

60V PNP SMALL SIGNAL TRANSISTOR IN SOT23

Features

- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Complementary NPN Type: MMBT2222A
- 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)

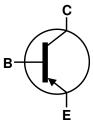
Mechanical Data

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

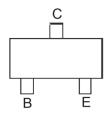




Top View



Device Symbol



Top View Pin-Out

Ordering Information (Notes 4 & 5)

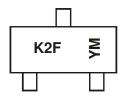
Product	Status	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
MMBT2907A-7-F	Active	AEC-Q101	K2F	7	8	3,000
MMBT2907A-13-F	Active	AEC-Q101	K2F	13	8	10,000
MMBT2907AQ-7-F	Active	Automotive	K2F	7	8	3,000

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- 2. 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

SOT23



 $\begin{array}{l} \text{K2F} = \text{Product Type Marking Code} \\ \text{YM} = \text{Date Code Marking} \\ \text{Y or } \overline{\text{Y}} = \text{Year (ex: D} = 2016) \\ \text{M or } \overline{\text{M}} = \text{Month (ex: 9} = \text{September)} \end{array}$

Date Code Key

Year	2013		2014	2015		2016	2017		2018	2019		2020
Code	Α		В	С		D	Е		F	G		Н
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}	-60	V
Collector-Emitter Voltage	V _{CEO}	-60	V
Emitter-Base Voltage	V _{EBO}	-6.0	V
Collector Current	Ic	-600	mA
Peak Collector Current	Ісм	-800	mA
Peak Base Current	Івм	-200	mA

Thermal Characteristics

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

ESD Ratings (Note 9)

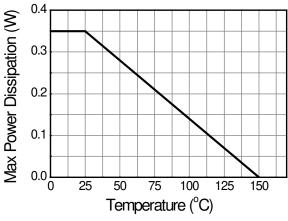
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	С

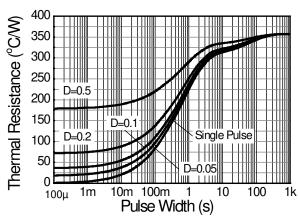
Notes:

- 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.



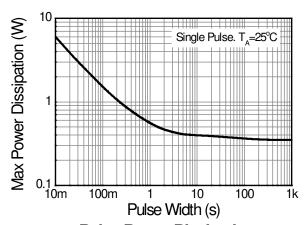
Thermal Characteristics and Derating Information





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	-60		V	$I_C = -100\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 10)	BV _{CEO}	-60	_	V	$I_C = -10 \text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV _{EBO}	-6.0	_	V	$I_E = -100 \mu A, I_C = 0$
Collector Cut-Off Current	I _{CBO}		-10	nA µA	$V_{CB} = -50V, I_E = 0$ $V_{CB} = -50V, I_E = 0, T_A = +125^{\circ}C$
Collector Cut-Off Current	I _{CEX}	_	-50	nA	$V_{CE} = -30V$, $V_{EB(OFF)} = -0.5V$
Base Cut-Off Current	I _{BL}	_	-50	nA	$V_{CE} = -30V$, $V_{EB(OFF)} = -0.5V$
Emitter Cut-Off Current	I _{EBO}		-50	nA	V _{EB} = -6.0V
ON CHARACTERISTICS (Note 10)				•	
DC Current Gain	h _{FE}	75 100 100 100 50	 300 	_	$\begin{split} I_{C} &= -100 \mu A, \ V_{CE} = -10V \\ I_{C} &= -1.0 m A, \ V_{CE} = -10V \\ I_{C} &= -10 m A, \ V_{CE} = -10V \\ I_{C} &= -150 m A, \ V_{CE} = -10V \\ I_{C} &= -500 m A, \ V_{CE} = -10V \end{split}$
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	_	-0.4 -1.6	V	$I_C = -150$ mA, $I_B = -15$ mA $I_C = -500$ mA, $I_B = -50$ mA
Base-Emitter Saturation Voltage	V _{BE(SAT)}	_	-1.3 -2.6	V	$I_C = -150$ mA, $I_B = -15$ mA $I_C = -500$ mA, $I_B = -50$ mA
SMALL SIGNAL CHARACTERISTICS				•	
Output Capacitance	C_{obo}	_	8.0	pF	$V_{CB} = -10V$, $f = 1.0MHz$, $I_E = 0$
Input Capacitance	C_{ibo}	_	30	pF	$V_{EB} = -2.0V$, $f = 1.0MHz$, $I_C = 0$
Current Gain-Bandwidth Product	f _T	200		MHz	V _{CE} = -20V, I _C = -50mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Turn-On Time	ton	_	45	ns	V 20V I 150mA
Delay Time	t_D		10	ns	$V_{CC} = -30V$, $I_{C} = -150$ mA, $I_{B1} = -15$ mA
Rise Time	t _R	_	40	ns	IBI = -IOIIIA
Turn-Off Time	t _{OFF}		100	ns	V 60V L 150~A
Storage Time	ts		80	ns	$V_{CC} = -6.0V$, $I_{C} = -150mA$, $I_{B1} = I_{B2} = -15mA$
Fall Time	tϝ	_	30	ns	IB1 = IB2 = - IOHIM

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



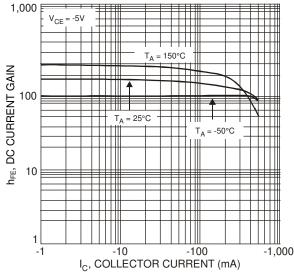


Fig. 1 Typical DC Current Gain vs. Collector Current

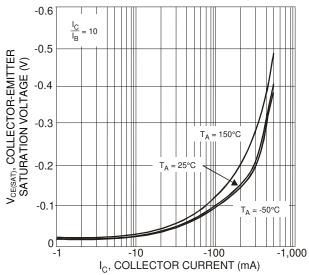


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

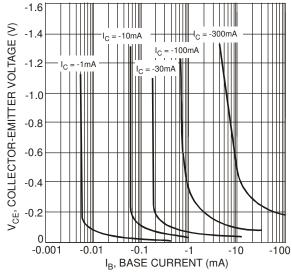


Fig. 5 Typical Collector Saturation Region

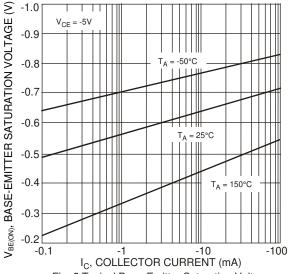


Fig. 2 Typical Base-Emitter Saturation Voltage vs. Collector Current

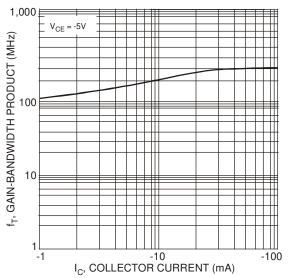


Fig. 4 Typical Gain-Bandwidth Product vs. Collector Current

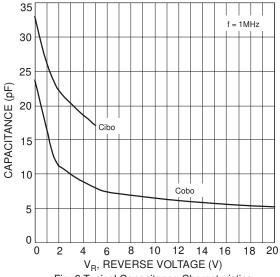


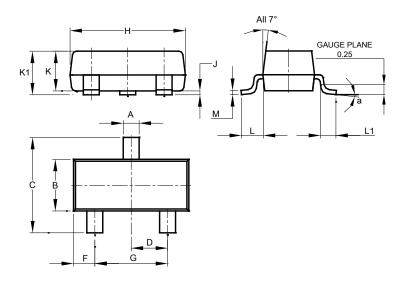
Fig. 6 Typical Capacitance Characteristics



Package Outline Dimensions

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

SOT23

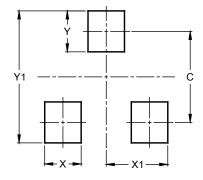


SOT23							
Dim	Min	Max	Тур				
Α	0.37	0.51	0.40				
В	1.20	1.40	1.30				
С	2.30	2.50	2.40				
D	0.89	1.03	0.915				
F	0.45	0.60	0.535				
G	1.78	2.05	1.83				
Н	2.80	3.00	2.90				
J	0.013	0.10	0.05				
K	0.890	1.00	0.975				
K1	0.903	1.10	1.025				
L	0.45	0.61	0.55				
L1	0.25	0.55	0.40				
М	0.085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

Suggested Pad Layout

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

SOT23



Dimensions	Value (in mm)
С	2.0
Х	0.8
X1	1.35
Υ	0.9
V1	2.0



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