MMBT2222AT

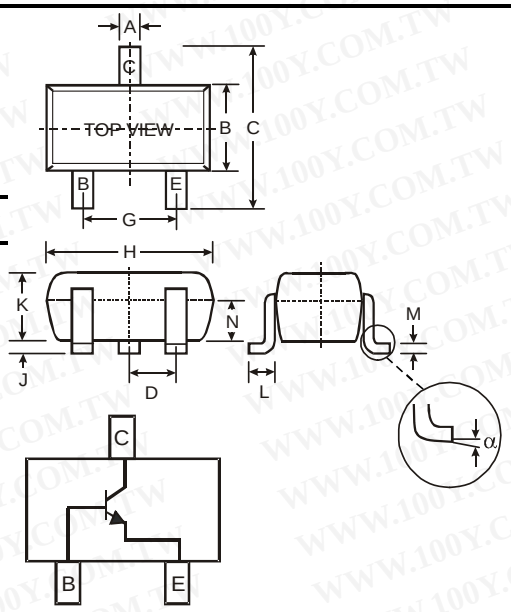
NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMBT2907AT)
- Ultra-Small Surface Mount Package
- **Lead Free/RoHS Compliant (Note 2)**
- **"Green" Device (Note 3 and 4)**

Mechanical Data

- Case: SOT-523
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Terminal Connections: See Diagram
- Marking Information: 1P, See Page 4
- Ordering & Date Code Information: See Page 4
- Weight: 0.002 grams (approximate)



SOT-523			
Dim	**Min**	**Max**	**Typ**
A	0.15	0.30	0.22
B	0.75	0.85	0.80
C	1.45	1.75	1.60
D	—	—	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
J	0.00	0.10	0.05
K	0.60	0.80	0.75
L	0.10	0.30	0.22
M	0.10	0.20	0.12
N	0.45	0.65	0.50
α	0°	8°	—
All Dimensions in mm			

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
Power Dissipation	(Note 1)	P_d	150	mW
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	833	°C/W
Operating and Storage Temperature Range		T_j, T_{STG}	-55 to +150	°C

Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
2. No purposefully added lead
3. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com/products/lead_free/index.php.
4. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

Electrical Characteristics @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 5)					
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	75	—	V	I_C = 10μA, I_E = 0
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	I_C = 10mA, I_B = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	6.0	—	V	I_E = 10μA, I_C = 0
Collector Cutoff Current	I_{CEX}	—	10	nA	V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0V
Base Cutoff Current	I_{BL}	—	20	nA	V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0V
ON CHARACTERISTICS (Note 5)					
DC Current Gain	h_{FE}	35 50 75 100 40	— — — 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	$V_{CE(SAT)}$	—	0.3 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}	—	30	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
Input Impedance	h_{ie}	0.25	1.25	kΩ	V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0kHz
Voltage Feedback Ratio	h_{re}	—	4.0	X 10^{-4}	V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0kHz
Small-Signal Current Gain	h_{fe}	75	375	—	V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0kHz
Output Admittance	h_{oe}	25	200	μS	V_{CE} = 10 Vdc, I_C = 10 mAdc, 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	
Storage Time	t_s	—	225	ns	V_{CC} = 30V, I_C = 150mA, I_{B1} = I_{B2} = 15mA
Fall Time	t_f	—	60	ns	

Notes: 5. Short duration pulse test used to minimize self-heating effect.

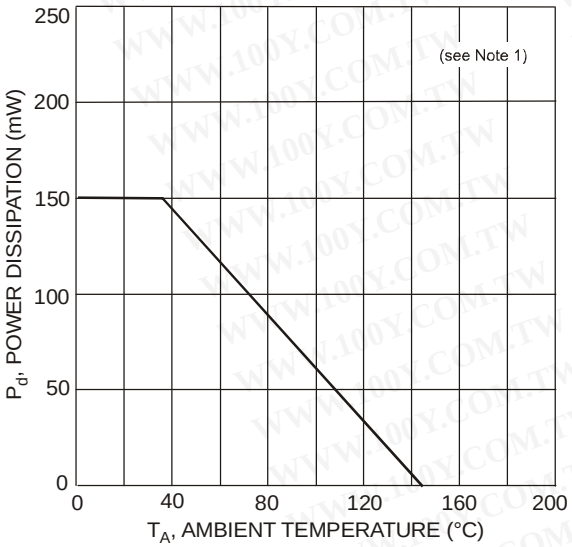


Fig. 1 Power Derating Curve

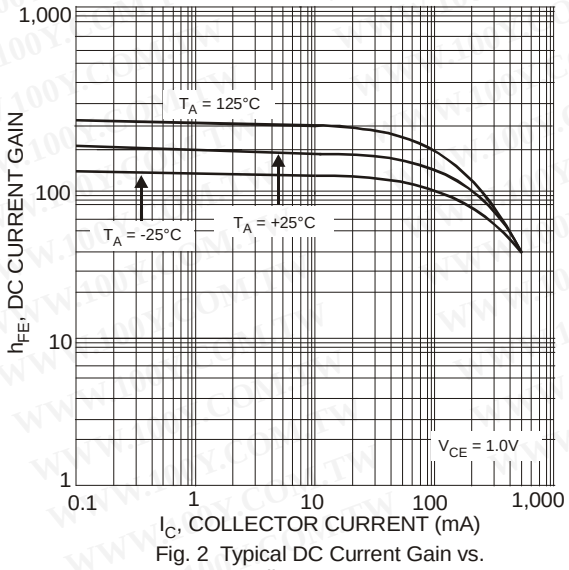


Fig. 2 Typical DC Current Gain vs. Collector Current

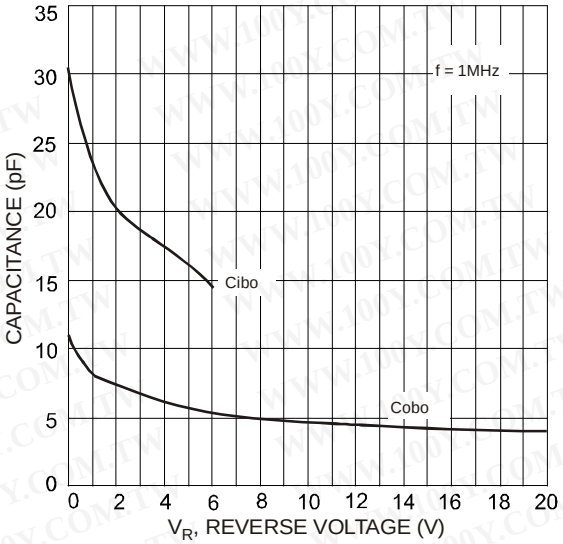


Fig. 3 Typical Capacitance Characteristics

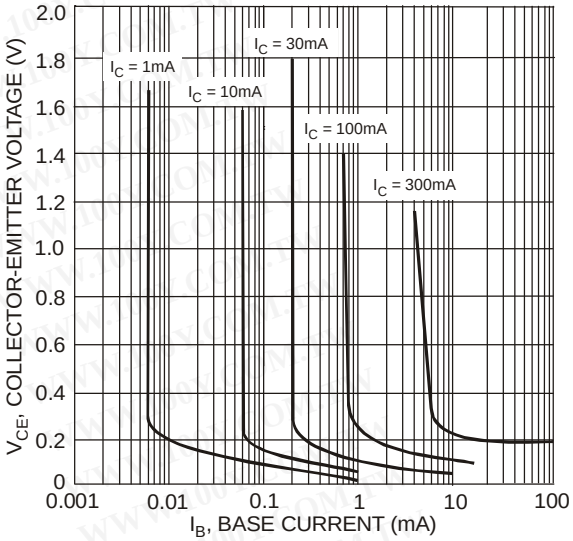


Fig. 4 Typical Collector Saturation Region

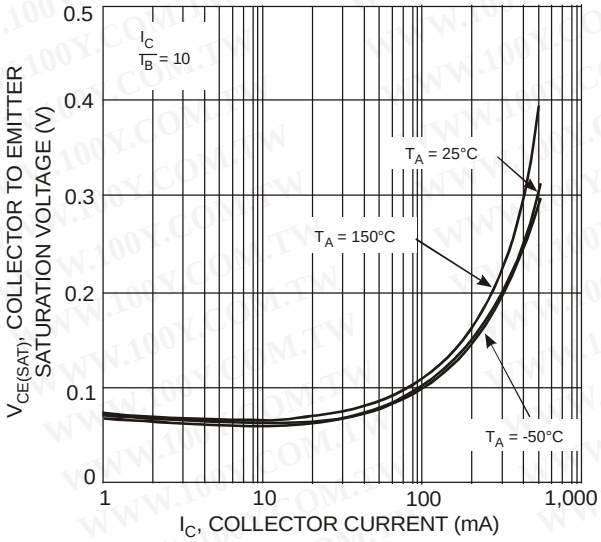


Fig. 5 Typical Collector Emitter Saturation Voltage vs. Collector Current

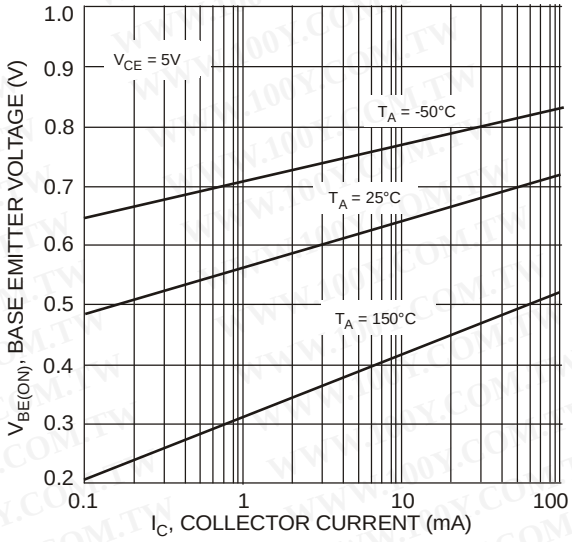


Fig. 6 Typical Base Emitter Voltage vs. Collector Current

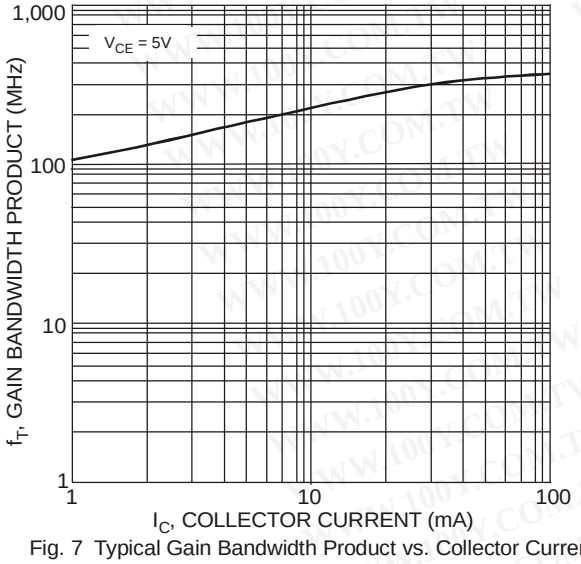


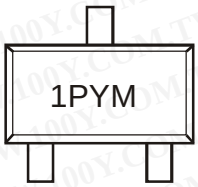
Fig. 7 Typical Gain Bandwidth Product vs. Collector Current

Ordering Information (Note 6)

Device	Packaging	Shipping
MMBT2222AT-7-F	SOT-523	3000/Tape & Reel

Notes: 6. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

Marking Information



1P = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: N = 2002)
M = Month (ex: 9 = September)

Date Code Key

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Code	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z

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