NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

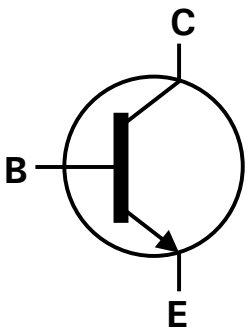
- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMBT2907A)
- Ideal for Low Power Amplification and Switching
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**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

Mechanical Data

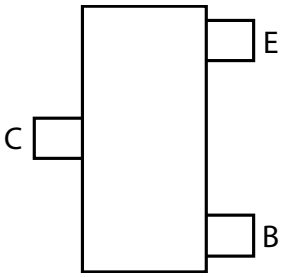
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Leads; Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.008 grams (approximate)

SOT23

Top View



Device Symbol



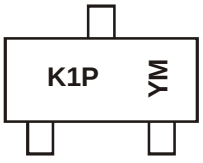
Top View
Pin-Out

Ordering Information (Note 4 & 5)

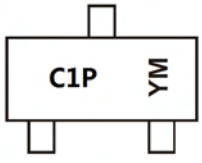
Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMBT2222A-7-F	AEC-Q101	K1P / C1P	7	8	3,000
MMBT2222A-13-F	AEC-Q101	K1P / C1P	13	8	10,000
MMBT2222AQ-7-F	Automotive	K1P	7	8	3,000

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com 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.
5. For packaging details, go to our website at http://www.diodes.com.

Marking Information



K = SAT (Shanghai Assembly / Test site)
1P = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: N = 2002)
M = Month (ex: 9 = September)



C = CAT (Chengdu Assembly / Test site)
1P = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: N = 2002)
M = Month (ex: 9 = September)

Date Code Key

Year	2010	2011	2012	2013	2014	2015	2016	2017
Code	X	Y	Z	A	B	C	D	E

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

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 - Continuous	I_C	600	mA
Peak Collector Current	I_{CM}	800	mA

Thermal Characteristics (@T_A = +25°C unless otherwise specified)

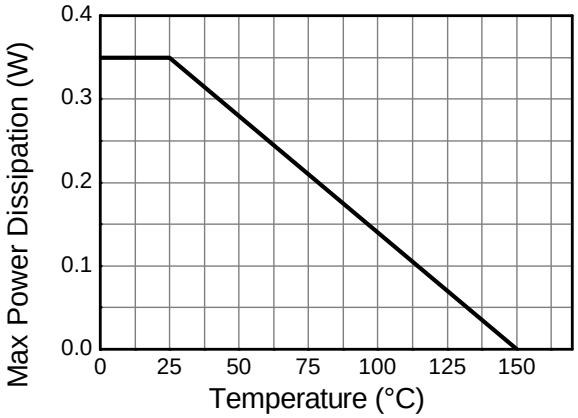
Characteristic		Symbol	Value	Unit
Collector Power Dissipation	(Note 6)	P_D	310	mW
	(Note 7)		350	
Thermal Resistance, Junction to Ambient	(Note 6)	$R_{\theta JA}$	403	°C/W
	(Note 7)		357	
Thermal Resistance, Junction to Leads	(Note 8)	$R_{\theta JL}$	350	°C/W
Operating and Storage Temperature Range	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

ESD Ratings (Note 9)

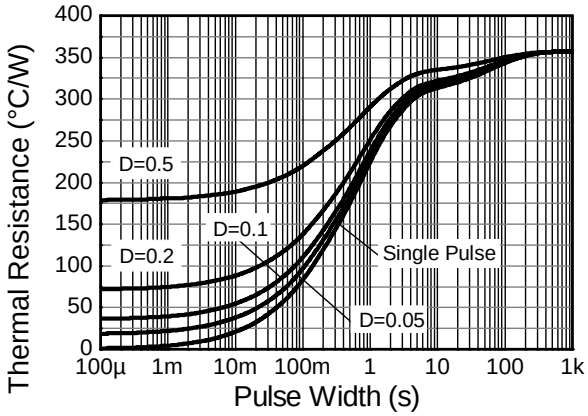
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	≥ 8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	≥ 400	V	C

Notes:
6. For the device mounted on minimum recommended pad layout FR4 PCB with high coverage of single sided 1oz copper in still air condition; the device is measured when operating in a steady-state condition.
7. Same as Note 6, except the device is mounted on 15mm X 15mm X 1.6mm FR4 PCB
8. Thermal resistance from junction to solder-point (at the end of the collector lead).
9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

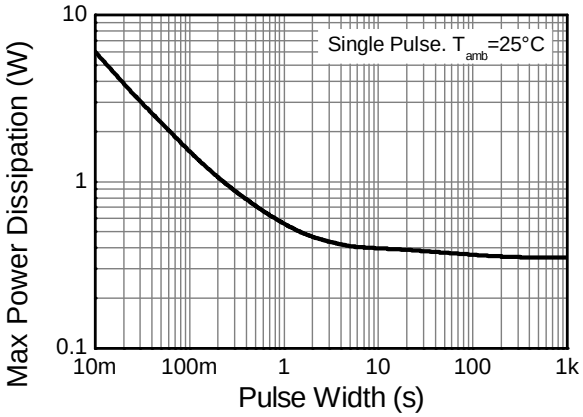
Thermal Characteristics



Derating Curve



Transient Thermal Impedance



Pulse Power Dissipation

Electrical Characteristics @T_A = 25°C unless otherwise specified

Characteristic (Note 9)	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV_{CBO}	75	—	V	I_C = 100μA, I_E = 0
Collector-Emitter Breakdown Voltage	BV_{CEO}	40	—	V	I_C = 10mA, I_B = 0
Emitter-Base Breakdown Voltage	BV_{EBO}	6.0	—	V	I_E = 100μA, I_C = 0
Collector Cutoff Current	I_{CBO}	—	10	nA μA	V_{CB} = 60V, I_E = 0 V_{CB} = 60V, I_E = 0, T_A = 150°C
Collector Cutoff Current	I_{CEX}	—	10	nA	V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0V
Emitter Cutoff Current	I_{EBO}	—	10	nA	V_{EB} = 3.0V, I_C = 0
Base Cutoff Current	I_{BL}	—	20	nA	V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0V
ON CHARACTERISTICS (Note 9)					
DC Current Gain	h_{FE}	35 50 75 100 40 50 35	— — — 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 I_C = 10mA, V_{CE} = 10V, T_A = -55°C I_C = 150mA, V_{CE} = 1.0V
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					
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	NF	—	4.0	dB	V_{CE} = 10V, I_C = 100μA, R_S = 1.0kΩ, 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 = 150mA, I_{B1} = 15mA, $V_{BE(OFF)}$ = 0.5V
Storage Time	t_s	—	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

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

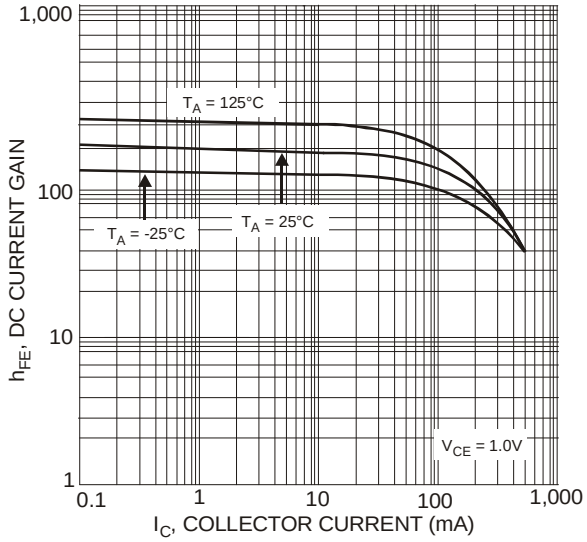


Figure 1 Typical DC Current Gain vs. Collector Current

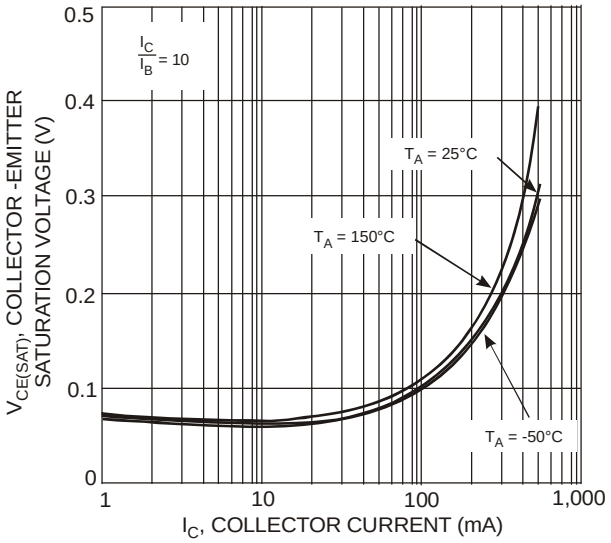


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

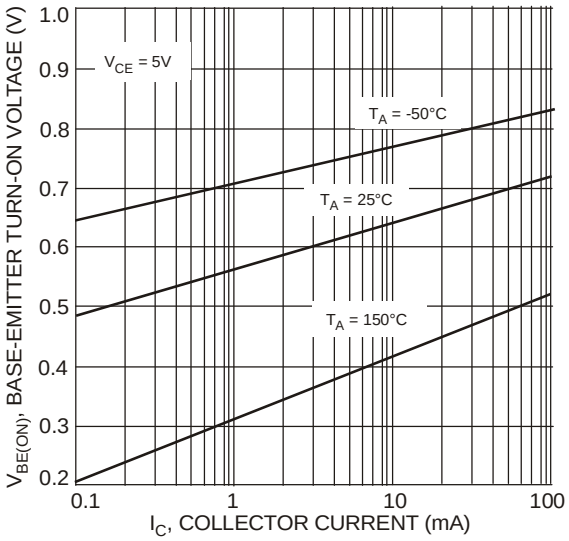


Figure 3 Base-Emitter Turn-On Voltage vs. Collector Current

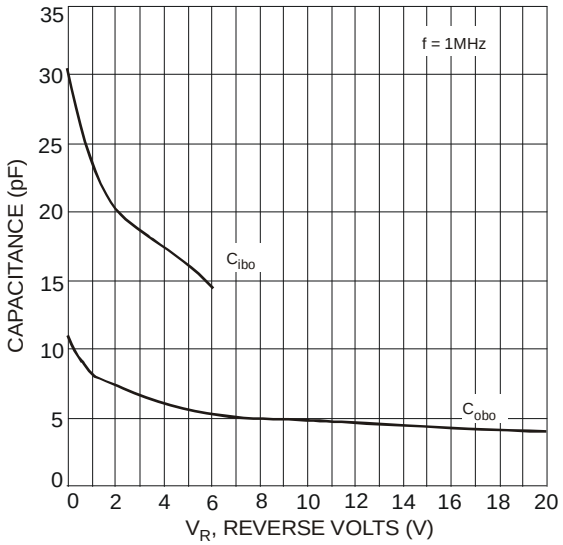


Figure 4 Typical Capacitance Characteristics

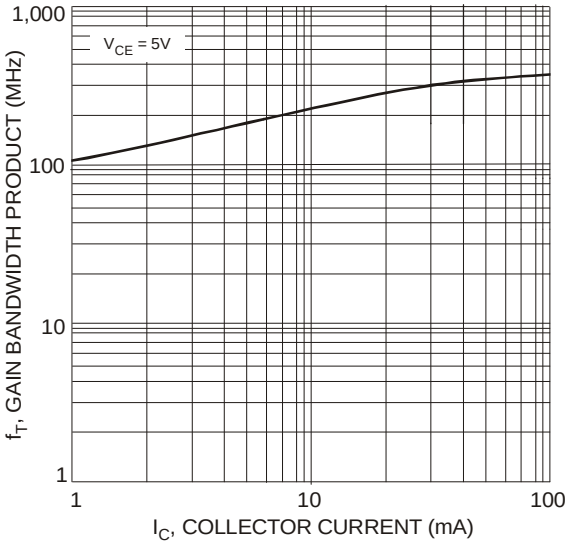


Figure 5 Typical Gain Bandwidth Product vs. Collector Current

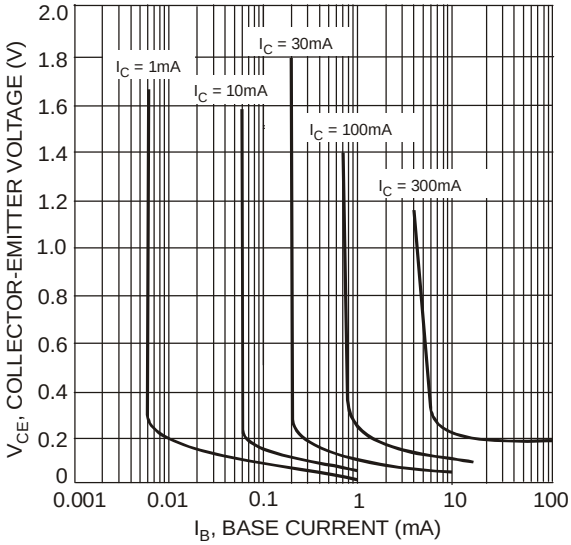
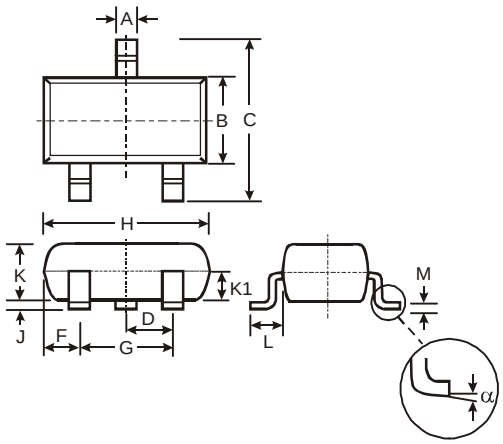


Figure 6 Typical Collector Saturation Region

Package Outline Dimensions

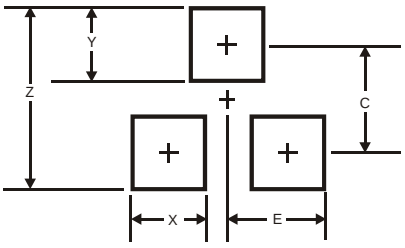
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	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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