

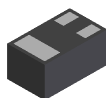
Features

- $BV_{CEO} > 40V$
- $I_C = 200mA$ High Collector Current
- $P_D = 1000mW$ Power Dissipation
- $0.60mm^2$ Package Footprint, 13 times Smaller than SOT23
- 0.5mm Height Package Minimizing Off-Board Profile
- Complementary PNP Type MMBT3906LP
- **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**

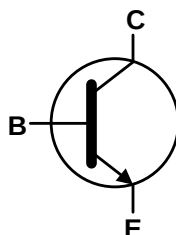
Mechanical Data

- Case: X1-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound.
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
Terminals: Finish — NiPdAu.
- Solderable per MIL-STD-202, Method 208 ^(e4)
- Weight: 0.0008 grams (Approximate)

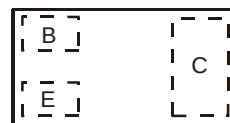
X1-DFN1006-3



Bottom View



Device Symbol

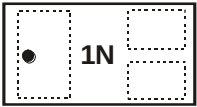
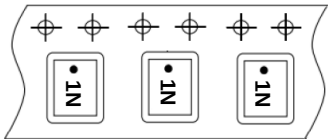
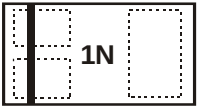
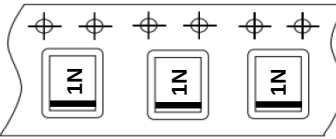
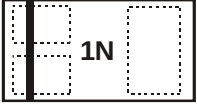
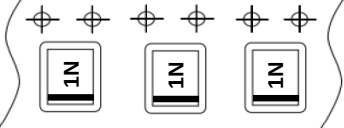

 Top View
 Device Schematic

Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMBT3904LP-7	1N	7	8mm	3,000
MMBT3904LP-7B	1N	7	8mm	10,000

- 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. For packaging details, go to our website at <http://www.diodes.com>.

Marking Information

MMBT3904LP-7	 Top View Dot Denotes Collector Side  From date code 1527 (YYWW), this changes to:  Top View Bar Denotes Base and Emitter Side 
MMBT3904LP-7B	 Top View Bar Denotes Base and Emitter Side  1N = Product Type Marking Code

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}	40	V
Emitter-Base Voltage	V _{EBO}	6.0	V
Collector Current	I _C	200	mA
Peak Collector Current	I _{CM}	200	mA

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

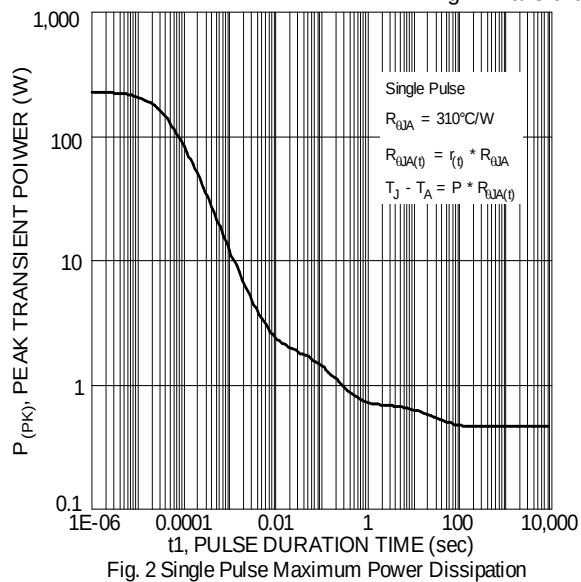
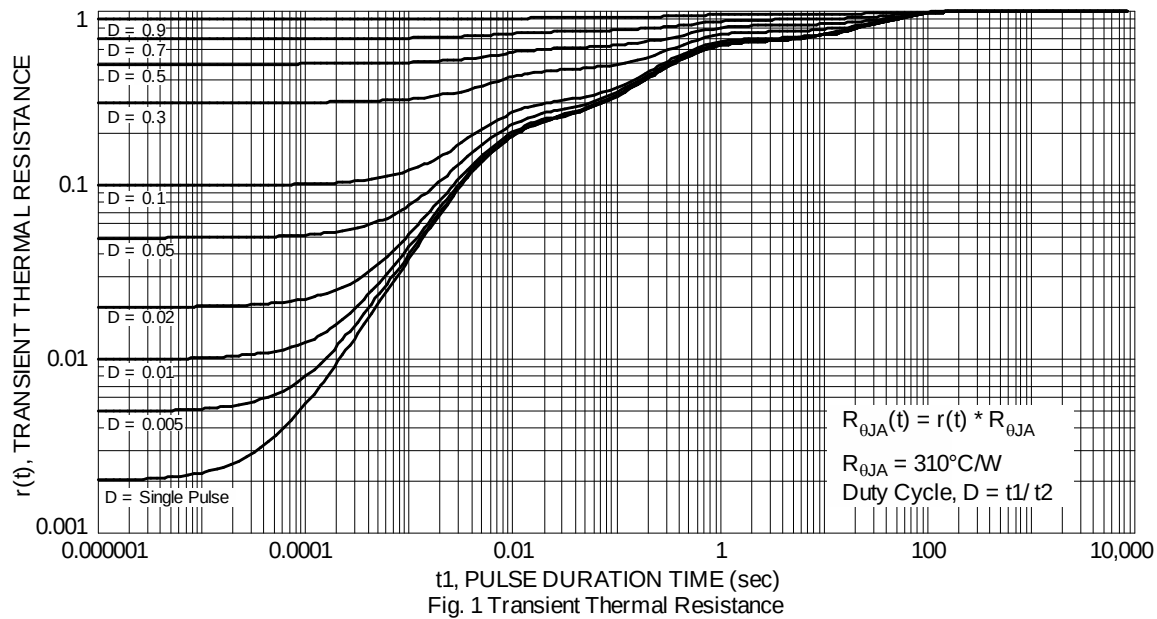
Characteristic	Symbol	Value	Unit
Power Dissipation	P _D	400	mW
		1000	
Thermal Resistance, Junction to Ambient	R _{θJA}	310	°C/W
		120	
Thermal Resistance, Junction to Lead	R _{θJL}	120	°C/W
Operating and Storage and Temperature Range	T _J , T _{STG}	-55 to +150	°C

ESD Ratings (Note 8)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	200	V	B

- Notes:
5. For the device mounted on minimum recommended pad layout 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady state condition. The entire exposed collector pad is attached to the heatsink.
 6. Same as Note 5, except the exposed collector pad is mounted on 25mm x 25mm 2oz copper.
 7. Thermal resistance from junction to solder-point (on the exposed collector pad).
 8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics



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	$I_C = 10\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 9)	BV_{CEO}	40	—	V	$I_C = 1.0mA, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	6.0	—	V	$I_E = 10\mu A, I_C = 0$
Collector Cutoff Current	I_{CEX}	—	50	nA	$V_{CE} = 30V, V_{EB(OFF)} = 3.0V$
Base Cutoff Current	I_{BL}	—	50	nA	$V_{CE} = 30V, V_{EB(OFF)} = 3.0V$
ON CHARACTERISTICS (Note 9)					
DC Current Gain	h_{FE}	40	—	—	$I_C = 100\mu A, V_{CE} = 1.0V$
		70	—		$I_C = 1.0mA, V_{CE} = 1.0V$
		100	300		$I_C = 10mA, V_{CE} = 1.0V$
		60	—		$I_C = 50mA, V_{CE} = 1.0V$
		30	—		$I_C = 100mA, V_{CE} = 1.0V$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	0.20 0.30	V	$I_C = 10mA, I_B = 1.0mA$ $I_C = 50mA, I_B = 5.0mA$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.65 —	0.85 0.95	V	$I_C = 10mA, I_B = 1.0mA$ $I_C = 50mA, I_B = 5.0mA$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	4.0	pF	$V_{CB} = 5.0V, f = 1.0MHz, I_E = 0$
Input Capacitance	C_{ibo}	—	8.5	pF	$V_{EB} = 0.5V, f = 1.0MHz, I_C = 0$
Input Impedance	h_{ie}	1.0	10	kΩ	$V_{CE} = 10V, I_C = 1.0mA,$ $f = 1.0kHz$
Voltage Feedback Ratio	h_{re}	0.5	8.0	$\times 10^{-4}$	
Small Signal Current Gain	h_{fe}	100	400	—	
Output Admittance	h_{oe}	1.0	40	μS	$V_{CE} = 20V, I_C = 10mA,$ $f = 100MHz$
Current Gain-Bandwidth Product	f_T	300	—	MHz	
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	35	ns	$V_{CC} = 3.0V, I_C = 10mA,$
Rise Time	t_r	—	35	ns	$V_{BE(off)} = -0.5V, I_{B1} = 1.0mA$
Storage Time	t_s	—	200	ns	$V_{CC} = 3.0V, I_C = 10mA,$
Fall Time	t_f	—	50	ns	$I_{B1} = I_{B2} = 1.0mA$

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

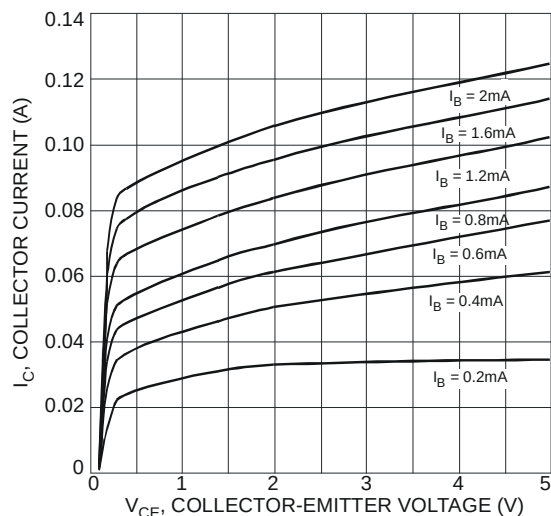


Fig. 4 Typical Collector Current vs. Collector-Emitter Voltage

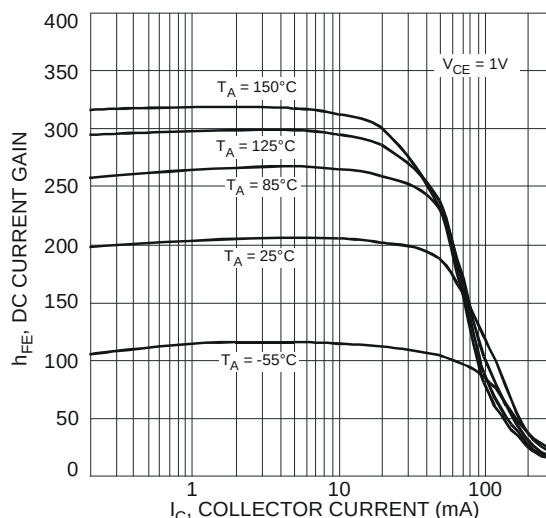


Fig. 5 Typical DC Current Gain vs. Collector Current

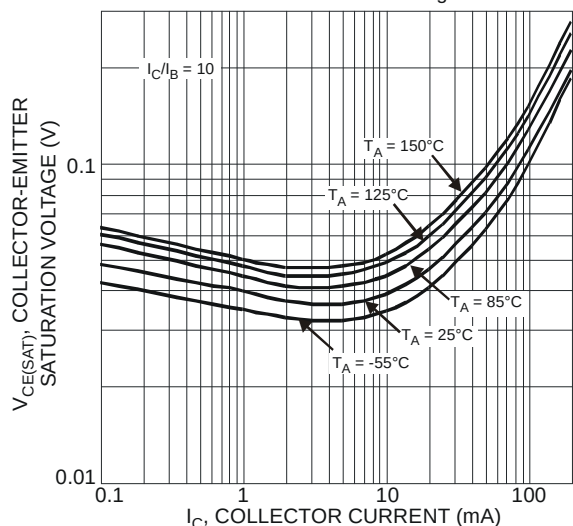


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

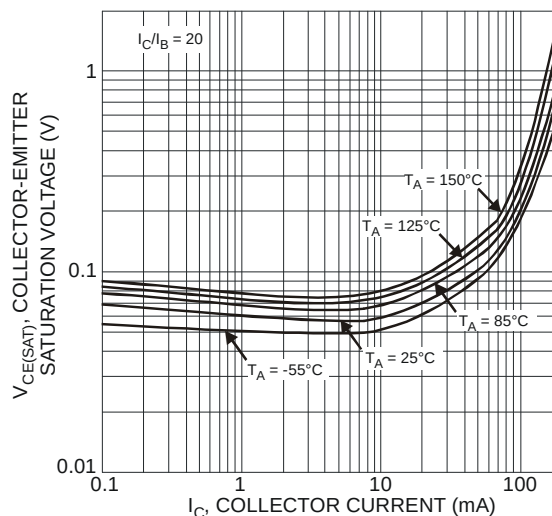


Fig. 7 Typical Collector-Emitter Saturation Voltage vs. Collector Current

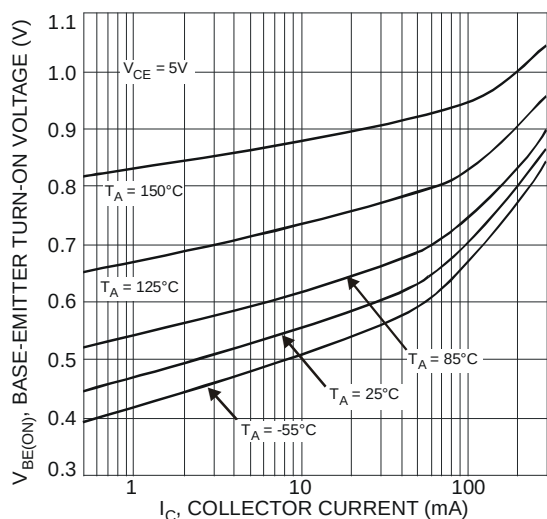


Fig. 8 Typical Base-Emitter Turn-On Voltage vs. Collector Current

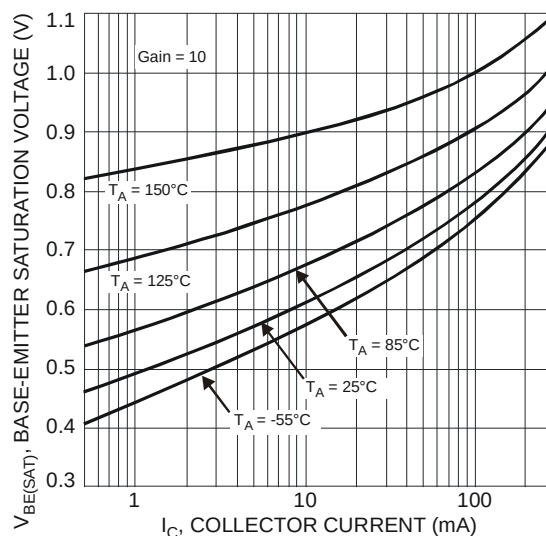
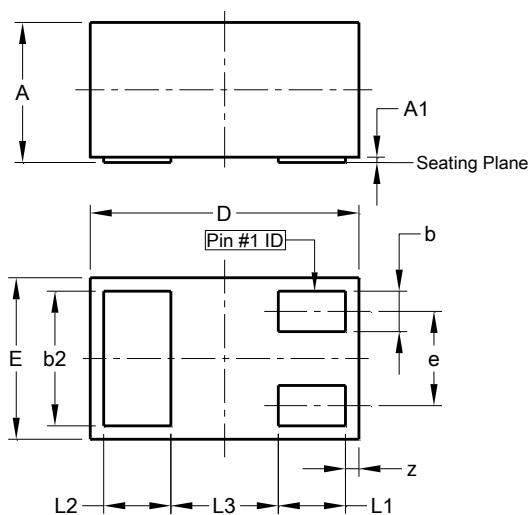


Fig. 9 Typical Base-Emitter Saturation Voltage vs. Collector Current

Package Outline Dimensions

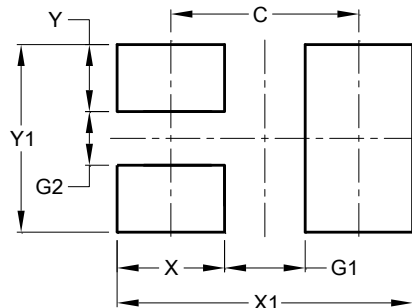
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



X1-DFN1006-3			
Dim	Min	Max	Typ
A	0.47	0.53	0.50
A1	0.00	0.05	0.03
b	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.075	1.00
E	0.55	0.675	0.60
e	-	-	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	-	-	0.40
z	0.02	0.08	0.05
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)
C	0.70
G1	0.30
G2	0.20
X	0.40
X1	1.10
Y	0.25
Y1	0.70

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