60V PNP SMALL SIGNAL TRANSISTOR IN SOT23

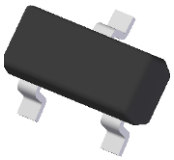
Features

- 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)**

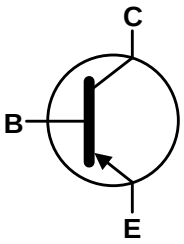
Mechanical Data

- 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 (e3)
- Weight: 0.008 grams (Approximate)

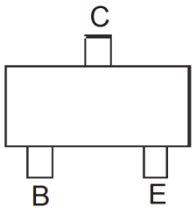
SOT23



Top View



Device Symbol



Top View
Pin-Out

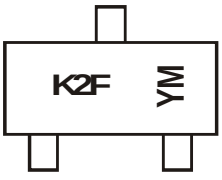
Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMBT2907A-7-F	AEC-Q101	K2F	7	8	3,000
MMBT2907A-13-F	AEC-Q101	K2F	13	8	10,000
MMBT2907AQ-7-F	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/quality/product_compliance_definitions/.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information

SOT23



K2F = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: A = 2013)
M or $\overline{M}$ = Month (ex: 9 = September)

Date Code Key

Year	2013	2014	2015	2016	2017	2018	2019	2020
Code	A	B	C	D	E	F	G	H

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	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	I_C	-600	mA
Peak Collector Current	I_{CM}	-800	mA
Peak Base Current	I_{BM}	-200	mA

Thermal Characteristics

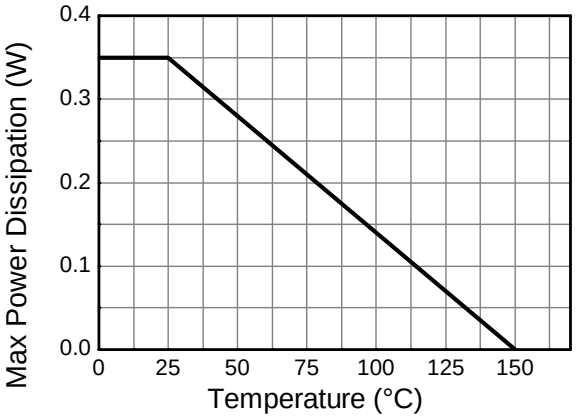
Characteristic		Symbol	Value	Unit
Collector Power Dissipation	(Note 6)	P_D	310	mW
	(Note 7)		350	
Thermal Resistance, Junction to Ambient	(Note 6)	$R_{\theta JA}$	403	°C/W
	(Note 7)		357	
Thermal Resistance, Junction to Leads	(Note 8)	$R_{\theta JL}$	350	°C/W
Operating and StorageTemperatureRange		T_J,T_{STG}	-55 to+150	°C

ESD Ratings (Note 9)

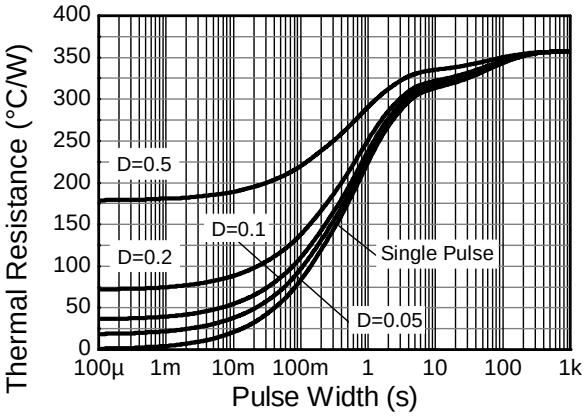
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

Notes:
6. For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR4 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.

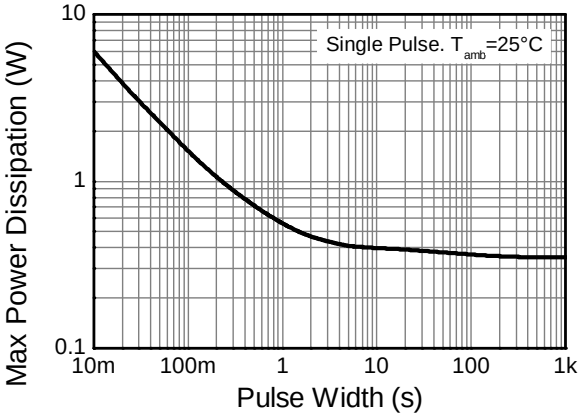
Thermal Characteristics and Derating Information



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 = -100µA, I_E = 0
Collector-Emitter Breakdown Voltage (Note 10)	BV_{CEO}	-60	—	V	I_C = -10mA, I_B = 0
Emitter-Base Breakdown Voltage	BV_{EBO}	-6.0	—	V	I_E = -100µA, 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°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 —	—	I_C = -100µA, V_{CE} = -10V I_C = -1.0mA, V_{CE} = -10V I_C = -10mA, V_{CE} = -10V I_C = -150mA, V_{CE} = -10V I_C = -500mA, V_{CE} = -10V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	-0.4 -1.6	V	I_C = -150mA, I_B = -15mA I_C = -500mA, I_B = -50mA
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	-1.3 -2.6	V	I_C = -150mA, I_B = -15mA I_C= -500mA, I_B= -50mA
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	t_{off}	—	45	ns	V_{CC} = -30V, I_C = -150mA, I_{B1} = -15mA
Delay Time	t_d	—	10	ns	
Rise Time	t_r	—	40	ns	
Turn-Off Time	t_{off}	—	100	ns	V_{CC} = -6.0V, I_C = -150mA, I_{B1} = I_{B2} = -15mA
Storage Time	t_s	—	80	ns	
Fall Time	t_f	—	30	ns	

Note: 10. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

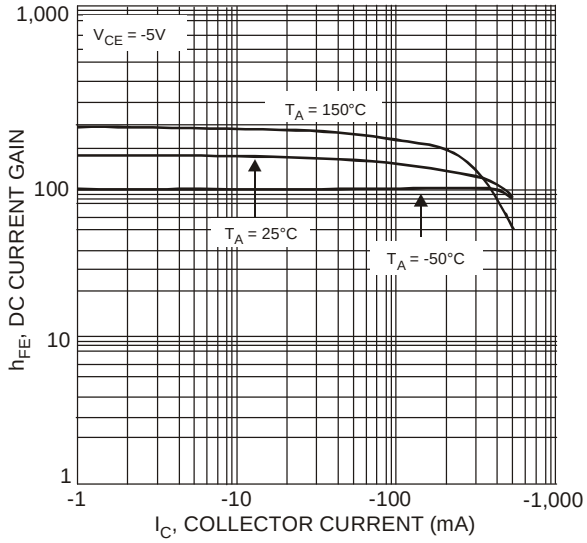


Fig. 1 Typical DC Current Gain vs. Collector Current

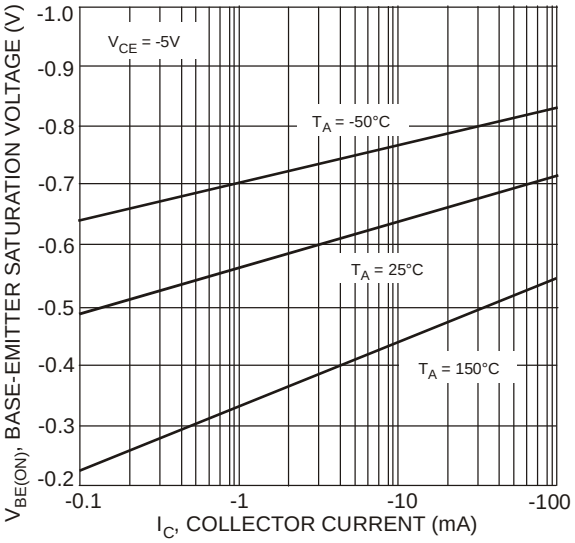


Fig. 2 Typical Base-Emitter Saturation Voltage vs. Collector Current

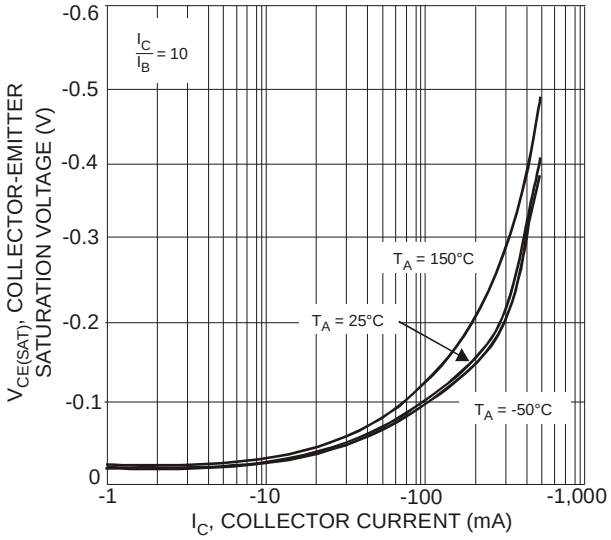


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

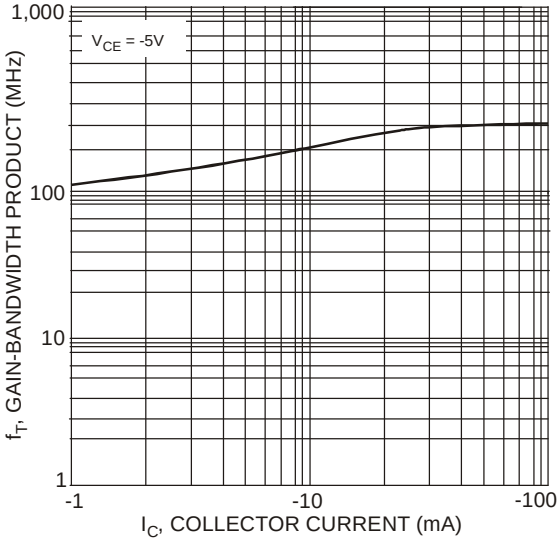


Fig. 4 Typical Gain-Bandwidth Product vs. Collector Current

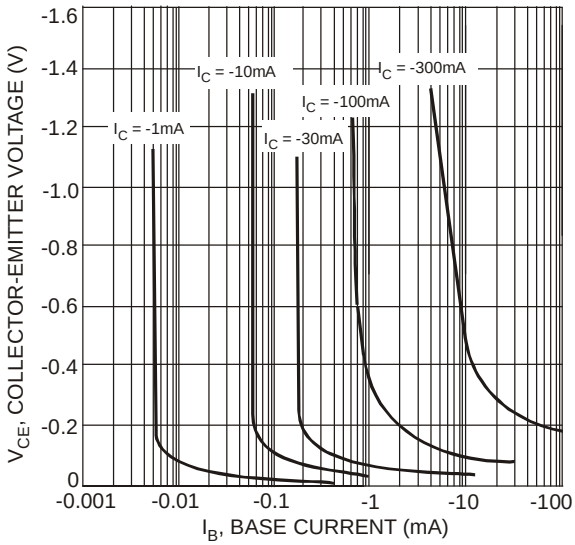


Fig. 5 Typical Collector Saturation Region

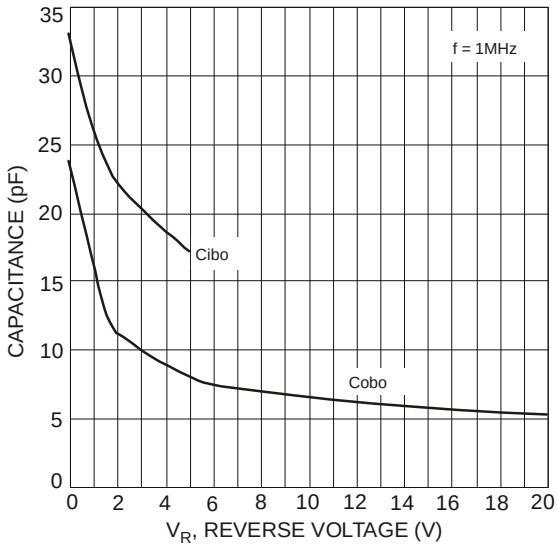
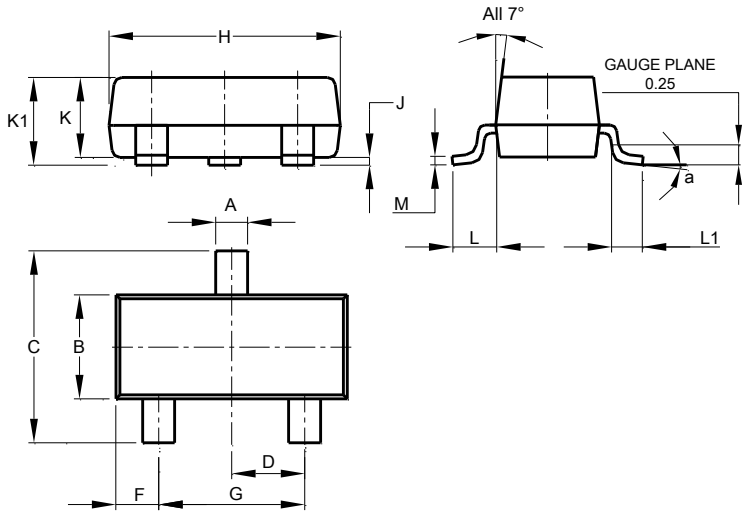


Fig. 6 Typical Capacitance Characteristics

Package Outline Dimensions

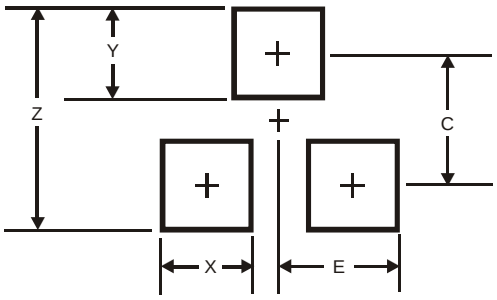
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	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
H	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
M	0.085	0.150	0.110
a	8°		
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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