

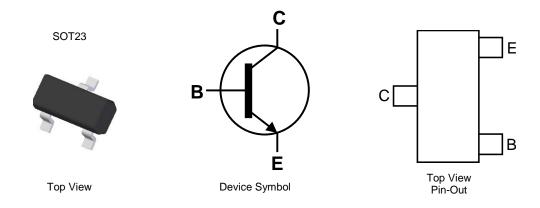
40V NPN SMALL SIGNAL TRANSISTOR IN SOT23

Features

- Epitaxial Planar Die Construction
- Complementary PNP Type: MMBT2907A
- Ideal for Low Power Amplification and Switching
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP Capable (Note 4)

Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound;
 UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish; Solderable per MIL-STD-202, Method 208 (©3)
- Weight: 0.008 grams (Approximate)



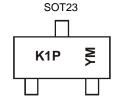
Ordering Information (Notes 4 & 5)

Product	Status	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
MMBT2222A-7-F	Active	AEC-Q101	K1P	7	8	3,000
MMBT2222A-13-F	Active	AEC-Q101	K1P	13	8	10,000
MMBT2222AQ-7-F	Active	Automotive	K1P	7	8	3,000

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- 3. Halogen and Antimony free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to http://www.diodes.com/product_compliance_definitions.html.
- $5.\ For\ packaging\ details,\ go\ to\ our\ website\ at\ http://www.diodes.com/products/packages.html.$

Marking Information



$$\begin{split} & \text{K1P} = \text{Product Type Marking Code} \\ & \text{YM} = \text{Date Code Marking} \\ & \text{Y or } \overline{\text{Y}} = \text{Year (ex: D} = 2016) \\ & \text{M or } \overline{\text{M}} = \text{Month (ex: 9} = \text{September)} \end{split}$$

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Date Code Key

Year	2015	5 2	016	2017	2018	2019	2020	202	1 2	022	2023	2024
Code	С		D	Е	F	G	Н	1		J	K	L
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	0	N	D



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	75	V
Collector-Emitter Voltage	V _{CEO}	40	V
Emitter-Base Voltage	V _{EBO}	6.0	V
Collector Current	Ic	600	mA
Peak Collector Current	Ісм	800	mA
Peak Base Current	I _{BM}	200	mA

Thermal Characteristics (@TA = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit	
Collector Power Dissipation	(Note 6)	6	310	mW	
Collector Power Dissipation	(Note 7)	P_{D}	350		
Thermal Desistance Junction to Ambient	(Note 6)	D	403	°C/W	
Thermal Resistance, Junction to Ambient	(Note 7)	$R_{ heta JA}$	357	C/VV	
Thermal Resistance, Junction to Leads (Note 8)		$R_{ heta JL}$	350	°C/W	
Operating and Storage Temperature Range	$T_{J,}T_{STG}$	-55 to +150	°C		

ESD Ratings (Note 9)

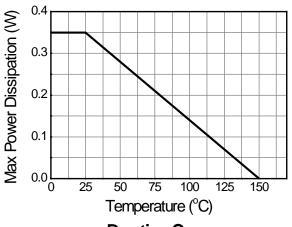
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	С

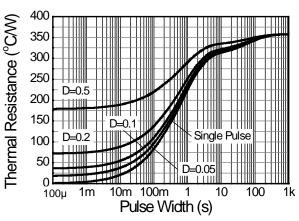
Notes:

- 6. For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
- 7. Same as Note 6, except the device is mounted on 15 mm x 15mm 1oz copper.
- 8. Thermal resistance from junction to solder-point (at the end of the leads). 9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.



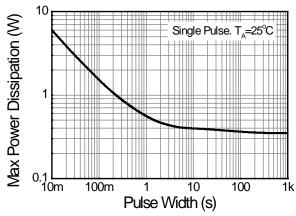
Thermal Characteristics and Derating Information





Derating Curve

Transient Thermal Impedance



Pulse Power Dissipation



Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS				•	
Collector-Base Breakdown Voltage	BV _{CBO}	75	_	V	$I_C = 100\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 10)	BV _{CEO}	40	_	V	$I_C = 10mA, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	6.0	_	V	$I_E = 100\mu A, I_C = 0$
Collector Cut-Off Current	I _{CBO}	_	10	nΑ μΑ	V _{CB} = 60V, I _E = 0 V _{CB} = 60V, I _E = 0, T _A = +150°C
Collector Cut-Off Current	I _{CEX}		10	nA	V _{CE} = 60V, V _{EB(OFF)} = 3.0V
Collector Cut-Off Current	I _{CEV}		10	nA	$V_{CE} = 60V, V_{BE} = \pm 0.25V$
Emitter Cut-Off Current	I _{EBO}	_	10	nA	$V_{EB} = 5.0V, I_C = 0$
Base Cut-Off Current	I _{BL}	_	20	nA	V _{CE} = 60V, V _{EB(OFF)} = 3.0V
ON CHARACTERISTICS (Note 10)					
DC Current Gain	h _{FE}	35 50 75 100 40 50 35		_	$\begin{split} I_C &= 100 \mu A, \ V_{CE} = 10 V \\ I_C &= 1.0 m A, \ V_{CE} = 10 V \\ I_C &= 10 m A, \ V_{CE} = 10 V \\ I_C &= 150 m A, \ V_{CE} = 10 V \\ I_C &= 500 m A, \ V_{CE} = 10 V \\ I_C &= 10 m A, \ V_{CE} = 10 V, \ T_A = -55 ^{\circ} C \\ I_C &= 150 m A, \ V_{CE} = 1.0 V \end{split}$
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	_	0.3 1.0	V	I _C = 150mA, I _B = 15mA I _C = 500mA, I _B = 50mA
Base-Emitter Saturation Voltage	V _{BE(SAT)}	0.6	1.2 2.0	V	I _C = 150mA, I _B = 15mA I _C = 500mA, I _B = 50mA
SMALL SIGNAL CHARACTERISTICS	JI.			I.	
Output Capacitance	C _{obo}	_	8	pF	V _{CB} = 10V, f = 1.0MHz, I _E = 0
Input Capacitance	C _{ibo}	_	25	pF	$V_{EB} = 0.5V$, $f = 1.0MHz$, $I_C = 0$
Current Gain-Bandwidth Product	f _T	300	_	MHz	V _{CE} = 20V, I _C = 20mA, f = 100MHz
Noise Figure	N _F	_	4.0	dB	$V_{CE} = 10V, I_C = 100\mu A,$ $R_S = 1.0k\Omega, f = 1.0kHz$
SWITCHING CHARACTERISTICS	•		•	•	•
Delay Time	t _D	_	10	ns	$V_{CC} = 30V$, $I_C = 150mA$, $V_{BE(OFF)} = -0.5V$, $I_{B1} = 15mA$
Rise Time	t _R	_	25	ns	$V_{CC} = 3.0V$, $I_{C} = 150$ mA, $I_{B1} = 15$ mA, $V_{BE(OFF)} = 0.5V$
Storage Time	ts	_	225	ns	V _{CC} = 30V, I _C = 150mA, I _{B1} = I _{B2} = 15mA
Fall Time	t _F		60	ns	V _{CC} = 30V, I _C = 150mA, I _{B1} = I _{B2} = 15mA

Note: 10. Measured under pulsed conditions. Pulse width \leq 300 μ s. Duty cycle \leq 2%.



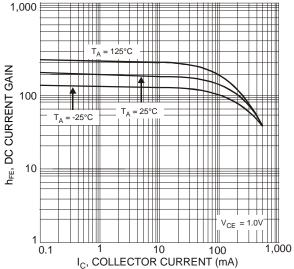
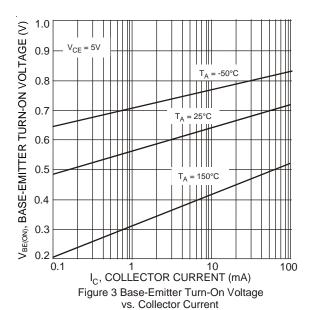


Figure 1 Typical DC Current Gain vs. Collector Current



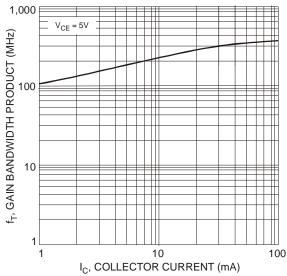


Figure 5 Typical Gain Bandwidth Product vs. Collector Current

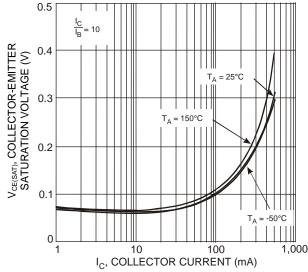


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

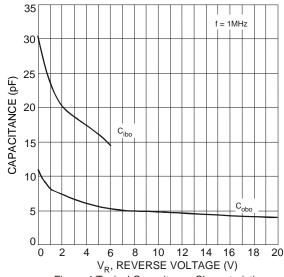


Figure 4 Typical Capacitance Characteristics

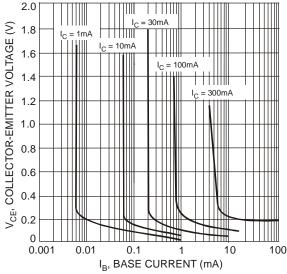


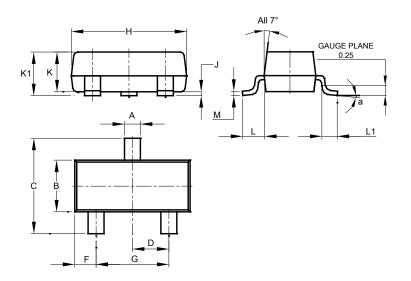
Figure 6 Typical Collector Saturation Region



Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT23

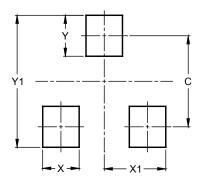


SOT23						
Dim	Min	Max	Тур			
Α	0.37	0.51	0.40			
В	1.20	1.40	1.30			
С	2.30	2.50	2.40			
D	0.89	1.03	0.915			
F	0.45	0.60	0.535			
G	1.78	2.05	1.83			
Н	2.80	3.00	2.90			
7	0.013	0.10	0.05			
K	0.890	1.00	0.975			
K1	0.903	1.10	1.025			
L	0.45	0.61	0.55			
L1	0.25	0.55	0.40			
М	0.085	0.150	0.110			
а	0°	8°				
All	Dimens	ions in	mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT23



Dimensions	Value (in mm)
C	2.0
Х	0.8
X1	1.35
Y	0.9
Y1	2.9



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