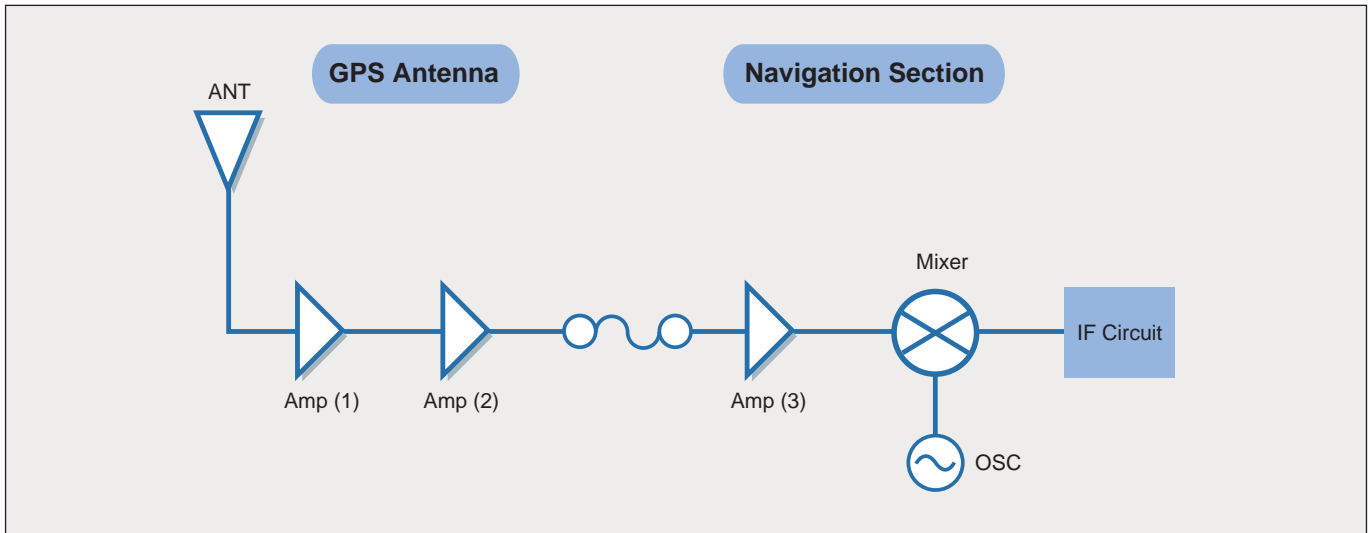
Application	Package Type	Package Type				
		USC	ESC	sESC	fSC	CST2
ANT Switch	900 MHz	1SV271 1SV307 1SS314	JDP2S04E 1SV308 1SS381	JDP2S02AS JDS2S03S	JDP2S02AFS	JDP2S02ACT*
	2.4 GHz	1SV271 1SV307	JDP2S04E 1SV308	JDP2S02AS	JDP2S02AFS JDP2S05FS*	JDP2S02ACT* JDP2S05CT**
	5.8 GHz				JDP2S05FS*	JDP2S05CT**
VCO Varicap Diode	900 MHz	1SV214 1SV229 1SV276 1SV304 1SV310 1SV313	1SV278 1SV279 1SV284 1SV305 1SV311 1SV314	JDV2S06S JDV2S08S JDV2S09S JDV2S10S	JDV2S06FS JDV2S08FS JDV2S09FS JDV2S10FS	
			JDV2S01E JDV2S02E JDV2S05E	JDV2S01S JDV2S02S JDV2S05S JDV2S16S JDV2S19S JDV2S20S	JDV2S01FS JDV2S02FS JDV2S05FS JDV2S16FS JDV2S19FS JDV2S20FS	
			JDV2S02E	JDV2S02S JDV2S17S* JDV2S20S JDV2S22S*	JDV2S02FS JDV2S17FS* JDV2S20FS JDV2S22FS*	
	2.4 GHz					
	5.8 GHz					

*: New **: Under development

Application	Package Type	Package Type					
		USM	SSM	TESM	SMQ	USQ	TESQ
VCO Buffer Amp Mixer Power Amp Pre Amp LAN	900 MHz	2SC5065 2SC5085 MT3S06U MT3S16U*	2SC5066 2SC5086 MT3S06S	2SC5066FT 2SC5086FT MT3S06T MT3S16T* MT3S17T* MT3S18T*	2SC5087 MT4S06	2SC5088 MT4S06U	
	2.4 GHz	MT3S06U	MT3S06S	2SC5317FT MT3S06T MT3S17T* MT3S18T* MT3S35T	MT4S06	2SC5319 MT4S06U	
	5.8 GHz			MT3S35T MT3S37T		MT4S100U MT4S101U MT4S102U* MT4S104U*	MT4S100T MT4S101T MT4S102T* MT4S104T*

*: New

1-9 High-Frequency Devices for Global Positioning System (GPS) LNB Down Converters



GPS Antenna Section

Application	Package		ES6	USQ	TESQ
	Type				
Amp (2)	Bipolar transistor			2SC5319 MT4S32U MT4S100U MT4S101U MT4S102U* MT4S104U*	MT4S100T MT4S101T MT4S102T* MT4S104T*
	Si Cell-Pack		TA4016AFE*		

*: New

Navigation Section

Application	Package		USQ	TESQ
	Type			
Amp (3)	Bipolar transistor		2SC5319 MT4S06U MT4S32U MT4S100U MT4S101U MT4S102U* MT4S104U*	MT4S100T MT4S101T MT4S102T* MT4S104T*
	Mixer, OSC	Bipolar transistor	2SC5319 MT4S06U	

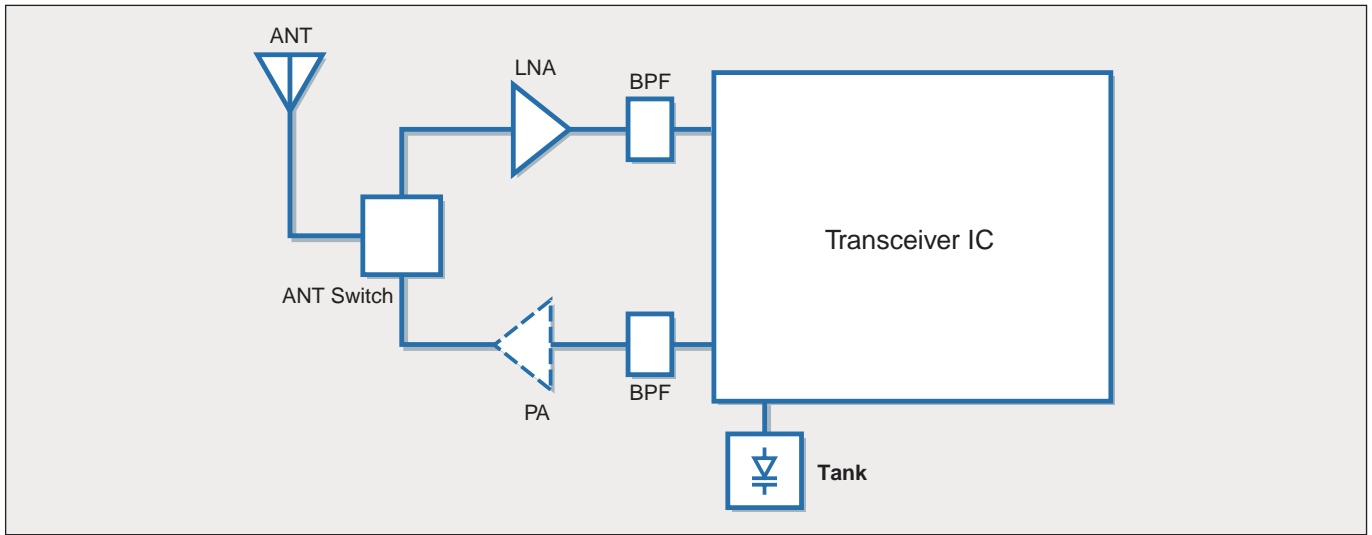
*: New

Application	Package		ESC	sESC	fSC
	Type				
OSC	Varicap Diode		1SV314 1SV329 JDV2S01E JDV2S02E JDV2S05E	JDV2S10S JDV2S13S JDV2S01S JDV2S02S JDV2S05S JDV2S16S JDV2S17S* JDV2S19S JDV2S20S JDV2S22S*	JDV2S10FS JDV2S13FS JDV2S01FS JDV2S02FS JDV2S05FS JDV2S16FS JDV2S17FS* JDV2S19FS JDV2S20FS JDV2S22FS*

*: New

1. Recommended Products by Application

1-10 2.4-GHz Wireless LAN and Bluetooth



ANT-Switch

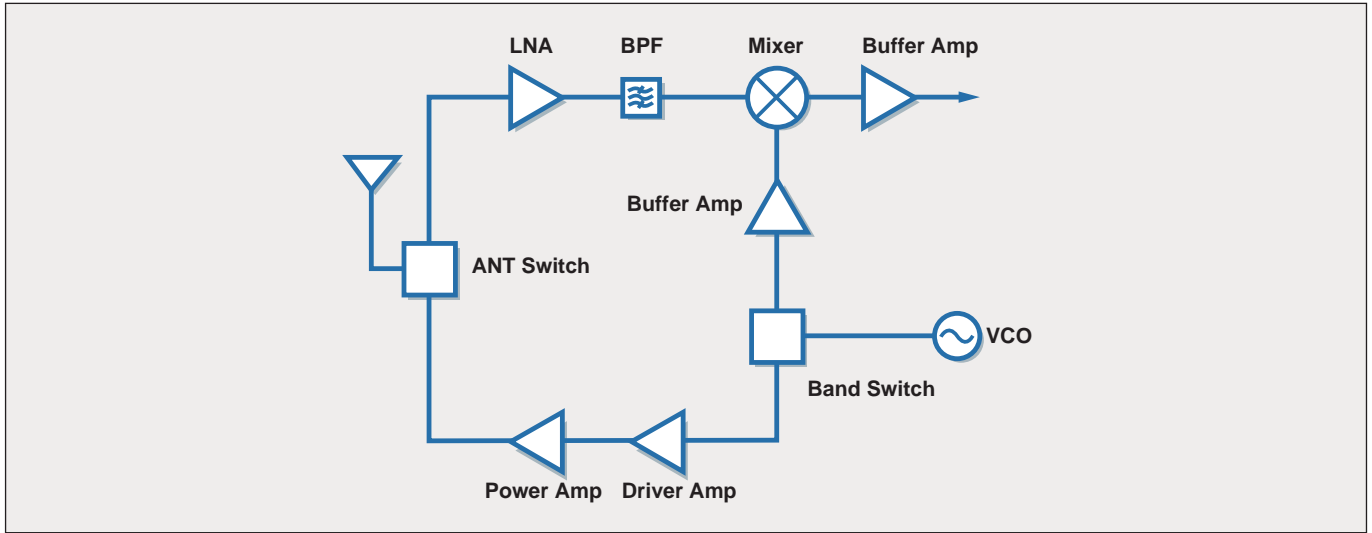
	Type	Comment
For Class 1	TG2216TU	GaAs MMIC
For Class 2, 3	TG2210FT	
	TG2211FT**	
	TG2213S*	
	TG2214S*	

*: New **: Built-in inverter

Application	Package		USQ	TESQ
	Type			
LNA	Bipolar	Transistor	2SC5319 MT4S32U MT4S100U MT4S101U	MT4S100T MT4S101T

Application	Package		ESC	sESC	fSC
	Type				
VCO	Varicap	Diode	1SV314 1SV329 JDV2S01E JDV2S02E JDV2S05E	JDV2S10S JDV2S13S JDV2S01S JDV2S02S JDV2S05S JDV2S16S JDV2S19S JDV2S20S	JDV2S10FS JDV2S13FS JDV2S01FS JDV2S02FS JDV2S05FS JDV2S16FS JDV2S19FS JDV2S20FS

1-11 High-Frequency Devices for FRS, GMRS



Application	Package		USC	ESC	sESC	fSC	CST2	USM	SSM	TESM	SMQ	USQ
	Type											
ANT Switch	FRS, GMRS		1SS314 1SV271 1SV307	1SS381 JDP2S04E 1SV308	JDS2S03S JDP2S02AS	JDP2S02AFS JDP2S05FS*	JDP2S02ACT*					
VCO			1SV214 1SV229 1SV276 1SV304	1SV278 1SV279 1SV284 1SV305 1SV282A	JDV2S06S JDV2S08S	JDV2S06FS JDV2S08FS						
VCO, Driver Buffer Amp Mixer LAN									2SC5065 2SC5085 MT3S06U MT3S16U*	2SC5066 2SC5086 MT3S06S	2SC5066FT 2SC5086FT MT3S06T MT3S16T* MT3S17T* MT3S18T*	2SC5087 MT4S06

*: New

Application	Package		PW-MINI	PW-X
	Type			
Power Amp	FRS		2SK3078A 2SK3656*	
	GMRS			2SK3079A 2SK3756*

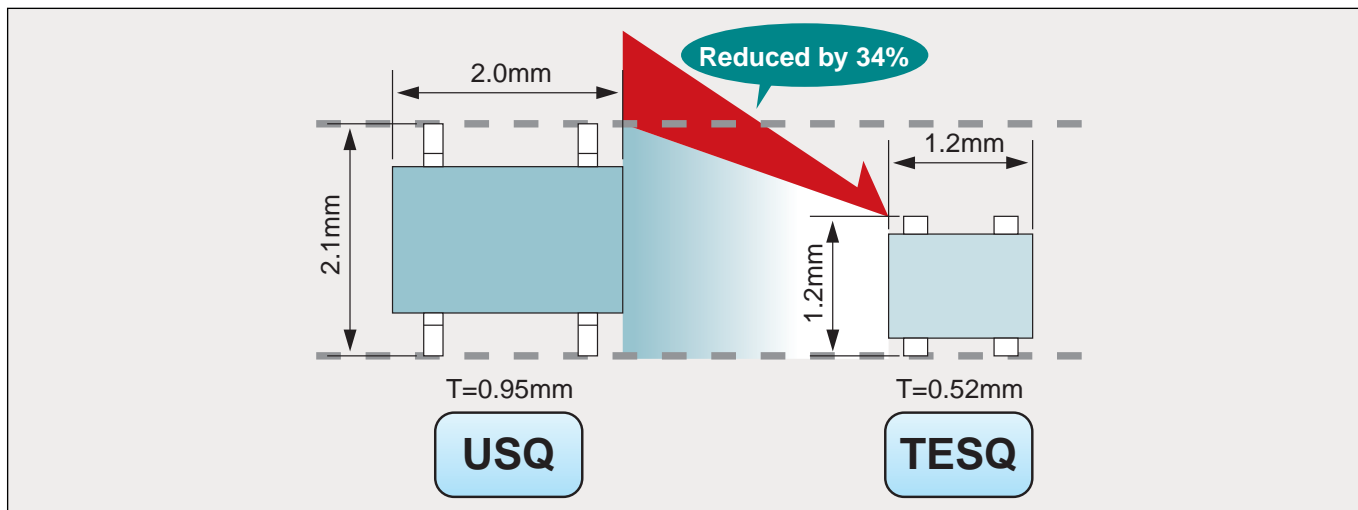
*: New

2. Product Line-up

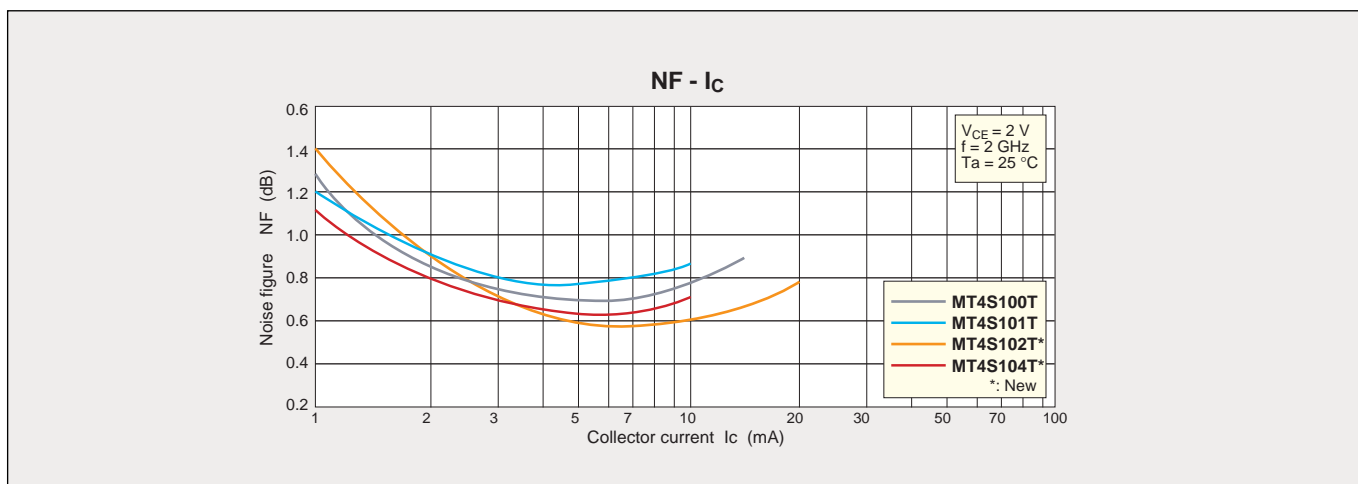
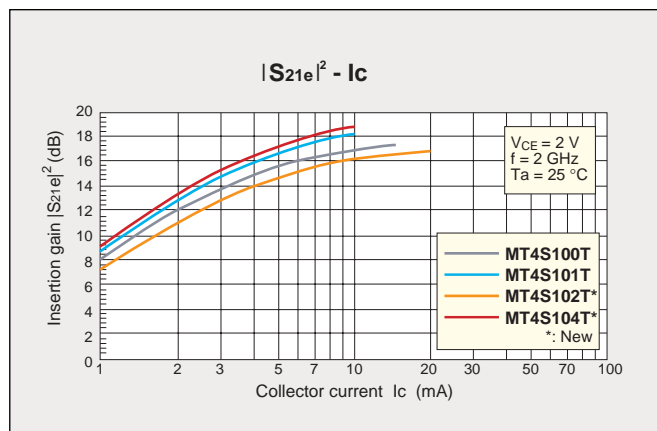
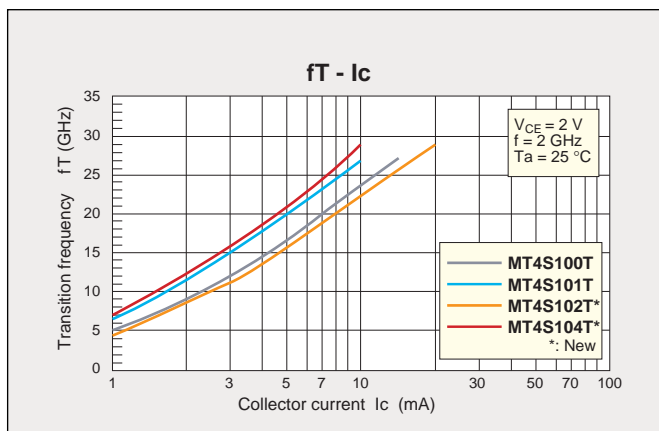
2-1 Microwave Transistors

- New silicon germanium transistor
- Compact TESQ package in addition to the USQ package
- Lower noise figure and higher transition frequency

■ Silicon Germanium Transistor Package Dimensions

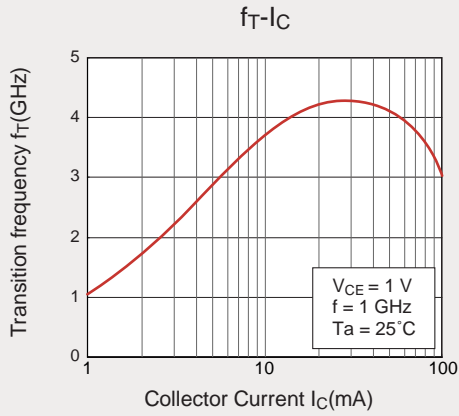


■ Silicon Germanium Transistor Characteristics



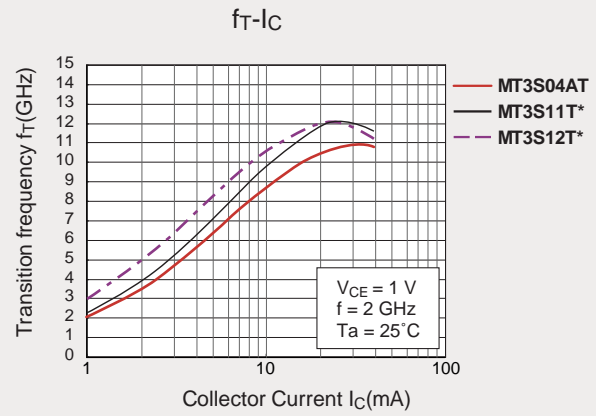
fT = 4 GHz Transistors

MT3S16FS*



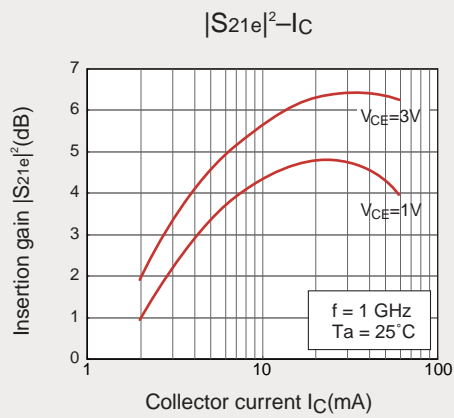
*: New

fT = 7 GHz Transistors

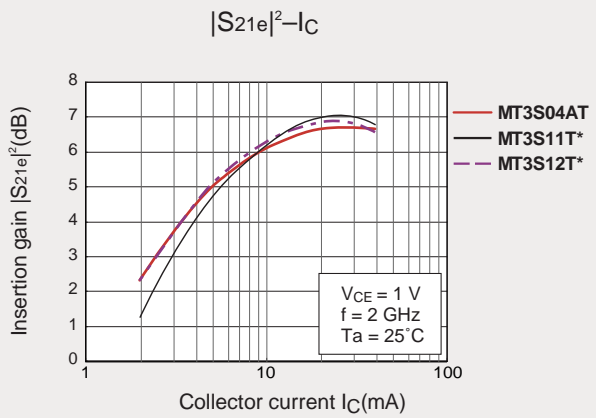


*: New

MT3S16FS*



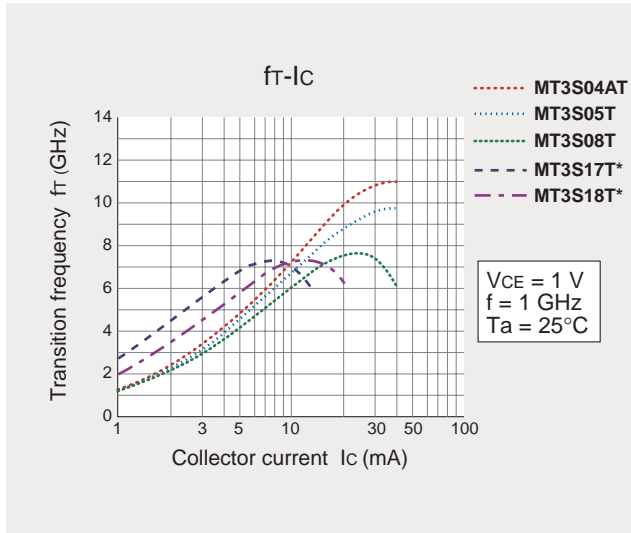
*: New



*: New

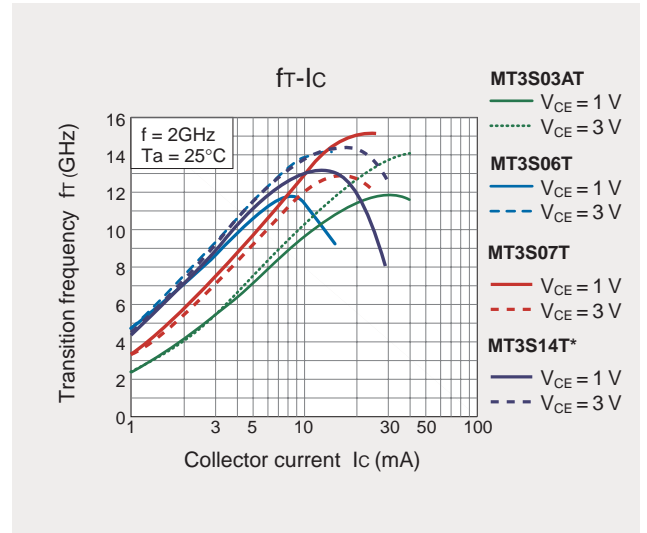
2. Product Line-up

fT = 7~10 GHz Transistors

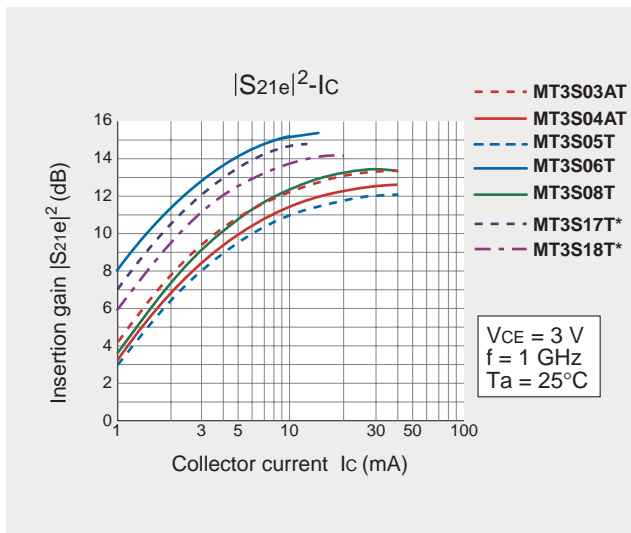


*: New

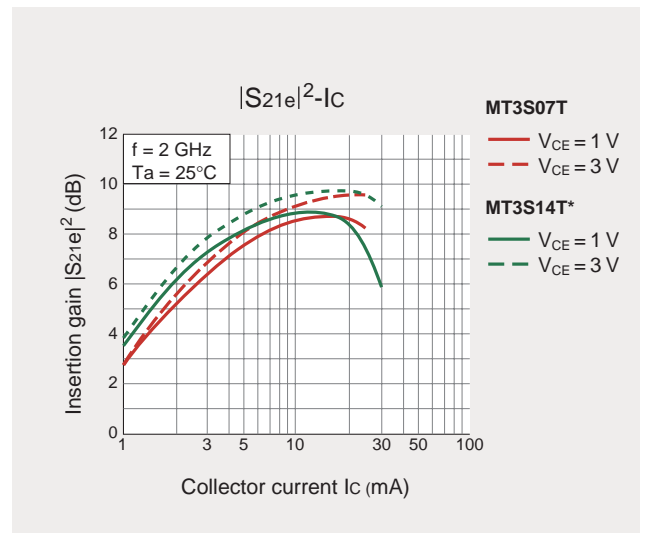
fT = 10 ~ 12 GHz Transistors



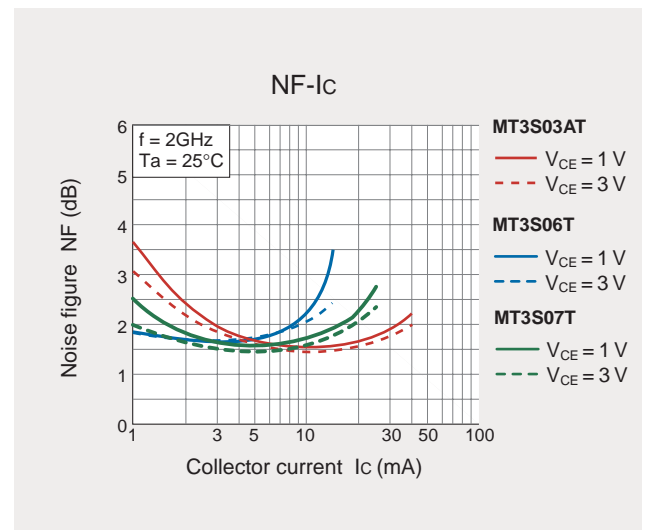
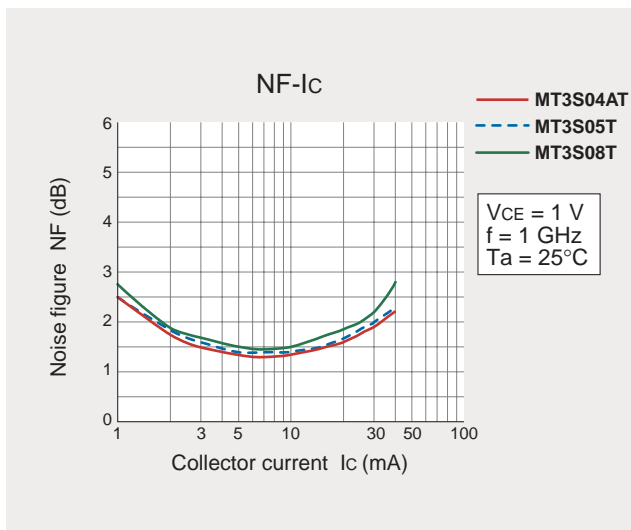
*: New



*: New

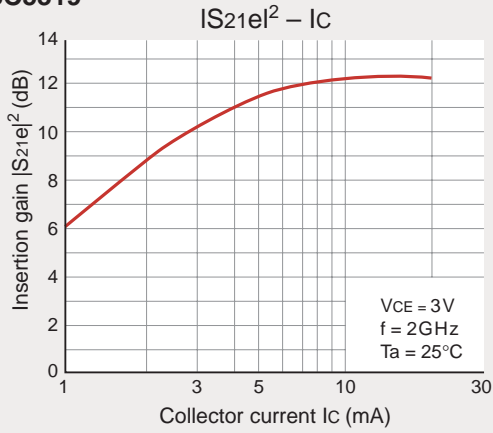


*: New

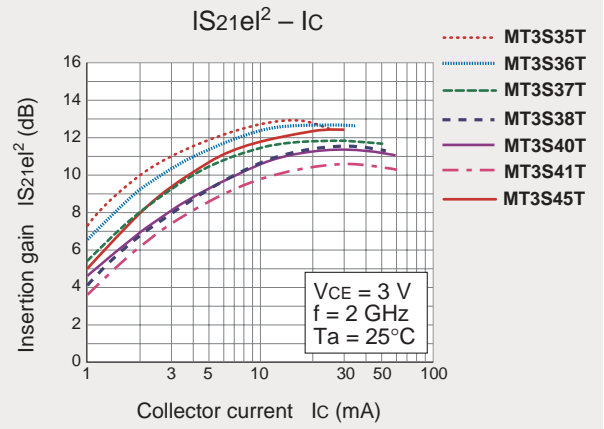


f_T = 16 GHz Transistors

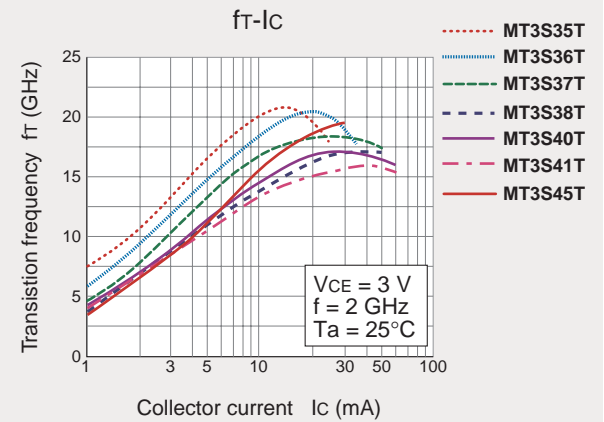
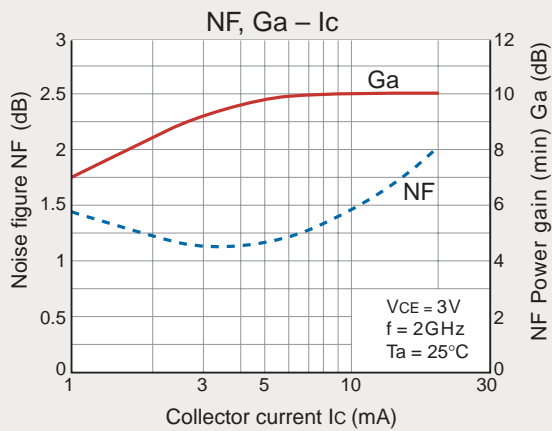
2SC5319



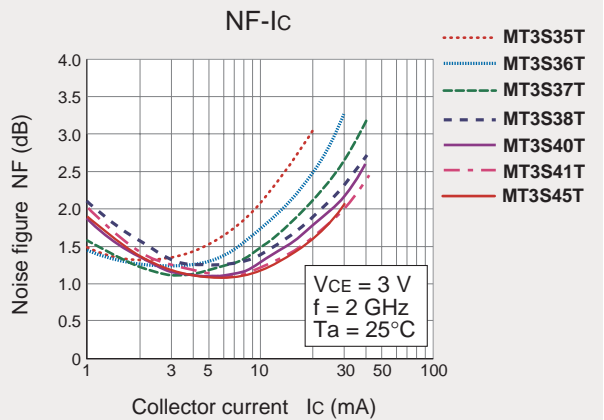
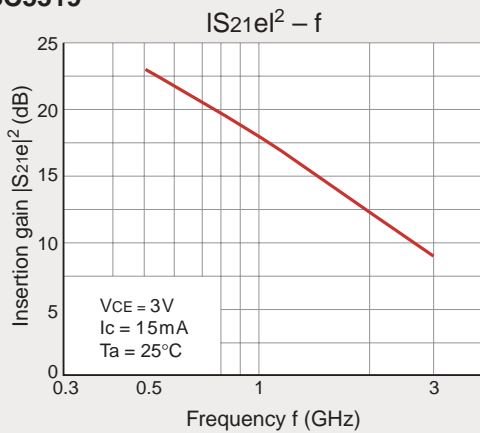
SMART-2 series f_T = 15 ~ 20 GHz Transistors



2SC5319



2SC5319



2. Product Line-up

2-1 Microwave Transistors

■ Transistors for AM/FM Tuners

Application	Part Number	Max Ratings			Electrical Characteristics								Package
		V _{CEO} (V)	I _C (mA)	P _C (mW)	h _{FE}	f _T Typ. (Min)		C _{re} (Cob) (pF)					
						V _{CE} (V)	I _C (mA)		V _{CE} (V)	I _C (mA)			
FM RF, MIX / OSC	2SC1923	30	20	100	40 to 200	6	1	550	6	1	0.7	TO-92	
	2SC2668											MINI	
	2SC2714											S-MINI	
	2SC4215											USM	
	2SC4915											SSM	
FM OSC	2SC2995	30	50	200	40 to 240	6	1	350	6	1	0.9	MINI	
	2SC2996			150								S-MINI	
FM IF / AM CONV, IF	2SC380TM	30	50	300	40 to 240	12	2	(100)	10	1	(2.0)	TO-92	
	2SC2669			200								MINI	
	2SC2715			150								S-MINI	
AM RF, CONV	2SC941TM	30	100	400	40 to 240	12	2	(80)	10	2	2.2	TO-92	
	2SC2670			200								MINI	
	2SC2716			150								S-MINI	
AM CONV, IF	2SC1815	50	150	400	70 to 700	6	2	(80)	10	1	(2.0)	TO-92	
	2SC2458			200								MINI	
	2SC2712			150								S-MINI	
	2SC4116			100								USM	

■ Transistors for TV Tuners

Application	Part Number	Max Ratings			Electrical Characteristics												Package	
		V _{CEO} (V)	I _C (mA)	P _C (mW)	h _{FE}	f _T (Typ.)				G _p (GC)/NF (Typ.)				C _{re} (Crb) (pF)	Cob (pF)			
						V _{CE} (V)	I _C (mA)	(MHz)	V _{CE} (V)	I _C (mA)	(dB/dB)	V _{CC} (V)	I _C (mA)			V _{ACC} (V)		f (MHz)
VHF RF	2SC3122	30	20	150	60 to 300	10	2	650	10	2	24 / 2	12	-	1.4	200	0.3	-	S-MINI
	2SC4249			100														USM
VHF MIX	2SC3123	20	50	150	40 to 300	10	5	1400	10	5	(23) / 3.8	12	3	-	200	0.4	-	S-MINI
	2SC4250			100														USM
VHF OSC	2SC3124	15	50	150	40 to 200	3	8	1100	10	8	-	-	-	-	-	-	-	S-MINI
	2SC4251			100														USM
	2SC4252	12	30	100	40 to 250	10	5	2000	10	5	-	-	-	-	-	-	-	1.1
UHF RF	2SC4214	20	20	150	40 min	3	1	850	3	1	15 / 2.8	4.5	-	2	800	(0.3)	-	SMQ
	2SC4244			100							17 / 4					(0.4)		USM
UHF MIX	2SC3862	15	50	150	40 to 200	10	5	2400	10	2	-	-	-	-	-	0.6	-	S-MINI E.B.Rev
UHF MIX OSC	2SC3120	15	50	150	40 to 200	10	5	2400	10	2	(17) / 8	10	2	-	800	0.6	-	S-MINI
	2SC4245			100														USM
UHF OSC	2SC3121	15	50	150	60 to 320	3	8	1500	10	8	-	-	-	-	-	-	-	S-MINI
	2SC4246			100														USM
	2SC3547A	12	30	150	35 to 130	10	5	4000	10	10	-	-	-	-	-	-	-	S-MINI
	2SC4247			100														USM
PIF AMP	2SC3125	25	50	150	20 to 200	10	10	600	10	10	-	-	-	-	-	-	-	S-MINI
	2SC4253			100														USM

■ Transistors for Use in VHF/UHF Band Low-Noise Amplifiers and Mixers

	TO-92	S-MINI	USM	SSM	TESM	fSM	SMQ	USQ	TESQ
VHF/UHF band	2SC2498	–	–	–	–	–	–	–	–
fT = 4 GHz high-current device	–	–	MT3S16U*	–	MT3S16T*	MT3S16FS*	–	–	–
fT = 7 GHz high-current device	–	2SC5084	2SC5085	2SC5086	2SC5086FT	–	2SC5087	2SC5088	–
fT = 7 GHz mid-current device	–	–	2SC5463	2SC5464	2SC5464FT	–	–	–	–
fT = 7 GHz low-current device	–	2SC5064	2SC5065	2SC5066	2SC5066FT	–	–	–	–
fT = 10 GHz high-current device	–	2SC5089	2SC5090	2SC5091	2SC5091FT	–	2SC5092	2SC5093	–
fT = 10 GHz low-current device	–	2SC5094	2SC5095	2SC5096	2SC5096FT	–	2SC5097	2SC5098	–
fT = 16 GHz high-current device	–	–	–	–	2SC5317FT	–	–	2SC5319	–
fT = 16 GHz low-current device	–	–	–	2SC5322	2SC5322FT	–	–	–	–
fT = 6 GHz low-voltage operating device	–	–	–	–	MT3S11T*	MT3S11FS*	–	–	–
fT = 7 GHz low-voltage operating device	–	MT3S04A	MT3S04AU	MT3S04AS	MT3S04AT	MT3S04AFS	MT4S04A	MT4S04AU	–
	–	–	–	–	–	–	–	–	–
	–	–	–	–	MT3S12T*	MT3S12FS*	–	–	–
	–	–	–	–	MT3S17T*	MT3S17FS*	–	–	–
fT = 10 GHz low-voltage operating device	–	MT3S03A	MT3S03AU	MT3S03AS	MT3S03AT	MT3S03AFS	MT4S03A	MT4S03AU	–
	–	–	MT3S06U	MT3S06S	MT3S06T	MT3S06FS	MT4S06	MT4S06U	–
fT = 12 GHz low-voltage operating device	–	–	MT3S07U	MT3S07S	MT3S07T	MT3S07FS	MT4S07	MT4S07U	–
fT = 15 GHz low-voltage operating device	–	–	–	–	MT3S14T*	MT3S14FS*	–	–	–
	–	–	–	–	MT3S41T	MT3S41FS	–	–	–
fT = 16 GHz low-voltage operating device	–	–	–	–	–	–	–	MT4S32U	–
fT = 17 GHz low-voltage operating device	–	–	–	–	MT3S38T	MT3S38FS	–	–	–
	–	–	–	–	MT3S40T	MT3S40FS	–	–	–
fT = 18 GHz low-voltage operating device	–	–	–	–	MT3S45T	MT3S45FS	–	–	–
fT = 19 GHz low-voltage operating device	–	–	–	–	MT3S37T	MT3S37FS	–	–	–
	–	–	–	–	MT3S36T	MT3S36FS	–	–	–
fT = 20 GHz low-voltage operating device	–	–	–	–	MT3S35T	MT3S35FS	–	–	–
fT = 21 GHz low-voltage operating device	–	–	–	–	–	–	–	MT4S101U* ¹	MT4S101T* ¹
fT = 22 GHz low-voltage operating device	–	–	–	–	–	–	–	MT4S100U* ¹	MT4S100T* ¹
fT = 25 GHz low-voltage operating device	–	–	–	–	–	–	–	MT4S102U* ²	MT4S102T* ²
	–	–	–	–	–	–	–	MT4S104U* ²	MT4S104T* ²

*: New, *1: SiGe, *2: New/SiGe

2. Product Line-up

■ Transistors for Use in VHF/UHF Band Low-Noise Amplifiers and Mixers

Application	Part Number	Max Ratings			Electrical Characteristics													Package				
		V _{CEO}	I _C	P _C	C _{ob}	C _{re}	f _T (Typ.)			IS _{21el} ² (Typ.)			NF (Typ.)									
		(V)	(mA)	(mW)	(pF)	(pF)	(GHz)	V _{CE} (V)	I _C (mA)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)					
VHF/UHF band	2SC2498	20	50	300	1.15	0.75	3.5	10	10	14.5	10	10	0.5	2.5	10	5	1.5	TO-92				
f _T = 4 GHz high-current device	MT3S16U*	5	60	100	-	2.4	4	3	10	5.5	3	30	1	2.4	2	5	1	USM				
	MT3S16T*			TESM																		
	MT3S16FS*			50														fSM				
f _T = 7 GHz high-current device	2SC5084	12	80	150	1	0.65	7	10	20	11	10	20	1	1.1	10	5	1	S-MINI				
	2SC5085			USM																		
	2SC5086			100														SSM				
	2SC5086FT			TESM																		
	2SC5087			150														SMQ				
	2SC5088			100														1.1	13	USQ		
f _T = 7 GHz mid-current device	2SC5463	12	60	100	0.75	0.5	7	8	15	12	8	15	1	1.1	8	5	1	USM				
	2SC5464																	SSM				
	2SC5464FT																	TESM				
f _T = 7 GHz low-current device	2SC5064	12	30	150	0.7	0.45	7	5	10	12	5	10	1	1.1	5	3	1	S-MINI				
	2SC5065			USM																		
	2SC5066			100														SSM				
	2SC5066FT			TESM																		
f _T = 10 GHz high-current device	2SC5089	10	40	150	0.7	0.5	10	8	20	7	8	20	2	1.7	8	5	2	S-MINI				
	2SC5090			USM																		
	2SC5091			100														SSM				
	2SC5091FT			TESM																		
	2SC5092			150														0.5	0.35	10	1.8	SMQ
	2SC5093			100														0.65	0.45	9.5		USQ
f _T = 10 GHz low-current device	2SC5094	10	15	150	0.5	0.4	10	6	7	7.5	6	7	2	1.8	6	3	2	S-MINI				
	2SC5095			USM																		
	2SC2096			100														SSM				
	2SC5096FT			TESM																		
	2SC5097			150														0.35	10	SMQ		
	2SC5098			100														0.34	9.5	USQ		
f _T = 16 GHz high-current device	2SC5317FT	5	20	100	0.6	0.45	15	3	15	9.5	3	15	2	1.3	3	5	2	TESM				
	2SC5319									11.5								USQ				
f _T = 16 GHz low-current device	2SC5322	5	10	100	0.4	0.3	15	3	7	10	3	7	2	1.4	3	3	2	SSM				
	2SC5322FT																	TESM				

*: New

■ Transistors for Use in VHF/UHF Band Low-Noise Amplifiers and Mixers

Application	Part Number	Max Ratings			Electrical Characteristics													Package														
		V _{CEO}	I _C	P _C	C _{ob}	C _{re}	f _T (Typ.)			IS _{21eI} ² (Typ.)			NF (Typ.)																			
		(V)	(mA)	(mW)	(pF)	(pF)	(GHz)	V _{CE} (V)	I _C (mA)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)	(dB)	V _{CE} (V)	I _C (mA)	f (GHz)															
f _T = 6 GHz low-voltage operating device	MT3S11T*	6	40	100	-	0.65	6	1	5	6.5	3	20	2	2.4	1	5	2	TESM														
	50			fSM																												
f _T = 7 GHz low-voltage operating device	MT3S04A	5	40	150	-	0.8	7	3	7	12.5	3	20	1	1.2	3	7	1	S-MINI														
	MT3S04AU			USM																												
	MT3S04AS			SSM																												
	MT3S04AT			TESM																												
	MT3S04AFS			fSM																												
	MT4S04A			SMQ																												
	MT4S04AU	USQ																														
	MT3S12T*	6	40	100	-	0.7	7	1	5	7	3	20	2	1.7	1	5	2	TESM														
	MT3S12FS*			50														fSM														
	MT3S17T*	8	12	100	-	0.3	7	1	5	14	3	7	1	1.4	1	5	1	TESM														
	MT3S17FS*			50														fSM														
	MT3S18T*	8	20	100	-	0.4	6	1	5	14	3	15	1	1.4	1	5	1	TESM														
MT3S18FS*	fSM																															
f _T = 10 GHz low-voltage operating device	MT3S03A	5	40	150	-	0.75	10	3	10	8	3	20	2	1.4	3	7	2	S-MINI														
	MT3S03AU			USM																												
	MT3S03AS			SSM																												
	MT3S03AT			TESM																												
	MT3S03AFS			fSM																												
	MT4S03A			SMQ																												
	MT4S03AU	USQ																														
	MT3S06U	5	15	60	-	0.25	10	3	5	9.5	3	7	2	1.6	3	3	2	USM														
	MT3S06S			SSM																												
	MT3S06T			TESM																												
	MT3S06FS			fSM																												
	MT4S06			SMQ																												
	MT4S06U			USQ																												
	MT3S07U			5														25	100	-	0.4	12	3	10	9.5	3	15	2	1.5	3	5	2
MT3S07S	SSM																															
MT3S07T	TESM																															
MT3S07FS	fSM																															
MT4S07	SMQ																															
MT4S07U	USQ																															
f _T = 15 GHz low-voltage operating device	MT3S14T*	2.5	30	100	-	0.35	11	1	5	10	3	15	2	1.7	1	5	2	TESM														
	MT3S14FS*			50														fSM														
	MT3S41T	4.5	80	100	0.9	0.55	15	3	20	10	3	20	2	1.2	3	5	2	TESM														
	MT3S41FS			50														fSM														
f _T = 16GHz, low-voltage operating device	MT4S32U	4.5	15	67.5	0.4	0.2	16	3	10	13.5	3	10	2	1.4	3	3	2	USQ														
f _T = 17 GHz low-voltage operating device	MT3S38T	4.5	50	100	-	0.76	17	3	20	11	3	20	2	1.2	3	5	2	TESM														
	MT3S38FS			50														fSM														
	MT3S40T			100														0.77	17	3	20	11	3	20	2	1.2	3	5	2	TESM		
	MT3S40FS			50																										fSM		
f _T = 18 GHz low-voltage operating device	MT3S45T	4.5	40	100	0.73	0.36	15.5	3	20	11	3	20	2	1.2	3	7	2	TESM														
	MT3S45FS			50														fSM														
f _T = 19 GHz low-voltage operating device	MT3S37T	4.5	50	100	0.66	0.35	19	3	20	12	3	20	2	1.2	3	3	2	TESM														
	MT3S37FS			50														fSM														
	MT3S36T			36														100	0.55	0.26	19	3	15	12.5	3	15	2	1.3	3	3	2	TESM
	MT3S36FS																	50														fSM
f _T = 20 GHz low-voltage operating device	MT3S35T	4.5	24	100	0.48	0.21	20	3	10	13	3	10	2	1.4	3	2	2	TESM														
	MT3S35FS			50														fSM														
f _T = 21 GHz low-voltage operating device	MT4S101U* ¹	3	10	30	0.34	0.10	21	2	7	16	2	7	2	0.8	2	5	2	USQ														
	MT4S101T* ¹			23			17			TESQ																						
f _T = 22 GHz low-voltage operating device	MT4S100U* ¹	3	15	45	0.41	0.14	22	2	10	16	2	10	2	0.72	2	5	2	USQ														
	MT4S100T* ¹			23			17			TESQ																						
f _T = 25 GHz low-voltage operating device	MT4S102U* ²	3	20	60	0.43	0.17	24	2	15	15	2	15	2	0.58	2	10	2	USQ														
	MT4S102T* ²			25			16			TESQ																						
	MT4S104U* ²			23			17			USQ																						
	MT4S104T* ²	3	10	30	0.26	0.09	25	2	7	17	2	7	2	0.67	2	5	5	USQ														
	MT4S104T* ²						18			TESQ																						

*: New, *: SiGe, **: New/SiGe

2. Product Line-up

Transistors for Use in VHF/UHF Band Oscillators

Application	S-MINI	USM	SSM	TESM	fSM	SMQ	USQ
VHF / UHF band	2SC3547A	–	–	–	–	–	–
	–	2SC4247	–	–	–	–	–
f _T = 5 GHz high-current device	2SC5109	2SC5110	2SC5111	2SC5111FT	–	–	–
f _T = 6 GHz low-current device	2SC5106	2SC5107	2SC5108	2SC5108FT	–	–	–
f _T = 7 GHz low-voltage operating device	MT3S04A	MT3S04AU	MT3S04AS	MT3S04AT	MT3S04AFS	MT4S04A	MT4S04AU
	–	–	–	MT3S05T	MT3S05FS	–	–
	–	–	–	MT3S08T	MT3S08FS	–	–
–	–	–	MT3S18T*	MT3S18FS*	–	–	–
f _T = 10 GHz low-voltage operating device	MT3S03A	MT3S03AU	MT3S03AS	MT3S03AT	MT3S03AFS	MT4S03A	MT4S03AU

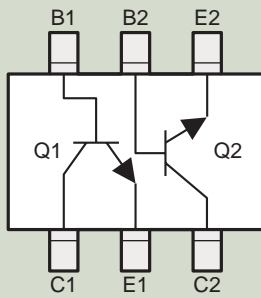
*: New

Application	Part Number	Max Ratings			Electrical Characteristics												Package		
		V _{CEO}	I _C	P _C	C _{ob}	C _{re}	f _T (Typ.)		IS _{21el} ² (Typ.)			NF (Typ.)							
		(V)	(mA)	(mW)	(pF)	(pF)	(GHz)	VCE (V)	IC (mA)	(dB)	VCE (V)	IC (mA)	f (GHz)	(dB)	VCE (V)	IC (mA)		f (GHz)	
VHF / UHF band	2SC3547A	12	30	150	1.05	–	4	10	10	–	–	–	–	–	–	–	–	–	S-MINI
	100			USM															
f _T = 5 GHz high-current device	2SC5109	10	60	150	0.9	0.7	5	5	5	10	5	5	1	–	–	–	–	–	S-MINI
	2SC5110			100															USM
	2SC5111			100															SSM
	2SC5111FT			100															TESM
f _T = 6 GHz low-current device	2SC5106	10	30	150	0.7	0.5	6	5	5	11	5	5	1	–	–	–	–	–	S-MINI
	2SC5107			100															USM
	2SC5108			100															SSM
	2SC5108FT			100															TESM
f _T = 7 GHz low-voltage operating device	MT3S04A	5	40	150	–	0.8	7	3	7	12.5	3	20	1	1.2	3	7	1	–	S-MINI
	MT3S04AU			100															USM
	MT3S04AS			100															SSM
	MT3S04AT			100															TESM
	MT3S04AFS			50															fSM
	MT4S04A			150															SMQ
	MT4S04AU	100	USQ																
	MT3S05T	5	40	100	–	0.9	4.5	1	5	8.5	1	5	1	1.4	1	5	1	–	TESM
	MT3S05FS			50															fSM
	MT3S08T	8	40	100	–	0.55	4.5	1	5	10.5	1	5	1	1.4	1	5	1	–	TESM
	MT3S08FS			50															fSM
	MT3S18T	8	20	100	–	0.4	6	1	5	14	3	15	1	1.4	1	5	1	–	TESM
MT3S18FS*	50			fSM															
f _T = 10 GHz low-voltage operating device	MT3S03A	5	40	150	–	0.75	10	3	10	8	3	20	2	1.4	3	7	2	–	S-MINI
	MT3S03AU			100															USM
	MT3S03AS			100															SSM
	MT3S03AT			100															TESM
	MT3S03AFS			50															fSM
	MT4S03A			150															SMQ
	MT4S03AU			100															USQ

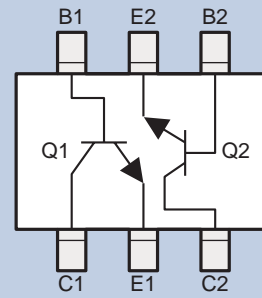
*: New

Pin Assignment for Multi-chip Transistors

● MT6C Series

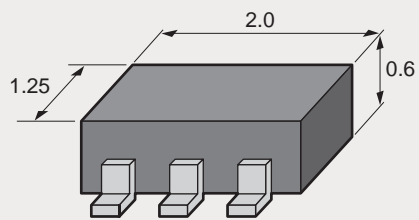


● MT6L Series



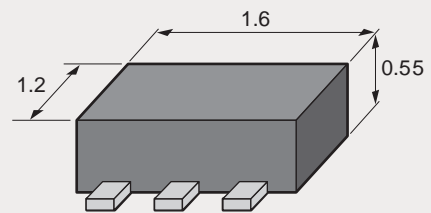
Package Dimensions for Multi-chip Transistors

● TU6



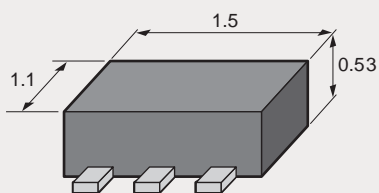
Unit: mm

● ES6



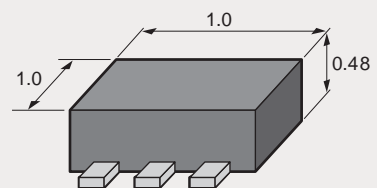
Unit: mm

● sES6



Unit: mm

● fS6



Unit: mm

2. Product Line-up

■ Multi-chip Transistors (MT Series)

Application	TU6	ES6	sES6	fS6
VHF / UHF Buffer + OSC	MT6L03AT	MT6L03E	–	–
	MT6L04AT	MT6L04AE	–	–
	–	MT6L05E	MT6L05S	MT6L05FS
	–	–	–	MT6L11FS*
	–	MT6L52AE	–	–
	–	MT6L53E	MT6L53S	MT6L53FS
	–	MT6L54E	MT6L54S	MT6L54FS
	–	MT6L55E	MT6L55S	MT6L55FS
	–	MT6L56E	MT6L56S	MT6L56FS
	MT6L57AT	MT6L57AE	MT6L57AS	MT6L57AFS
	MT6L58AT	MT6L58AE	MT6L58AS	MT6L58AFS
	MT6L59T	MT6L59E	–	–
	MT6L61AT	MT6L61AE	MT6L61AS	MT6L61AFS
	MT6L62AT	MT6L62AE	MT6L62AS	MT6L62AFS
	–	–	–	MT6L63FS*
	–	–	–	MT6L64FS*
	–	–	–	MT6L65FS*
	–	–	–	MT6L68FS*
	–	–	–	MT6L71FS*
	–	–	–	MT6L72FS*
	–	–	–	MT6L78FS*
	–	MT6C03AE	MT6C03AS	–
	–	MT6C04AE	MT6C04AS	–
–	MT6C06E	–	–	

*: New

Multi-chip Transistors (MT Series)

Application	Part Number	Tr	VCEO (V)	IC (mA)	PC*1 (mW)	hFE		f _T (Typ.)			NF (Typ.)			Contents	Package		
						VCE (V)	IC (mA)	(GHz)	VCE (V)	IC (mA)	(dB)	VCE (V)	IC (mA)			f (GHz)	
VHF / UHF Low Noise Amp	MT6L03AT		5	40	200	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AS x 2	TU6
	MT6L03AE		5	40	100	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AT x 2	ES6
	MT6L04AT		5	40	200	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AS x 2	TU6
	MT6L04AE		5	40	100	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AT x 2	ES6
VHF / UHF Buffer + OSC	MT6L05E		5	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05T x 2	sES6
	MT6L05S		5	40		80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05T x 2	sES6
	MT6L05FS		5	40	50	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05T x 2	fS6
	MT6L11FS*		6	40	50	100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11FS* x 2	fS6
	MT6L52AE	Q1	5	40	100	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AT	ES6
		Q2	5	40	100	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AT	
	MT6L53E	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	ES6
		Q2	5	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05T	
	MT6L53S	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	sES6
		Q2	5	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05T	
	MT6L53FS	Q1	5	15	50	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06FS	fS6
		Q2	5	40	50	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05FS	
	MT6L54E	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	ES6
		Q2	8	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S08T	
	MT6L54S	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	sES6
		Q2	8	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S08T	
	MT6L54FS	Q1	5	15	50	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06FS	fS6
		Q2	8	40	50	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S08FS	
	MT6L55E	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	ES6
		Q2	5	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05T	
	MT6L55S	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	sES6
		Q2	5	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05T	
	MT6L55FS	Q1	5	25	50	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07FS	fS6
		Q2	5	40	50	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S05FS	
	MT6L56E	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	ES6
		Q2	8	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S08T	
	MT6L56S	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	sES6
		Q2	8	40	100	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S08T	
	MT6L56FS	Q1	5	25	50	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07FS	fS6
		Q2	8	40	50	80 to 140	1	5	4.5	1	5	1.4	1	5	1	MT3S08FS	
	MT6L57AT	Q1	5	15	150	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06S	TU6
		Q2	5	40	150	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AS	
	MT6L57AE	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	ES6
		Q2	5	40	100	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AT	
	MT6L57AS	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	sES6
		Q2	5	40	100	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AT	
	MT6L57AFS	Q1	5	15	50	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06FS	fS6
		Q2	5	40	50	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AFS	
	MT6L58AT	Q1	5	15	150	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06S	TU6
		Q2	5	40	150	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AS	
MT6L58AE	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	ES6	
	Q2	5	40	100	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AT		
MT6L58AS	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	sES6	
	Q2	5	40	100	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AT		
MT6L58AFS	Q1	5	15	50	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06FS	fS6	
	Q2	5	40	50	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AFS		
MT6L59T	Q1	5	15	150	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06S	TU6	
	Q2	5	25	150	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07S		
MT6L59E	Q1	5	15	100	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T	ES6	
	Q2	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T		

*: New, *1: Total P_c

2. Product Line-up

Multi-chip Transistors (MT Series)

Application	Part Number	Tr	VCE0 (V)	IC (mA)	PC ^{∗1} (mW)	hFE		fT (Typ.)			NF (Typ.)			Contents	Package		
						VCE (V)	IC (mA)	(GHz)	VCE (V)	IC (mA)	(dB)	VCE (V)	IC (mA)			f (GHz)	
VHF / UHF Buffer + OSC	MT6L61AT	Q1	5	25	200	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07S	TU6
		Q2	5	40		80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AS	
	MT6L61AE	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	ES6
		Q2	5	40		80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AT	
	MT6L61AS	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	sES6
		Q2	5	40		80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AT	
	MT6L61AFS [*]	Q1	5	25	50	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07FS	fS6
		Q2	5	40		80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AFS	
	MT6L62AT	Q1	5	25	200	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07S	TU6
		Q2	5	40		80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AS	
	MT6L62AE	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	ES6
		Q2	5	40		80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AT	
	MT6L62AS	Q1	5	25	100	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07T	sES6
		Q2	5	40		80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AT	
	MT6L62AFS	Q1	5	25	50	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07FS	fS6
		Q2	5	40		80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AFS	
	MT6L63FS [*]	Q1	5	25	50	70 to 140	1	5	12	3	10	1.5	1	5	2	MT3S07FS	fS6
		Q2	6	40		100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11FS [*]	
	MT6L64FS [*]	Q1	4.5	24	50	70 to 140	3	10	20	3	10	1.4	3	2	2	MT3S35FS	fS6
		Q2	6	40		100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11FS [*]	
	MT6L65FS [*]	Q1	4.5	36	50	70 to 140	3	10	20	3	10	1.3	3	2	2	MT3S36FS	fS6
		Q2	6	40		100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11FS [*]	
	MT6L66FS [*]	Q1	4.5	36	50	70 to 140	3	10	20	3	10	1.3	3	2	2	MT3S36FS	fS6
		Q2	6	40		100 to 160	1	5	7	1	5	1.7	1	5	2	MT3S12FS [*]	
	MT6L67FS [*]	Q1	4.5	50	50	70 to 140	3	20	19	3	20	1.2	3	3	2	MT3S37FS	fS6
		Q2	6	40		100 to 160	1	5	7	1	5	1.7	1	5	2	MT3S12FS [*]	
	MT6L68FS [*]	Q1	5	15	50	70 to 140	1	5	10	3	5	1.7	1	3	2	MT3S06FS	fS6
		Q2	6	40		100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11FS [*]	
MT6L71FS [*]	Q1	5	25	50	70 to 140	1	5	12	3	10	1.5	3	5	2	MT3S07FS	fS6	
	Q2	6	40		100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11AFS [*]		
MT6L72FS [*]	Q1	4.5	36	50	70 to 140	3	10	19	3	15	1.3	3	3	2	MT3S36FS	fS6	
	Q2	6	40		100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11AFS [*]		
MT6L78FS [*]	Q1	6	40	50	100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11FS [*]	fS6	
	Q2	6	40		100 to 160	1	5	6	1	5	2.4	1	5	2	MT3S11AFS [*]		
MT6C03AE			5	40	100	80 to 160	1	5	10	3	10	1.4	3	7	2	MT3S03AT x 2	ES6
MT6C03AS																sES6	
MT6C04AE			5	40	100	80 to 160	1	5	7	3	7	1.2	3	7	1	MT3S04AT x 2	ES6
MT6C04AS																sES6	
MT6C06E			5	15	60	70 to 140	1	5	10	3	5	1.6	3	3	2	MT3S06T x 2	ES6

^{*}: New, ^{∗1}: Total Pc

2-2 FETs

■ MOSFETs/J-FETs for AM/FM Tuners

Application	Part Number	Max Ratings			Electrical Characteristics												Package
		VDS	ID	PD	IDSS(Typ.)			YfsI (Typ.)			Gps/NF (Typ.)						
		VGDS ¹ VGDO ² (V)	(IG) (mA)	(mW)	(mA)	VDS (V)	VG1S/ VG2S (V)	@1kHz (mS)	VDS (V)	ID (mA)	VG2S (VGS) (V)	(dB/dB)	VDS (V)	ID (mA)	VG2S (VGS) (V)	f (MHz)	
FM RF, MIX	3SK195	13.5	30	150	0 to 0.1	6	0 / 4	13	6	10	4	27 / 1.1	6	-	4	200	SMQ
	3SK225	13.5	30	150	0 to 0.1	6	0 / 4.5	21	6	10	4.5	22 / 2.0	6	10	4.5	500	SMQ
	3SK257			100													USQ
	3SK226			150													SMQ
	3SK258	100	USQ														
FM RF	2SK241	20	30	200	1.5 to 14	10	0	10	10	-	(0)	28 / 1.7	10	-	(0)	100	MINI
	2SK302			150													S-MINI
	2SK882			100													USM
	2SK161*	-18* ¹	(10)	200	1 to 10	10	0	9	10	-	(0)	18 / 2.5	10	-	(0)	100	MINI
	2SK211*			150													S-MINI
	2SK881*			100													USM
	2SK1771	12.5	30	150	0 to 0.1	8	0	15	8	10	-	23 / 1.0	8	16	-	100	SMQ
FM RF, OSC	2SK192A*	-18* ¹	(10)	200	3 to 24	10	0	7	10	-	(0)	24 / 1.8	10	-	(0)	100	MINI
	2SK210*			100													S-MINI
AM RF	2SK709*	-20* ²	(10)	300	6 to 32	5	0	25	5	-	(0)	- / 0.5	5	1	Rg 1kΩ	1kHz	TO-92
	2SK710*			200													MINI
	2SK711*			150													S-MINI
	2SK1875*			100													USM

*: J-FET

■ FETs for VHF/UHF Bands

Application	Part Number	Max Ratings			Electrical Characteristics												Package
		VDS	ID	PD	IDSS(Typ.)			YfsI (Typ.)			Gps(GCS)/NF(NFCS) (Typ.)						
		(V)	(mA)	(mW)	(mA)	VDS (V)	VG1S/ VG2S (V)	@1kHz (mS)	VDS (V)	ID (mA)	VG2S (V)	(dB/dB)	VDS (VDD) (V)	ID (mA)	VG2S (V)	f (MHz)	
VHF RF, MIX	3SK260	15	30	100	3 to 14	6	0 / 3	27	6	10	3	(24.5) / (3.3)	(10)	-	-	200	USQ
	3SK195	13.5	30	150	0 to 0.1	6	0 / 4	13	6	10	4	27 / 1.1	6	10	4	200	SMQ
	3SK225	13.5	30	150	0 to 0.1	6	0 / 4.5	21	6	10	4.5	22 / 2.0	6	10	4.5	500	SMQ
	3SK257			100													USQ
	3SK226			150													SMQ
	3SK258	100	USQ														
	3SK292	12.5	30	150	0 to 0.1	6	0 / 4.5	23.5	6	10	4.5	21.5 / 1.8	6	10	4.5	500	SMQ
	3SK294			100													USQ
UHF RF, MIX	3SK199	13.5	30	150	0 to 0.1	6	0 / 4	21.5	6	10	4	19.5 / 1.9	6	10	4	800	SMQ
	3SK207	13.5	30	150	0 to 0.1	6	0 / 4.5	21.5	6	10	4.5	19.5 / 1.9	6	10	4.5	800	SMQ
	3SK256			100													USQ
	3SK232			150													SMQ
	3SK249	12.5	30	100	0 to 0.1	6	0 / 4.5	21	6	10	4.5	20 / 1.5	6	10	4.5	800	USQ
	3SK259	15	30	100	0 to 0.1	6	0 / 3	18.5	6	10	3	19 / 2.6	6	10	3	800	USQ
	3SK291	12.5	30	150	0 to 0.16	6	0 / 4.5	27	6	10	4.5	23 / 1.5	6	10	4.5	800	SMQ
	3SK293			100													USQ

■ GaAs FETs

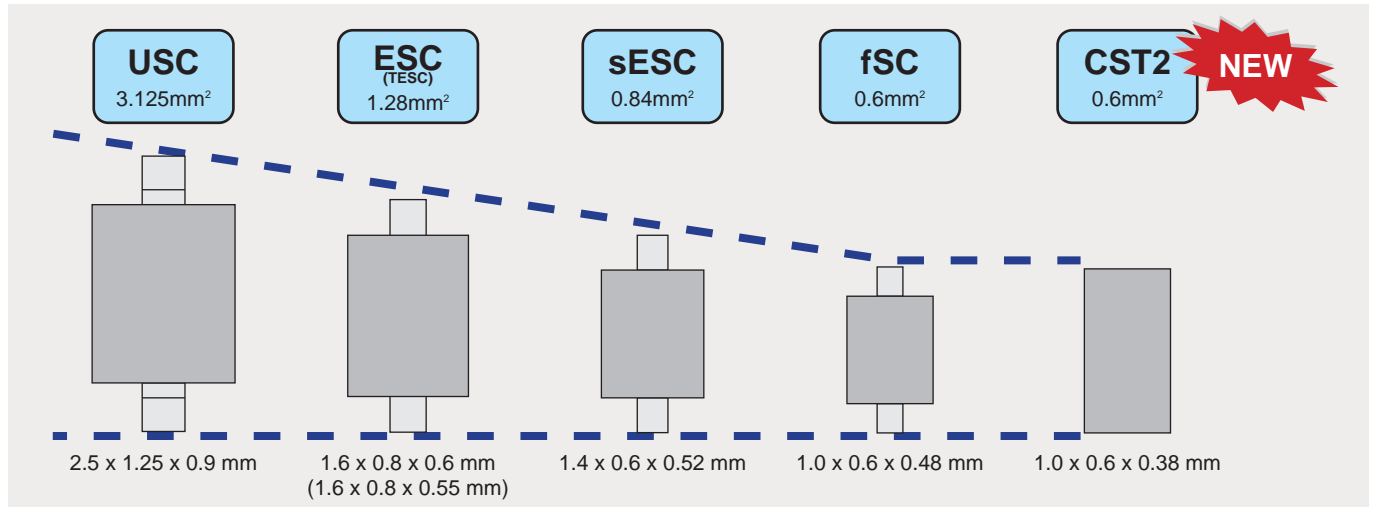
Application	Part Number	Max Ratings			Electrical Characteristics												Package
		VGDO	ID	PD	IDSS(Typ.)			YfsI (Typ.)			Gps(Ca)/NF(Typ.)						
		(V)	(mA)	(mW)	(mA)	VDS (V)	VG1S/ VG2S (V)	@1kHz (mS)	VDS (V)	ID (mA)	VG2S (V)	(dB/dB)	VDS (V)	ID (mA)	VG2S (V)	f (MHz)	
UHF RF, MIX	3SK240	-9	25	150	6 to 20	3	0/0	19	3	5	1	20.5/1.0	3	5	1	800	SMQ
	3SK274			100													USQ
	3SK320	-6	20	100	9 to 18	3	0/0	22	3	5	1	15/1.4	3	5	1	2000	USQ

2. Product Line-up

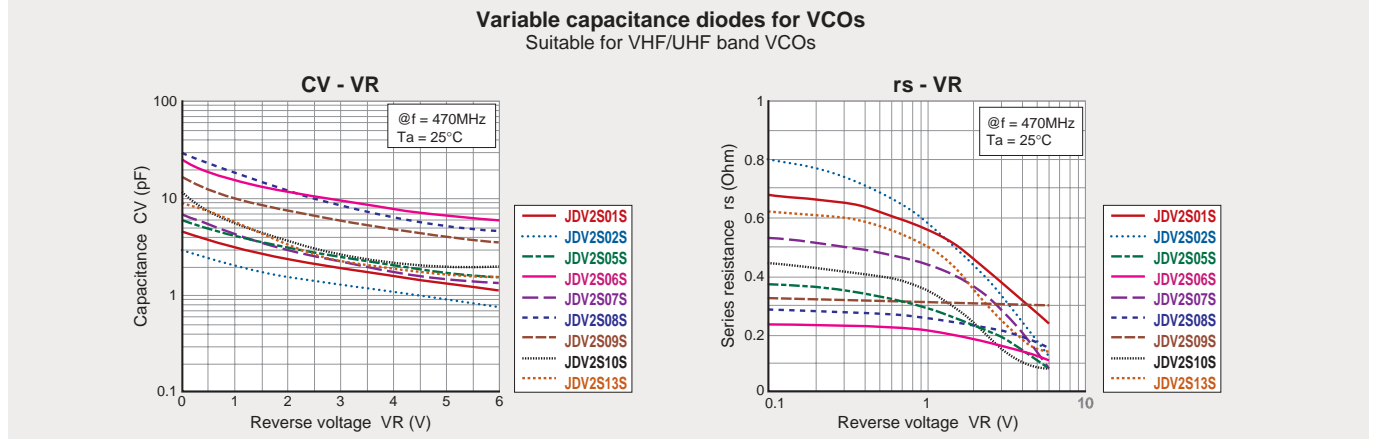
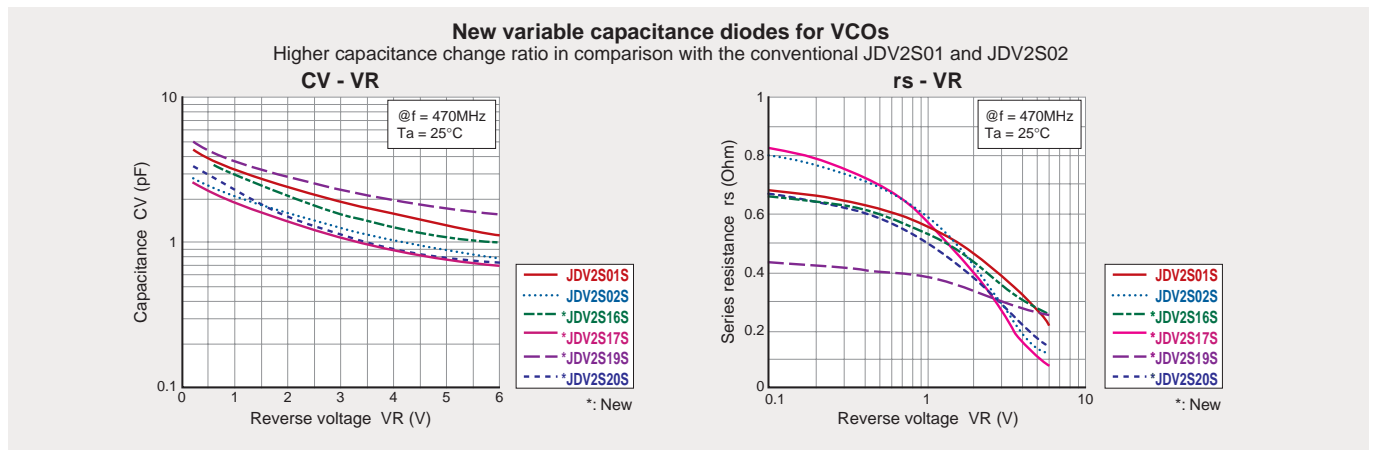
2-3 Diodes

- New ultra-compact fSC package (1.0 x 0.6 x 0.48 mm)
- 12 variable capacitance diodes and 2 PIN diodes
- New package CST2 (1.0 X 0.6 X 0.38) Thin type of chip scaled package

Package Dimensions



Variable Capacitance Diodes for VCOs



■ Variable Capacitance Diodes for VCO/VCXO

Application	USC	ESC	USQ	TESQ	sESC	fSC
VHF / UHF VCO	1SV229	1SV279**	1SV306	—	—	—
	1SV270	1SV281**	—	—	—	—
	1SV276	1SV284**	—	—	JDV2S06S	JDV2S06FS
L-Band VCO	1SV239	1SV280**	—	—	—	—
	1SV277	1SV285**	—	—	JDV2S07S	JDV2S07FS
UHF WIDE Band VCO	1SV304	1SV305	JDV4P08U	JDV4P08T	JDV2S08S	JDV2S08FS
	1SV310	1SV311	—	—	JDV2S09S	JDV2S09FS
	1SV313	1SV314	—	—	JDV2S10S	JDV2S10FS
UHF VCO	1SV328	1SV329	—	—	JDV2S13S	JDV2S13FS
	—	JDV2S01E	—	—	JDV2S01S	JDV2S01FS
	—	JDV2S02E	—	—	JDV2S02S	JDV2S02FS
	—	JDV2S05E	—	—	JDV2S05S	JDV2S05FS
	—	—	—	—	JDV2S16S	JDV2S16FS
	—	—	—	—	JDV2S17S*	JDV2S17FS*
	—	—	—	—	JDV2S19S	JDV2S19FS
	—	—	—	—	JDV2S20S	JDV2S20FS
VCXO	1SV322	1SV323	—	—	—	—
	1SV324	1SV325	—	—	—	—
	1SV330	1SV331	—	—	—	—

*: New, **: Product Line-up for overseas factory

2. Product Line-up

Variable Capacitance Diodes for VCO/CXO

Application	Part Number	VR (V)	IR (nA)	CT (1)		CT (2)		CT(1)/CT(2)	rs (Typ.)			Package	
				VR (V)	(pF)	VR (V)	(pF)		(Ω)	VR (V)	f (MHz)		
VHF / UHF VCO	1SV229	15	3	15	14 to 16	2	5.5 to 6.5	10	2.0 min	0.2	5	470	USC
	1SV279												ESC
	1SV306												USQ
	1SV270	10	3	10	15 to 17	1	7.3 to 8.7	4	1.8 min	0.28	1	470	USC
	1SV281												ESC
	1SV276	10	3	10	15 to 17	1	7.0 to 8.5	4	1.8 min	0.22	1	470	USC
	1SV284												ESC
	JDV2S06S												sESC
	JDV2S06FS												fESC
L-Band VCO	1SV239	15	3	15	3.8 to 4.7	2	1.5 to 2.0	10	2.0 min	0.45	1	470	USC
	1SV280												ESC
	1SV277	10	3	10	4.0 to 4.9	1	1.85 to 2.35	4	2.0 min	0.42	1	470	USC
	1SV285												ESC
	JDV2S07S												sESC
	JDV2S07FS												fESC
UHF WIDE Band VCO	1SV304	10	3	10	17.3 to 19.3	1	5.3 to 6.6	4	3 typ.	0.27	1	470	USC
	1SV305												ESC
	JDV4P08U												USQ
	JDV2S08S												sESC
	JDV2S08FS												fESC
	1SV310	10	3	10	9.7 to 11.1	1	4.45 to 5.45	4	1.8 min	0.28	1	470	USC
	1SV311												ESC
	JDV2S09S												sESC
	JDV2S09FS												fESC
	1SV313	10	3	10	7.3 to 8.4	0.5	2.75 to 3.4	2.5	2.4 min	0.35	1	470	USC
	1SV314												ESC
	JDV2S10S												sESC
JDV2S10FS	fESC												
UHF VCO	1SV328	10	3	10	5.7 to 6.7	1	1.85 to 2.45	4	2.8 typ.	0.55	1	470	USC
	1SV329												ESC
	JDV2S13S												sESC
	JDV2S13FS												fESC
	JDV2S01E	10	3	10	2.85 to 3.45	1	1.35 to 1.81	4	1.8 min	0.5	1	470	ESC
	JDV2S01S												sESC
	JDV2S01FS												fESC
	JDV2S02E	10	3	10	1.8 to 2.3	1	0.83 to 1.23	4	1.8 min	0.6	1	470	ESC
	JDV2S02S												sESC
	JDV2S02FS												fESC
	JDV2S05E	10	3	10	3.85 to 4.55	1	1.94 to 2.48	4	1.7 min	0.3	1	470	ESC
	JDV2S05S												sESC
	JDV2S05FS												fESC
	JDV2S16S	10	3	10	3.59 typ.	0.5	1.8 typ.	2.5	2.0 typ.	0.5	1	470	sESC
	JDV2S16FS												fESC
	JDV2S17S*	10	3	10	1.9 typ.	1	0.9 typ.	4	2.1 typ.	0.6	1	470	sESC
	JDV2S17FS*												fESC
	JDV2S19S	10	3	10	3.66 typ.	1	2.0 typ.	4	1.82 typ.	0.35	1	470	sESC
	JDV2S19FS												fESC
	JDV2S20S	10	3	10	2.93 typ.	0.5	1.33 typ.	2.5	2.2 typ.	0.6	1	470	sESC
JDV2S20FS	fESC												
JDV2S22S*	10	3	10	3.24 to 3.62	1	1.77 to 1.99	3	1.82	0.5	1	470	sESC	
JDV2S22FS*												fESC	
VCXO	1SV322	10	3	10	26 to 30	1	6 to 7.1	4	4 min	0.4	4	100	USC
	1SV323												ESC
	1SV324	10	3	10	43 to 49.5	1	8.5 to 12.2	4	4 min	0.4	4	100	USC
	1SV325												ESC
	1SV330	10	3	10	18	1	5.1	4	3.5 typ.	0.45	1	470	USC
	1SV331												ESC

*: New

Variable Capacitance Diodes for AM/FM Tuners

Application	Part Number	V _R (V)	I _R (nA)	C _T (1)		C _T (2)		Q(r _s (Ω)Typ.)			Package	
				V _R (V)	V _R (V)	V _R (V)	V _R (V)	min (-)	V _R (V)	f (MHz)		
AM tuning	1SV102	30	50	30	360 to 460	2	15 to 21	25	200	2	1	MINI
	1SV149	15	50	15	435 to 540	1	19.9 to 30	8	200	1	1	MINI
FM tuning	1SV101	15	10	15	28 to 32	3	12 to 14	9	(0.3)	C = 30 pF	50	MINI
FM tuning (twin)	1SV103	32	50	30	37 to 42	3	13.2 to 16.2	30	(0.35)*	C = 20 pF	50	MINI
	1SV228	15	10	15	28.5 to 32.5*	3	11.7 to 13.7*	8	(0.3)*	3	100	S-MINI
	1SV147		50							50	MINI	
	1SV225	32	50	30	18.5 to 21*	3	6.6 to 7.7*	30	(0.35)*	3	100	S-MINI
	JDV3C11	20	10	20	65.8 to 74.2	1	11.5 to 14.3	4.5	0.4	1.5	100	S-MINI
AFC	1SV160	15	100	4	7 to 14	4	-	-	(0.7)	4	50	S-MINI

*: Capacitance for series connection

Multi-chip Variable Capacitance Diodes for AM Tuners

Application	Part Number	V _R (V)	I _R (nA)	C _T (1)		C _T (2)		min (-)	Q		Contents	Package	
				V _R (V)	V _R (V)	V _R (V)	V _R (V)		f (MHz)				
AM tuning	HN1V01H	16	20	16	435 to 540	1	19.9 to 26.7	8	200	1	1	1SV149 x 4	FM8
	HN1V02H											1SV149 x 2	
	HN2V02H											1SV149 x 3	

Variable Capacitance Diodes for TV Tuners

Application	Part Number	V _R (V)	I _R (nA)	C _T (1)		C _T (2)		C _T (1) / C _T (2)	r _s (Typ.)			Package	
				V _R (V)	V _R (V)	V _R (V)	V _R (V)		(Ω)	V _R (V)	f (MHz)		
AFC	1SV216	30	10	28	10.5 to 16	2	3.3 to 5.7	10	2.5 to 3.4	0.55	5	470	USC
VHF tuning (CATV)	1SV215**	30	10	28	26 to 32	2	2.5 to 3.2	25	5.9 min	0.6	5	470	USC
	1SV217**	30	10	28	33 to 39	2	2.6 to 3.2	25	11 min	0.83	5	470	USC
	1SV231**	30	10	28	41 to 49.5	2	2.7 to 3.4	25	14 min	1.05	5	470	USC
	1SV232	30	10	28	28 to 32	2	2.75 to 3.1	25	10 min	0.55	5	470	USC
	1SV242	30	10	28	36 to 4.2	1	2.43 to 3.0	28	13.4 min	0.65	5	470	S-MINI
	1SV262	34	10	32	33 to 38	2	2.6 to 3.0	25	12 min	0.6	5	470	USC
	1SV282**												ESC
	1SV269**	34	10	32	29 to 34	2	2.5 to 2.9	25	10.8 min	0.55	5	470	USC
1SV283**	11 min								ESC				
VHF / UHF tuning	1SV214**	30	10	28	14.16 to 16.25	1	2.11 to 2.43	25	9.5 to 7.15	0.4	5	470	USC
	1SV278					2			5.9 to 7.15				ESC
UHF tuning (BS 2ND C / V) (CATV)	1SV245	30	10	28	3.31 to 4.55	2	0.61 to 0.77	25	5.0 min	1.2	1	470	USC
	1SV309												ESC
	1SV287	30	10	28	4.2 to 5.7	2	0.53 to 0.68	25	7.6 typ.	1.9	1	470	USC
	1SV291												ESC
	1SV302	30	10	28	42 to 51	2	2.1 to 3.1	25	17.5 typ.	1.05	5	470	USC
	1SV303												ESC
	JDV2S71U*	30	10	28	6 to 7.2	1	0.49 to 0.64	25	11.5 typ.	1	5	470	USC
JDV2S71E*	ESC												
CATV CONV OSC	1SV230	30	10	28	13.9 to 16.6	2	1.7 to 2.1	20	7.1 min	0.73	5	470	USC
	1SV286**				14.5 to 16.1		1.56 to 1.86			0.75			ESC
Wideband tuning (CATV)	1SV288	30	10	28	41 to 49.5	2	2.5 to 3.2	25	16 typ.	0.92	5	470	USC
	1SV290**												ESC

*: New, **: Product Line-up for overseas factory

2. Product Line-up

■ Diodes for TV Band Switches

	Part Number	V _R (V)	I _R		V _F (MAX)		C _T (Typ.)		r _s (Typ.)			Package
			(μ A)	V _R (V)	(V)	I _F (mA)	V _R (V)	(Ω)	I _F (mA)	f (MHz)		
Single	1SS314*	30	0.1	15	0.85	2	0.7	6	0.5	2	100	USC
	1SS381											ESC
	JDS2S03S											sESC
Twin	1SS268	30	0.1	15	0.85	2	0.8	6	0.6	2	100	S-MINI
	1SS312*											USM
	1SS364											SSM
	1SS269	30	0.1	15	0.85	2	0.8	6	0.6	2	100	S-MINI
	1SS313											USM

*: Product Line-up for overseas factory

■ PIN Diodes

	Part Number	V _R (V)	I _R		V _F (MAX)		C _T (Typ.)		r _s (Typ.)			Package	
			(μ A)	V _R (V)	(V)	I _F (mA)	V _R (V)	(Ω)	I _F (mA)	f (MHz)			
Single	1SV128	50	0.1	50	0.95 typ.	50	0.25	50	7	10	100	S-MINI	
	1SV271				1							USC	
	JDP2S04E				3							ESC	
	1SV307	30	0.1	30	1	50	0.3	1	1	10	100	USC	
	1SV308											ESC	
	JDP2S02T											TESC	
	JDP2S02AS											sESC	
	JDP2S02AFS											fSC	
	JDP2S02ACT*											CST2	
	JDP2S01T											TESC	
	JDP2S01S	30	0.1	30	0.95	50	0.65	1	0.65	10	100	sESC	
	JDP2S01AFS						0.55					0.7	fSC
	JDP2S05FS*						0.94					1.5	1
JDP2S05CT**	20	0.1	20	0.94	50	0.32	1	1.5	1	100	CST2		
Twin	1SV237	50	0.1	50	0.95 typ.	50	0.25	50	3	10	100	SMQ	
	1SV172											4	S-MINI
	1SV252											3.5	USM
	1SV312											3	USQ
	JDP4P02U	30	0.1	30	1	50	0.3	1	1	10	100	USQ	
	JDP4P02AT											TESQ	

*: New, **: Under Development

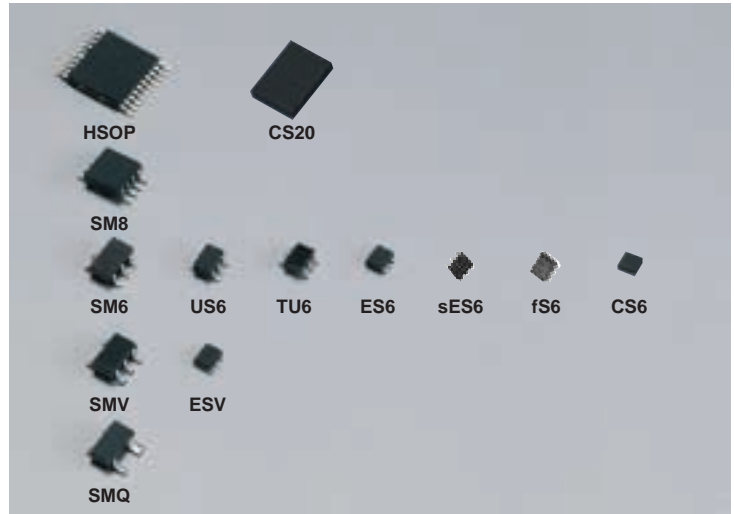
■ SBDs for VHF/UHF Band Mixers

	Part Number	V _R *V _{RM} (V)	I _F (mA)	V _F (Typ.)		C _T (Typ.)		Package
				(V)	I _F (mA)	V _R (V)		
Single	1SS154	6	30	0.5	10	0.8	0	S-MINI
	1SS315	5*	30	0.25	2	0.6	0.2	USC
	JDH2S01T							TESC
	JDH3D01S*	4	2.5	0.25	2	0.6	0.2	SSM
	JDH2S01FS	4	2.5	0.25	2	0.6	0.2	fSC
Twin	1SS271	6	30	0.55	10	0.8	0	S-MINI
	1SS295	4	30	0.25	2	0.6	0.2	S-MINI

*: New

2-4 High-Frequency Cell Packs (MMIC)

Toshiba's high-frequency cell packs are high-frequency integrated circuits that include certain circuits necessary for mobile communications equipment, such as amplifiers and mixers. Their design has been simplified to attain low power consumption levels and compact sizes.



Bipolar Linear ICs

The $f_T = 10$ GHz transistor process uses SMART (Silicon Monolithic Architecture for RF Technology) as the fundamental process. To achieve excellent high-frequency operation with low power consumption, optimize biased circuit parameters and transistors.

Product Lineup

Part Number	Package	Circuit	Application	Characteristics (Ta = 25°C.)
TA4001F	SMQ	Bipolar linear wideband amp	BS tuners, communications equipment, VHF / UHF amp	B/W = 2.4 GHz, Gp = 12.5dB @f = 500 MHz, Vcc = 5 V
TA4002F	SMQ	Bipolar linear wideband amp	BS tuners, communications equipment, VHF / UHF amp	B/W = 1.3 GHz, Gp = 23dB @f = 500 MHz, Vcc = 5 V
TA4003F	SMV	Bipolar linear wideband amp	Communications equipment, VHF/UHF amps	B/W = 1.5 GHz, Gp = 11dB @f = 500 MHz, Vcc = 2 V
TA4004F	SMV	Bipolar linear wideband amp	Communications equipment, VHF / UHF amps	B/W = 1.2 GHz, Gp = 10.5dB @f = 400 MHz, Vcc = 2 V
TA4011AFE	ESV	Bipolar linear wideband amp	Communications equipment, UHF amps	Band width 2.4 GHz, P01dB = -6dBmW @Vcc = 2 V
TA4011FU	USV	Bipolar linear wideband amp	Communications equipment, UHF amps	Band width 2.4 GHz, P01dB = -6dBmW @Vcc = 2 V
TA4012AFE	ESV	Bipolar linear wideband amp	Communications equipment, UHF amps	Band width 2.0 GHz, P01dB = 0dBmW @Vcc = 2 V
TA4012FU	USV	Bipolar linear wideband amp	Communications equipment, UHF amps	Band width 2.0 GHz, P01dB = 0dBmW @Vcc = 2 V
TA4014FT	TU6	Bipolar linear OSC & buffer	TCXO, VCXO	Icc = 1.2 mA @Vcc = 3.0 V Vosc = 1.4 p-p (reference)
TA4014FE	ES6	Bipolar linear OSC & buffer	TCXO, VCXO	
TA4014FC	CS6	Bipolar linear OSC & buffer	TCXO, VCXO	
TA4015FT	TU6	Bipolar linear OSC & buffer	TCXO, VCXO	Icc = 1.3 mA @Vcc = 3.0 V Vosc = 1.4 p-p (reference)
TA4015FE	ES6	Bipolar linear OSC & buffer	TCXO, VCXO	
TA4016AFE	ES6	Bipolar linear wideband amp	Communications equipment, UHF amps	Band width 3.2 GHz, Gp = 19dB @f = 1.5 GHz, Vcc = 2 V
TA4017FT	TU6	Bipolar differential amp	CATV, IF amp	S ₂₁ ² = 13dB, P01dB = 2dBmW @Vcc = 5 V, f = 45 MHz
TA4018F	SM8	Bipolar differential gain control amp	CATV, IF variable amp	S ₂₁ ² = 11dB, G _R = 37dB @Vcc = 5 V, f = 45 MHz
TA4019F	SM8	Bipolar differential amp	CATV, IF amp	S ₂₁ ² = 30dB, IM3 = 53dB @Vcc = 5 V, f = 45 MHz, Pin = -35dBmW
TA4107F	SM8	Bipolar linear down-converter	CATV, analog digital tuner	C.Gain = -0.5dB, IIP3 = 12dBmW @f _{RF} = 1 GHz, f _{LO} = 950 MHz, Vcc = 4.5 V
TA4303F	SSOP-20	Bipolar linear down-converter Si-MMIC	BS tuner, OSC + DBM + IF	C.Gain = 18 dB/1.6 GHz, IP3 = + 17 dBmW Vcc = 5 V, Icc = 74 mA

2. Product Line-up

GaAs MMIC

■ GaAs Switch

	TU6	UF6	sES6
Low-Power Switch	TG2210FT TG2211FT**	-	TG2213S* TG2214S*
Medium-Power Switch	-	TG2216TU	-

*: New, **: Built-in inverter

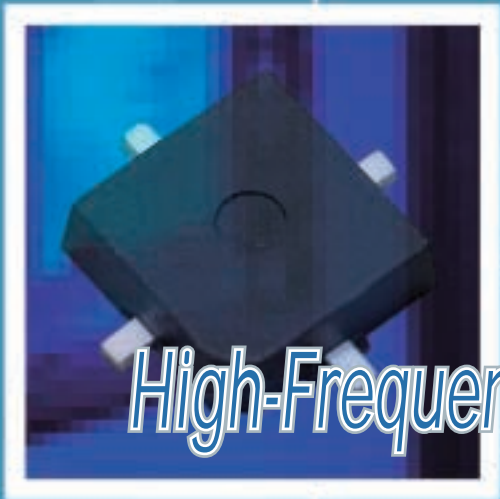
■ Line-up

Part Number	Package	Circuit	Application	Characteristics (Ta = 25°C)
TG2210FT	TU6	GaAs low power SPDT switch	General-purpose SPDT switches Bluetooth	Loss = 0.4dB, ISL = 30dB, Pi1dB = 18dBmW(min) @f = 1 GHz, Vc = 0 V / 2.5 V
TG2211FT	TU6	GaAs low power, SPDT switch Built-in inverter	General-purpose SPDT switches Bluetooth	Loss = 0.45dB, ISL = 25dB, @f = 1GHz, Vc = 0 V / 2.5 V Pi1dB = 22dBmW @f = 2.5 GHz
TG2213S*	sES6	GaAs low power, SPDT switch (small package)	General-purpose SPDT switches Bluetooth	Loss = 0.35dB, ISL = 24dB, @f = 1 GHz, Vc = 0 V / 2.7 V Pi1dB = 17dBmW @f = 2.5 GHz
TG2214S*	sES6	GaAs low power, SPDT switch (small package) Opposite switch connection to the TG2213S	General-purpose SPDT switches Bluetooth	Loss = 0.35dB, ISL = 24dB, @f = 1 GHz, Vc = 0 V / 2.7 V Pi1dB = 17dBmW @f = 2.5 GHz
TG2216TU	UF6	GaAs medium power SPDT switch	Cellular phones, Bluetooth Wireless LAN	Loss = 0.7dB, ISL = 23dB, Pi1dB = 28dBmW @f = 2.5 GHz, Vc = 0 V / 2.7 V
TG2401F	HSOP20	GaAs liner switch & power amp	PHS switches & power amps 1.9GHz band SPDT switches & power amps	PA: GP ≥ 32dB, Itotal ≤ 170 mA @f = 1.893 GHz, Po = 20.5dBmW SW: LOSS RX = 0.8dB ISL TX = 25dB ISL RX = 15dB @f = 1.893 GHz, Vc = 0 V / 3 V
TG2402FC**	CS20	GaAs liner switch & power amp	PHS switches & power amps 1.9GHz band SPDT switches & power amps	PA: GP ≥ 33dB, Itotal ≤ 180 mA @f = 1.92 GHz, Po = 20.2dBmW SW: LOSS RX = 0.8dB ISL TX = 25dB ISL RX = 15dB @f = 1.92 GHz, Vc = 0 V / 3 V

*: New, **: Under development

■ Power Amp for PHS

Part Number	Package	Circuit	Application	Characteristics (Ta = 25°C.)
TG2006F	SM8	GaAs linear Power amp	Power amp for PHS 1.9 GHz band amp	Po > 21dBmW, Gp = 23dB @F = 1.9 GHz, Vd = 3 V, It = 130 mA



High-Frequency POWER TRANSISTORS

High-Frequency Power Transistors

Toshiba provides high-power discrete transistors for HF, VHF and UHF. These devices are the most suitable for high-power amplifiers and boosters.

High-Frequency POWER MOSFETs

High-Frequency Power MOSFETs

Toshiba has developed High-Frequency power MOSFETs for VHF and UHF TV broadcast transmitters, and for 800-MHz cellular phone transmitter amplifiers. Salient features of these devices are high gain and high efficiency.

High-Frequency POWER MODULES

High-Frequency Power Modules

Power models for personal communications equipment, mobile radio transmitters, car phones, business-use radio transmitters and HAM radios are in great demand in the market. To meet such diverse needs, Toshiba offers a very varied product line comprised of devices that are suitable for all those applications.



3. High-Frequency Power Devices

■ Main Characteristics of High-Frequency Power Transistors

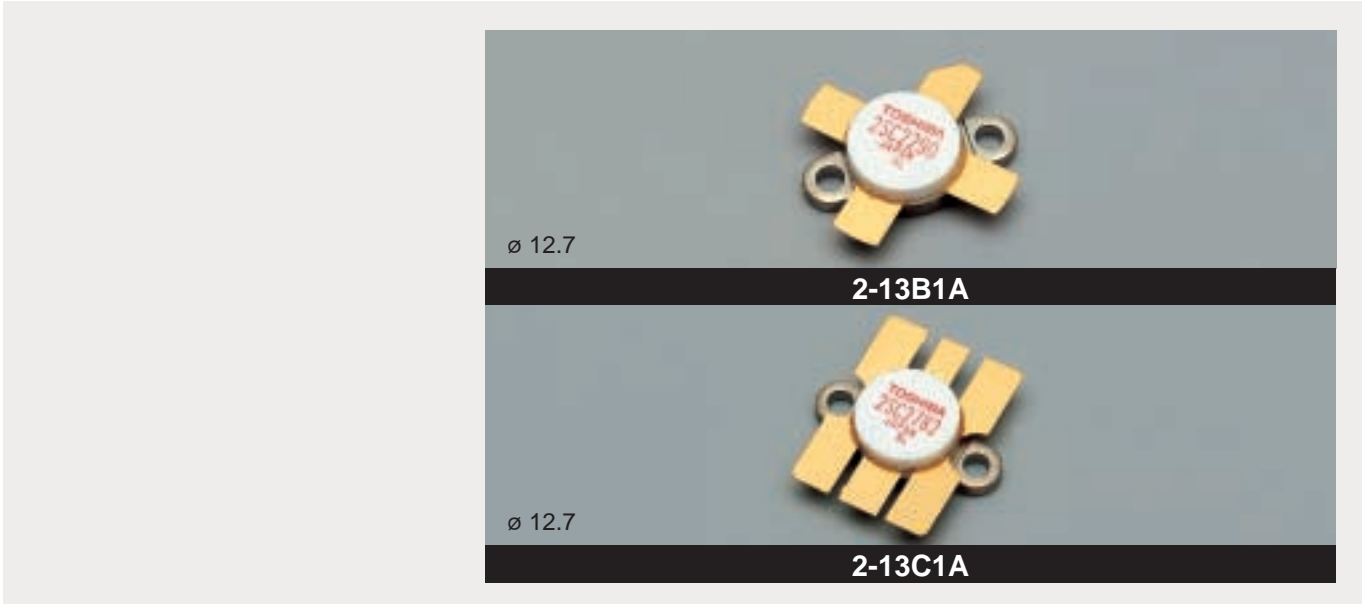
Application	Part Number	Maximum Ratings (TC = 25°C)			min	P _o (W)			Package
		VCBO (V)	PC (W)	IC (A)		Measuring Conditions			
						VCC (V)	f (MHz)	P _i (W)	
27 to 50 MHz CB Radio Transmitter HAM Radio Transmitter	2SC2290	45	175	20	60PEP	12.5	28	4PEP	2-13B1A
	2SC2879	45	250	25	80PEP	12.5	28	8PEP	2-13B1A
	2SC2510	60	250	20	150PEP	28	28	9PEP	2-13B1A
175 MHz Marine Radio Transmitter HAM Radio Transmitter Business-Use Radio Transmitter	2SC2782	36	220	20	80	12.5	175	18	2-13C1A

■ Main Characteristics of High-Frequency Power MOSFETs

Application		Part Number	Maximum Ratings (TC = 25°C)			P _{o min} (W)	Efficiency (min)	Measuring Conditions			Package
			V _{DSS} (V)	PC (W)	I _D (A)			V _{DD} (V)	f (MHz)	P _i (W)	
For TV Broadcasting	VHF	2SK1310A	100	250	12	190	65%(typ.)	50	230	10	2-22C2A
	UHF	2SK1739A	80	250	11	90	50%(typ.)	40	770	10	2-22C2A
For Cellular Phone		2SK2854	10	0.5	0.5	0.2	40%	6	849	0.02	PW-MINI
		2SK2855	10	0.5	1	1.26	55%	6	849	0.2	PW-MINI
For Radio Transmitter		2SK3074	30	3	1	0.63	45%	9.6	520	0.02	PW-MINI
		2SK3075	30	20	5	7.5	50%	9.6	520	0.5	PW-X
For Cellular Phone		2SK3077	10	0.1	0.1	0.032	20%	4.8	915	0.001	USQ
For Family Radio Service (FRS)		2SK3078A	10	3	0.5	0.63	50%	4.5	470	0.1	PW-MINI
		2SK3656*	7.5	3	0.5	0.5	50%	3.6	470	0.02	PW-MINI
		2SK3079A	10	20	3	2.24	50%	4.5	470	0.1	PW-X
For General Mobile Radio Service (GMR5)		2SK3756*	7.5	3	1	1.26	50%	4.5	470	0.1	PW-MINI
For Radio Transmitter		2SK3475	20	3	1	0.63	45%	7.2	520	0.02	PW-MINI
		2SK3476	20	20	3	7	60%	7.2	520	0.5	PW-X

*: New

■ Package



3. High-Frequency Power Devices

High-Frequency Power Module Product List by Product Number (Analog Application)

Applications		Part Number	Frequency Range	Characteristics			Measuring Conditions		Package ^{*1}
			f (MHz)	PO (W)	η_T (%)	ρ_i (-)	P _i (mW)	V _{CC} (V)	
VHF	50W FM Business-Use Radio Transmitter	S-AV32	134 to 174	60	45	3	50	5/12.5	5-53P
	25W FM Business-Use Radio Transmitter	S-AV33	134 to 174	32	45	3	50	5/12.5	5-53P
	25W FM Marine Radio Transmitter	S-AV35	154 to 162	32	50	3	10	5/12.5	5-32F
	65W FM Business-Use Radio Transmitter	S-AV36	134 to 174	80	45	3	50	5/12.5	5-53P
UHF	5W FM Portable Business-Use Radio Transmitter	S-AU50L	400 to 430	7	40	3	50	4/9.6	5-23E
		S-AU50M	430 to 480	7	40	2.5	50	4/9.6	5-23E
		S-AU50H	470 to 520	6.5	40	4.5	50	4/9.6	5-23E
	5W FM Portable HAM Radio Transmitter	S-AU57	430 to 450	7	40	3	20	4/9.6	5-23E
	5W FM Portable Business-Use Radio Transmitter	S-AU68L	400 to 420	7	35**	5**	20	4/9.6	5-23E
		S-AU68M	450 to 470	7	40**	2.5**	20	4/9.6	5-23E
	50W FM Business-Use Radio Transmitter	S-AU82VL	378 to 450	60	40	3	50	5/12.5	5-53P
		S-AU82L	400 to 470	60	40	3	50	5/12.5	5-53P
		S-AU82H	450 to 520	60	40	3	50	5/12.5	5-53P
	25W FM Business-Use Radio Transmitter	S-AU83L	400 to 470	32	40	3	50	5/12.5	5-53P
		S-AU83H	450 to 520	32	40	3	50	5/12.5	5-53P
	2W FM Portable Business-Use Radio Transmitter	S-AU92*	440 to 470	3	40	3	50	3.5/6	5-23E
50W FM Business-Use Radio Transmitter	S-AU93*	430 to 500	60	40	3	50	5/12.5	5-53P	

*: Under development, **: @Po = 7 W, ***: Please refer to page 46 for package dimensions

High-Frequency Power Module Product List by Product Number (Digital Application)

Applications		Part Number	Frequency Range	Characteristics		Measuring Conditions		Package
			f (MHz)	PO (dBmW)	ACP (dB)	V _{CC} (V)	ICC (A)	
Business-Use Radio Transmitter		S-AV34	150 to 165	39	-34	10.8	2.8	5-32G
Business-Use Radio Transmitter (Japan Digital MCA)		S-AU86	889 to 915	35	-39	12	1.7	5-28C

Micro PA Product List

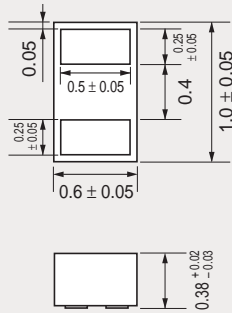
Applications	Part Number	Frequency Range f(MHz)	Po (Typ..) (dBmW)	Operating current I(Typ..) (mA)	Gp (Typ..) (dB)	ACPR1(Typ..) (dBc)	ACPR2(Typ..) (dBc)	Vcc (V)	Vcon (V)	Input Signal
Japan N-CDMA	S-AU84	887 to 925	27.5	415	27.5	-49 (@Δf = 900kHz)	-59 (@Δf = 1.98MHz)	3.5	2.8	1X
North America, Korea and China N-CDMA	S-AU85	824 to 849	27.5	415	27.5	-49 (@Δf = 900kHz)	-59 (@Δf = 1.98MHz)	3.5	2.8	1X
Japan N-CDMA	S-AU87	887 to 925	27.0	355	27.0	-49 (@Δf = 900kHz)	-60 (@Δf = 1.98MHz)	3.5	2.8	1X
W-CDMA / UMTS	S-AL54	887 to 925	26.0	250	27.5	-40 (@Δf = 5MHz)	-53 (@Δf = 10MHz)	3.5	2.85	-

4. Package Dimensions

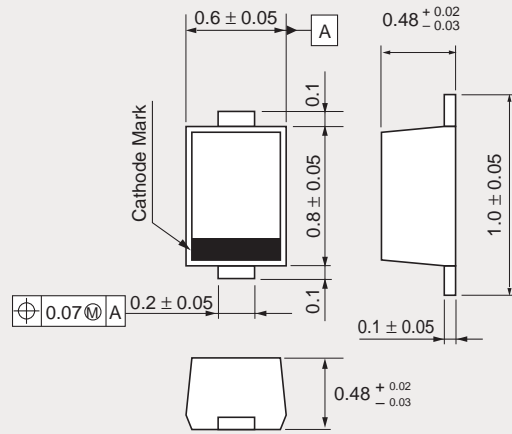
■ 2-Pin Package

Unit: mm

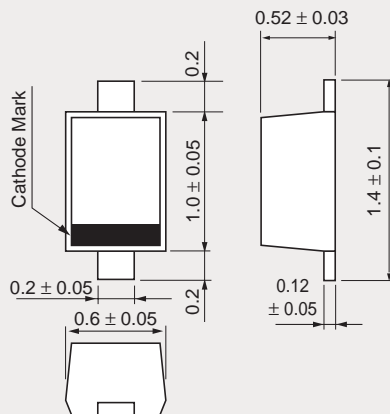
CST2



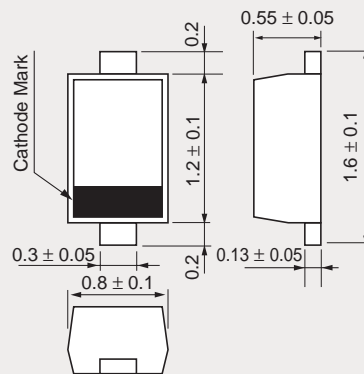
fSC



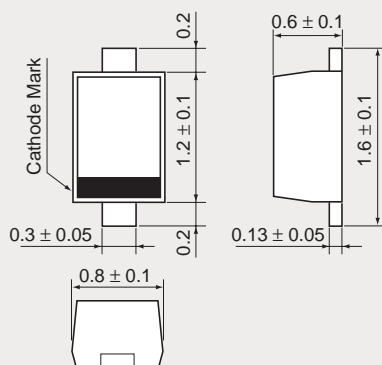
sESC



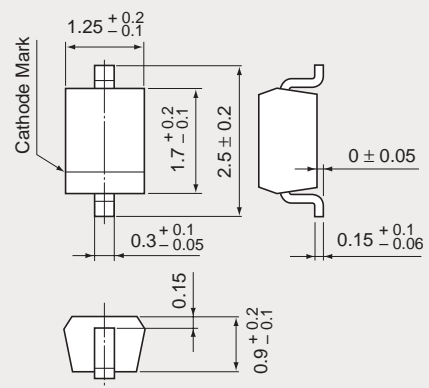
TESC



ESC



USC

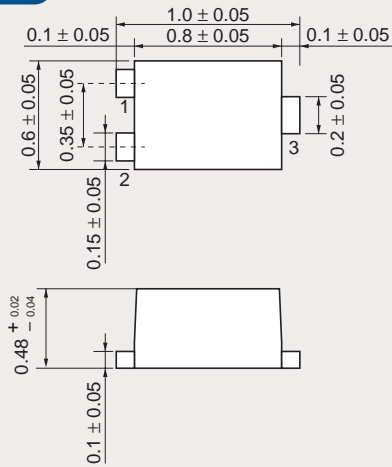


4. Package Dimensions

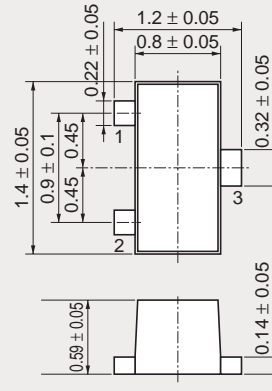
■ 3-Pin Package

Unit: mm

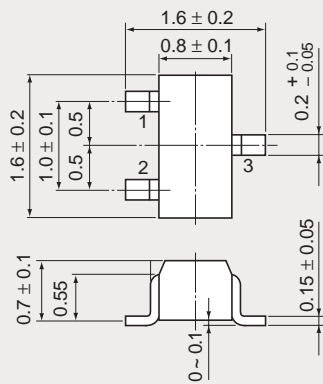
fSM



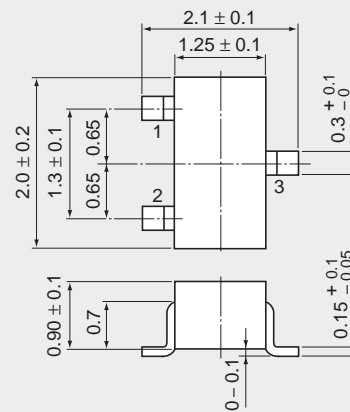
TESM



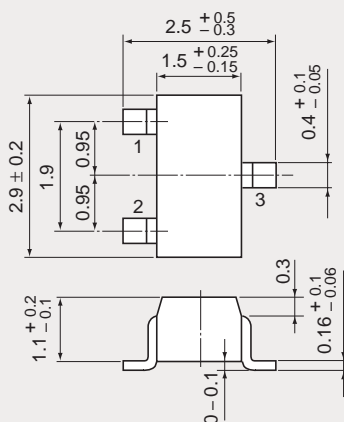
SSM



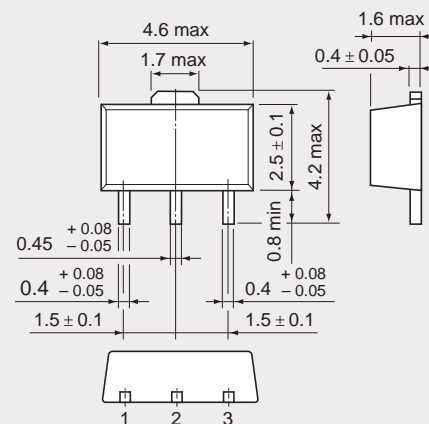
USM



S-MINI



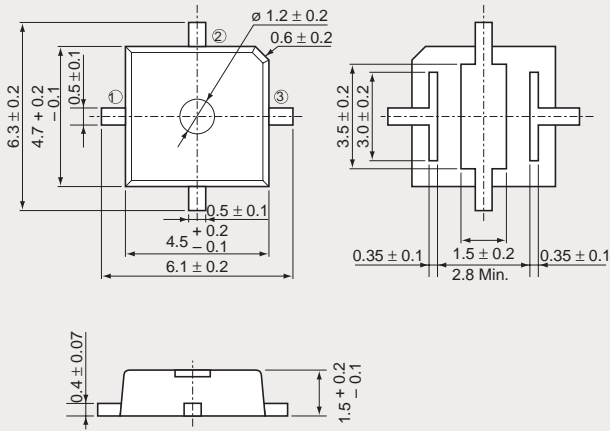
PW-MINI



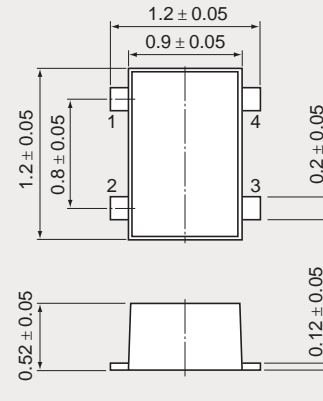
■ 3-,4- and 5-Pin Packages

Unit: mm

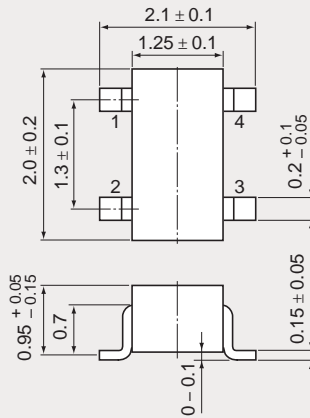
PW-X



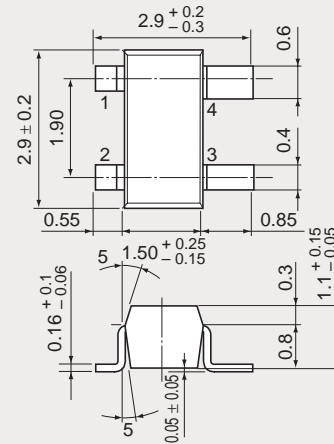
TESQ



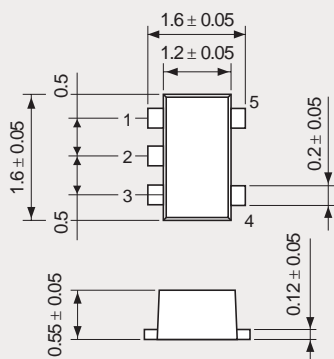
USQ



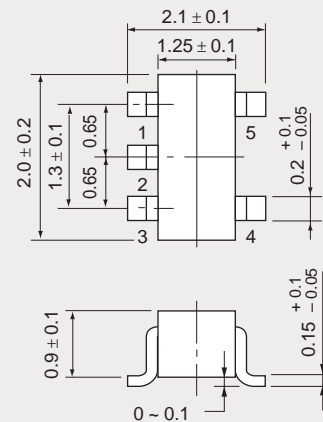
SMQ



ESV



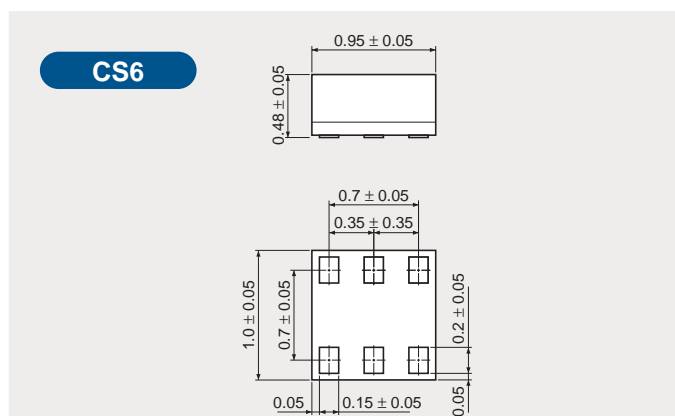
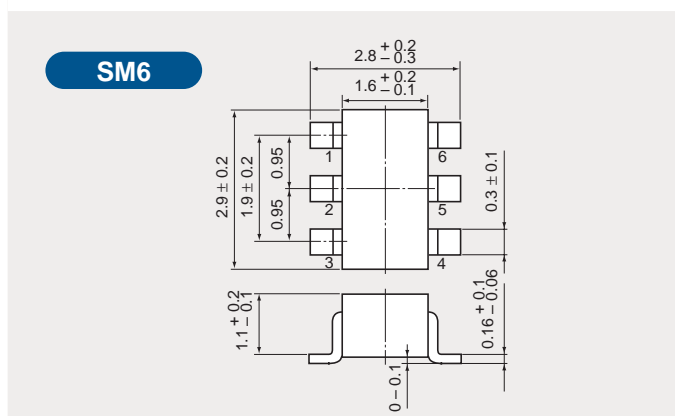
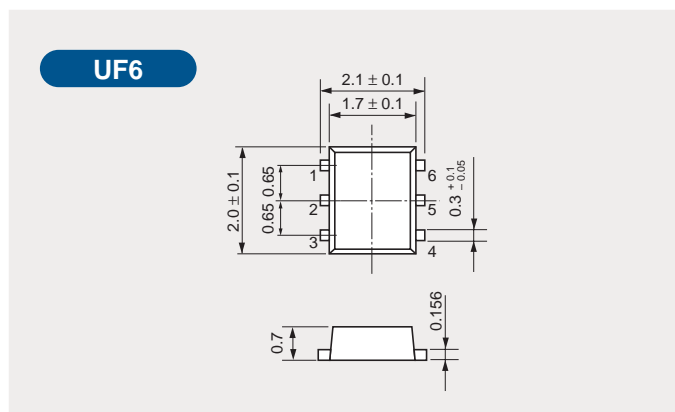
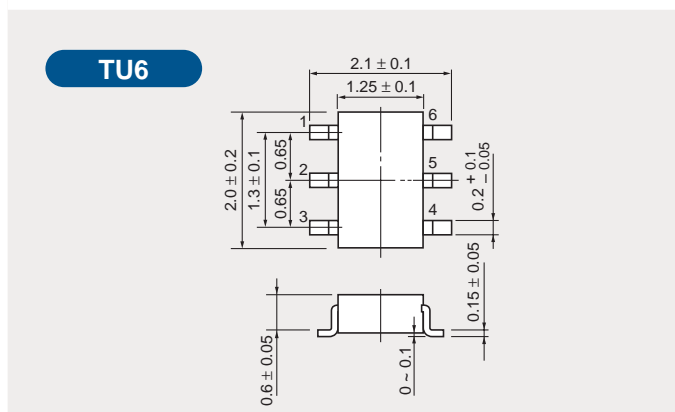
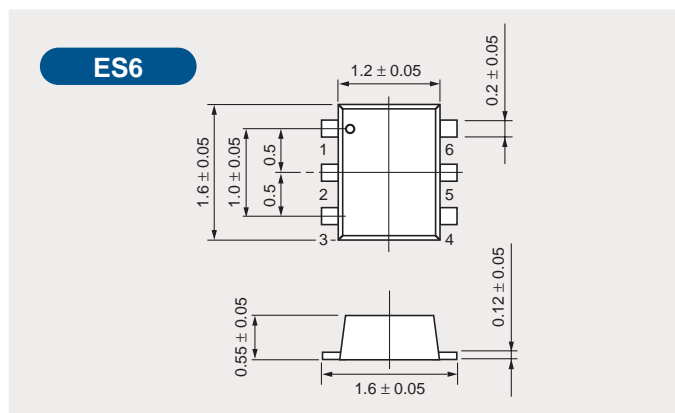
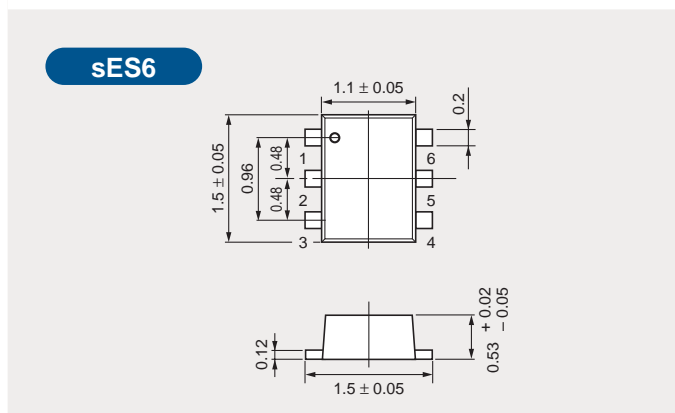
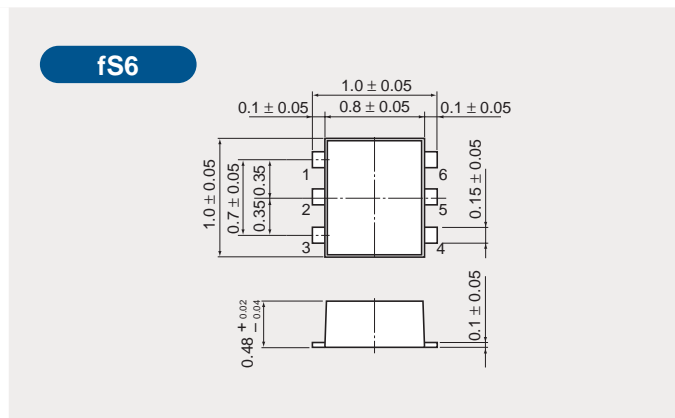
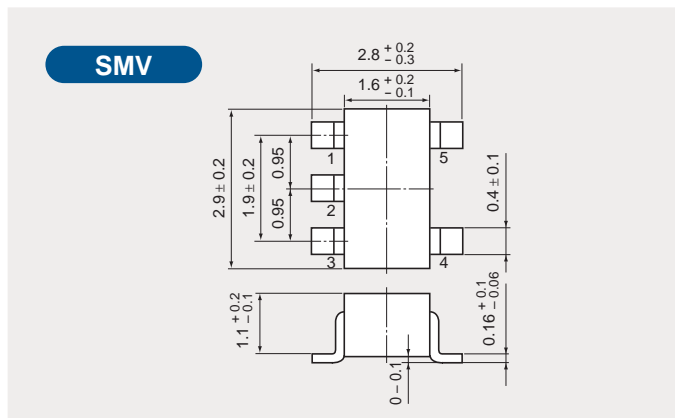
USV



4. Package Dimensions

5-and 6-Pin Packages

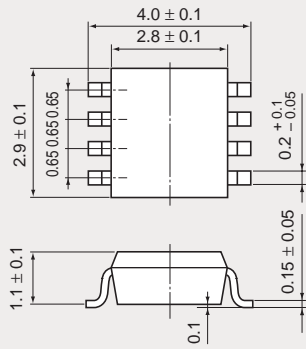
Unit: mm



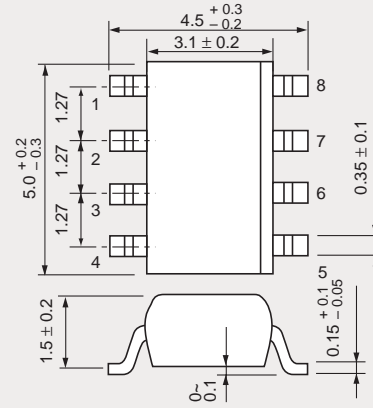
8- and 20-Pin Packages

Unit: mm

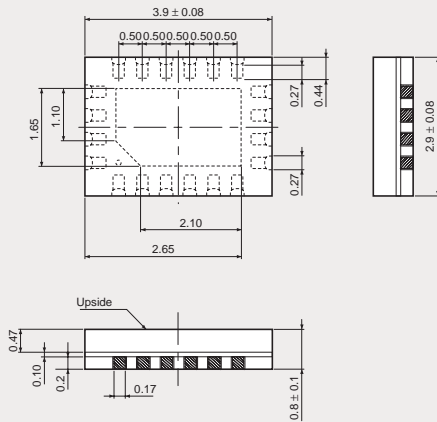
SM8



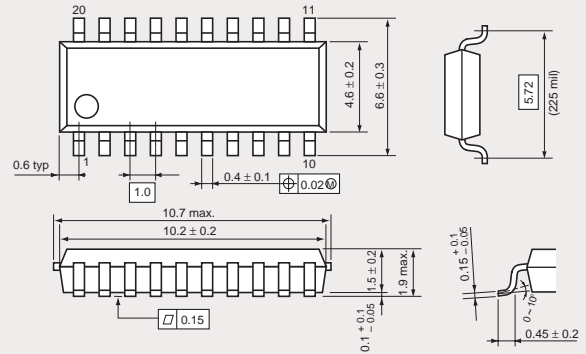
FM8



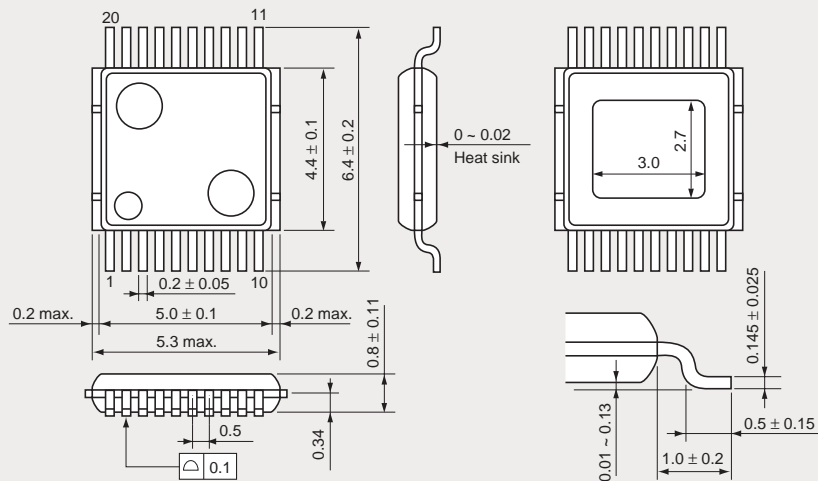
CS20



SSOP-20



HSOP20

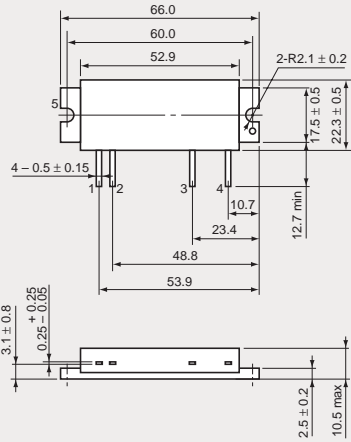


4. Package Dimensions

High-Frequency Power Module

Unit: mm

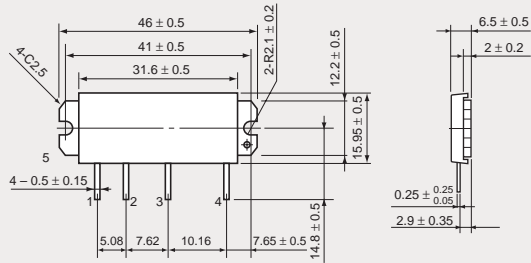
5-53P



1. High-frequency input
2. V_{CON}
3. V_{CC}
4. High-frequency output
5. Ground (flange)

5-32F

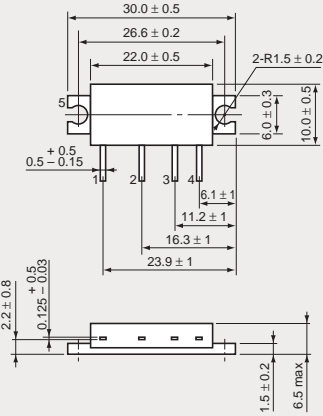
Bottom of lead to bottom of flange



Lead pitch tolerance: ± 0.15mm

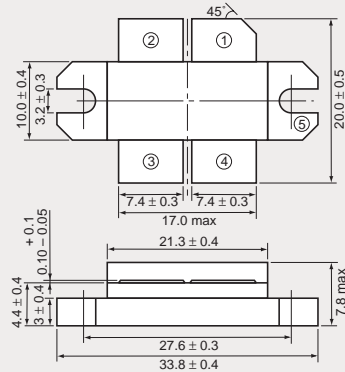
1. High-frequency input
2. V_{CON}
3. V_{CC}
4. High-frequency output
5. Ground (flange)

5-23E



1. High-frequency input
2. V_{GG}
3. V_{DD}
4. High-frequency output
5. Ground (flange)

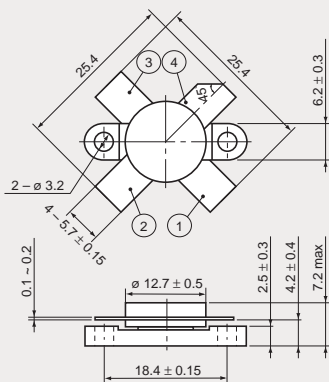
2-22C2A



1. Drain
2. Drain
3. Gate
4. Gate
5. Source

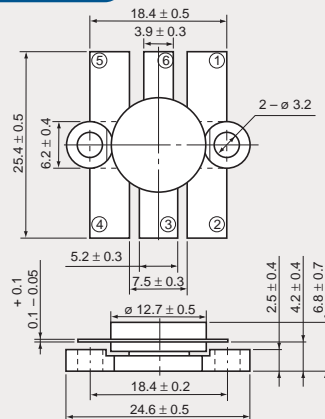
High-Frequency Power MOSFETs/Transistors

2-13B1A



1. Emitter
2. Base
3. Emitter
4. Collector

2-13C1A

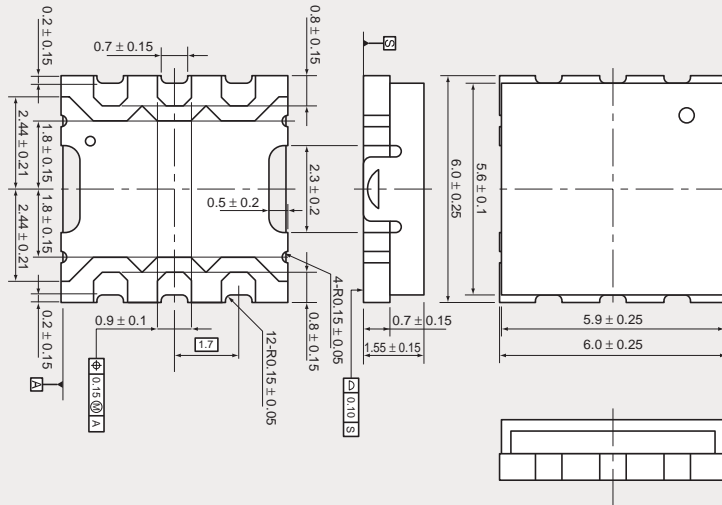


1. Emitter
2. Emitter
3. Base
4. Emitter
5. Emitter
6. Collector

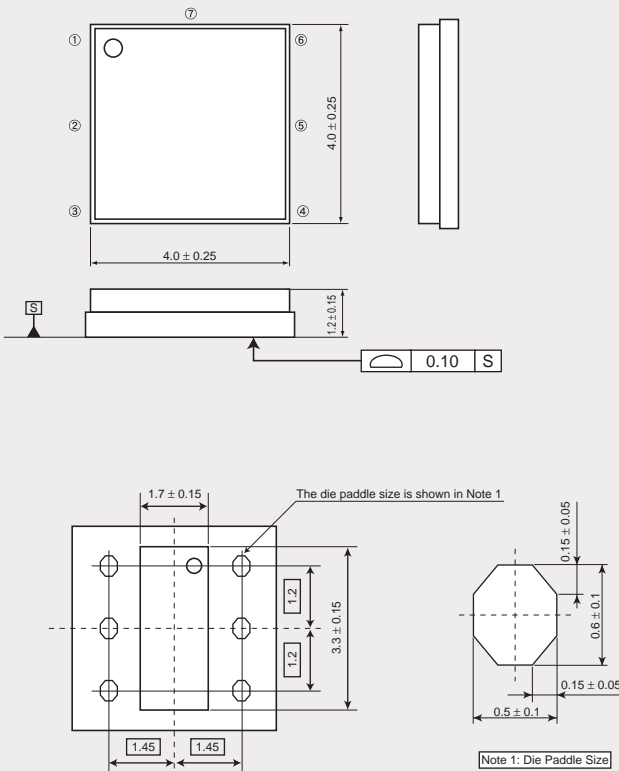
Micro PA

Unit: mm

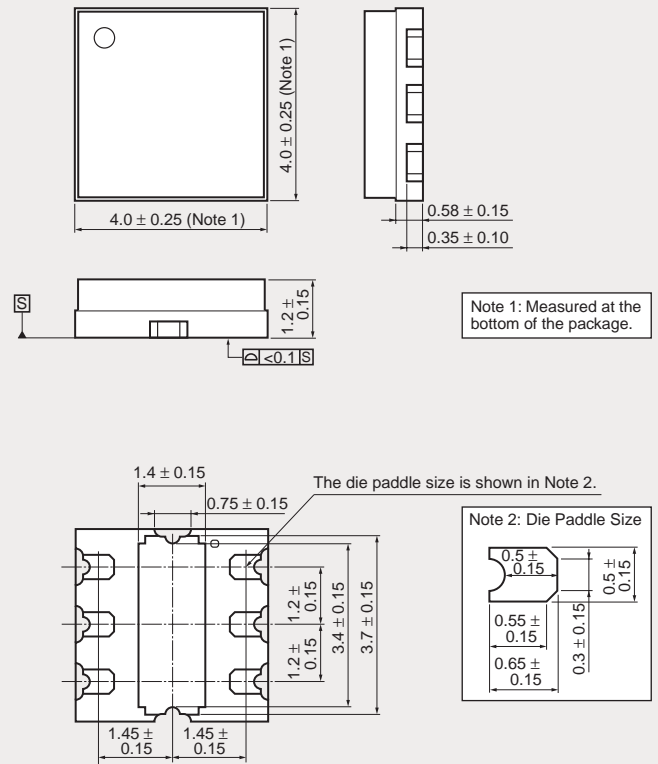
S-AU84 / S-AU85



S-AU87



S-AL54



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Previous edition: BCE0003A
2004-2(1k)PC-DQ
Printed in Japan

100% recycled paper