

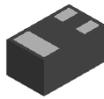
## Features

- $BV_{CEO} > -40V$
- $I_C = -200mA$  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 NPN Type DIODES™ MMBT3904LP
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

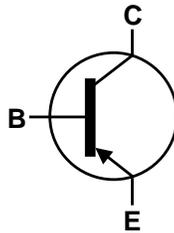
## Mechanical Data

- Package: X1-DFN1006-3
- Package 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)

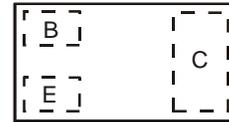
X1-DFN1006-3



Bottom View



Device Symbol

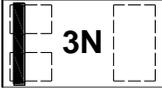
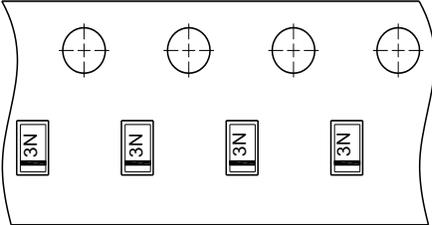
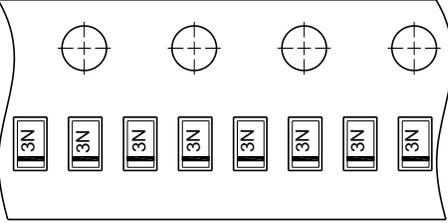

 Top View  
Device Schematic

## Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
MMBT3906LP-7	X1-DFN1006-3	3N	7	8	3,000	Reel
MMBT3906LP-7B	X1-DFN1006-3	3N	7	8	10,000	Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

**Marking Information**

<p><b>MMBT3906LP-7</b></p>	 <p>3N = Product Type Marking Code</p> <p>Top View Bar Denotes Base and Emitter Side</p> 
<p><b>MMBT3906LP-7B</b></p>	 <p>3N = Product Type Marking Code</p> <p>Top View Bar Denotes Base and Emitter Side</p> 

**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	-40	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	V
Emitter-Base Voltage	V <sub>EB0</sub>	-6	V
Collector Current	I <sub>C</sub>	-200	mA
Peak Collector Current	I <sub>CM</sub>	-200	mA

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 5) 400	mW
		(Note 6) 1000	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 5) 310	°C/W
		(Note 6) 120	
Thermal Resistance, Junction to Case	R <sub>θJC</sub>	60	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**ESD Ratings** (Note 7)

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 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady state condition.
  6. Same as Note 5, except the exposed collector pad is mounted on 25mm x 25mm 2oz copper.
  7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics**

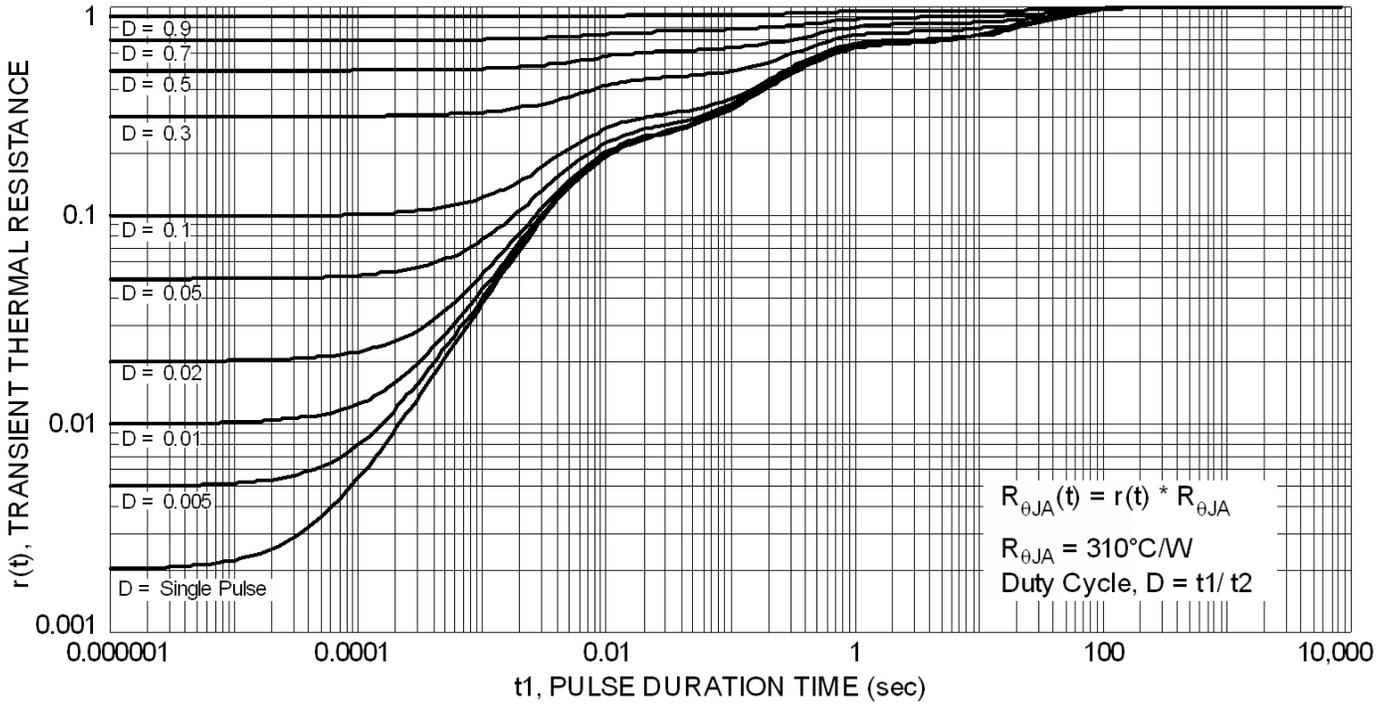


Fig. 1 Transient Thermal Resistance

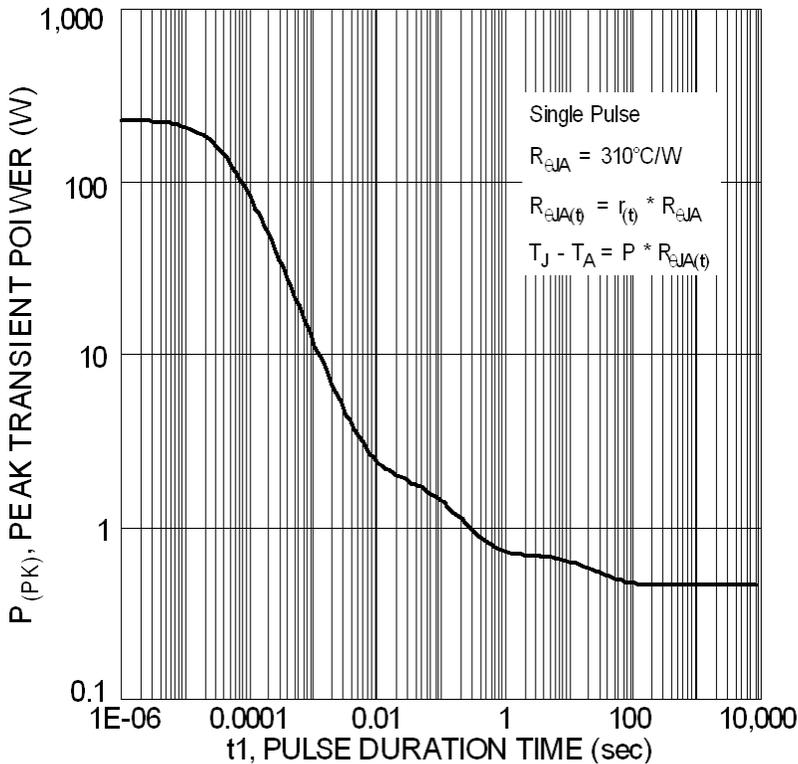


Fig. 2 Single Pulse Maximum Power Dissipation

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>					
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-40	—	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 8)	BV <sub>CEO</sub>	-40	—	V	I <sub>C</sub> = -10.0mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-6	—	V	I <sub>E</sub> = -100μA
Collector Cutoff Current	I <sub>CEX</sub>	—	-50	nA	V <sub>CE</sub> = -30V, V <sub>EB(off)</sub> = -3.0V
	I <sub>CBO</sub>	—	-50	nA	V <sub>CB</sub> = -30V
Base Cutoff Current	I <sub>BL</sub>	—	-50	nA	V <sub>CE</sub> = -30V, V <sub>EB(off)</sub> = -3.0V
<b>ON CHARACTERISTICS (Note 8)</b>					
DC Current Gain	h <sub>FE</sub>	60	—	—	I <sub>C</sub> = -100μA, V <sub>CE</sub> = -1.0V
		80	—		I <sub>C</sub> = -1.0mA, V <sub>CE</sub> = -1.0V
		100	300		I <sub>C</sub> = -10mA, V <sub>CE</sub> = -1.0V
		60	—		I <sub>C</sub> = -50mA, V <sub>CE</sub> = -1.0V
		30	—		I <sub>C</sub> = -100mA, V <sub>CE</sub> = -1.0V
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	—	-0.25	V	I <sub>C</sub> = -10mA, I <sub>B</sub> = -1.0mA
		—	-0.40		I <sub>C</sub> = -50mA, I <sub>B</sub> = -5.0mA
Base-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	-0.65	-0.85	V	I <sub>C</sub> = -10mA, I <sub>B</sub> = -1.0mA
		—	-0.95		I <sub>C</sub> = -50mA, I <sub>B</sub> = -5.0mA
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	C <sub>obo</sub>	—	4.5	pF	V <sub>CB</sub> = -5.0V, f = 1.0MHz
Input Capacitance	C <sub>ibo</sub>	—	10	pF	V <sub>EB</sub> = -0.5V, f = 1.0MHz
Input Impedance	h <sub>ie</sub>	2	12	kΩ	V <sub>CE</sub> = -10V, I <sub>C</sub> = -1.0mA f = 1.0kHz
Voltage Feedback Ratio	h <sub>re</sub>	0.1	10	x 10 <sup>-4</sup>	
Small Signal Current Gain	h <sub>fe</sub>	100	400	—	
Output Admittance	h <sub>oe</sub>	3	60	μS	
Current Gain-Bandwidth Product	f <sub>T</sub>	300	—	MHz	
<b>SWITCHING CHARACTERISTICS</b>					
Delay Time	t <sub>d</sub>	—	35	ns	V <sub>CC</sub> = -3.0V, I <sub>C</sub> = -10mA I <sub>B1</sub> = -I <sub>B2</sub> = -1.0mA
Rise Time	t <sub>r</sub>	—	35	ns	
Storage Time	t <sub>s</sub>	—	225	ns	
Fall Time	t <sub>f</sub>	—	75	ns	

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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

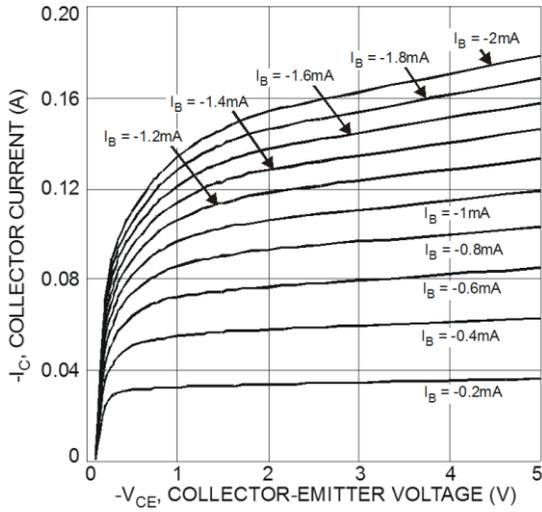


Fig. 3 Typical Collector Current vs. Collector-Emitter Voltage

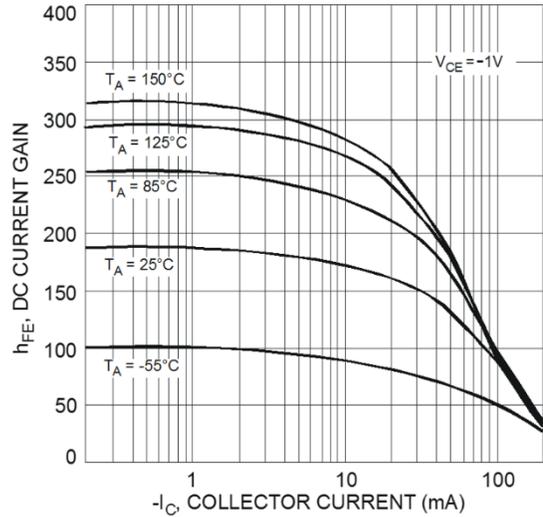


Fig. 4 Typical DC Current vs. Collector Current

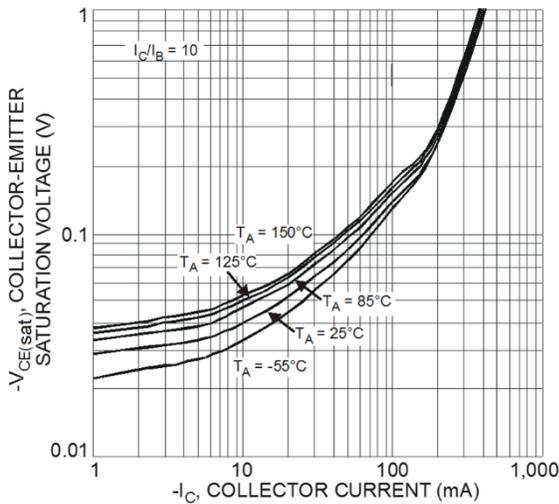


Fig. 5 Typical Collector-Emitter Saturation Voltage vs. Collector Current

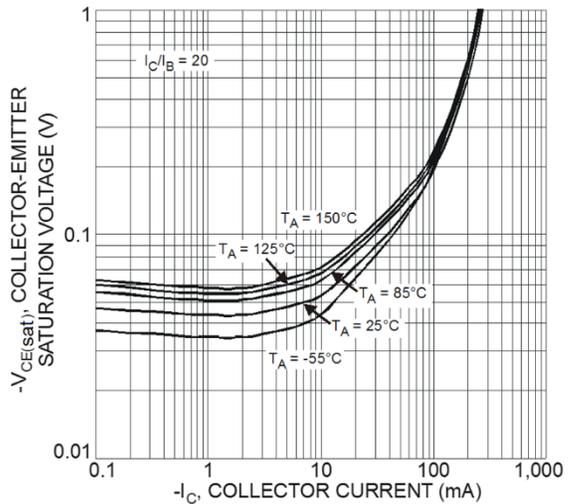


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

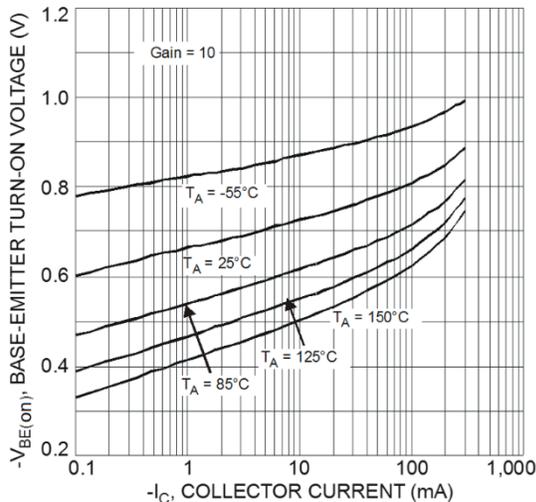


Fig. 7 Typical Base-Emitter Turn-On Voltage vs. Collector Current

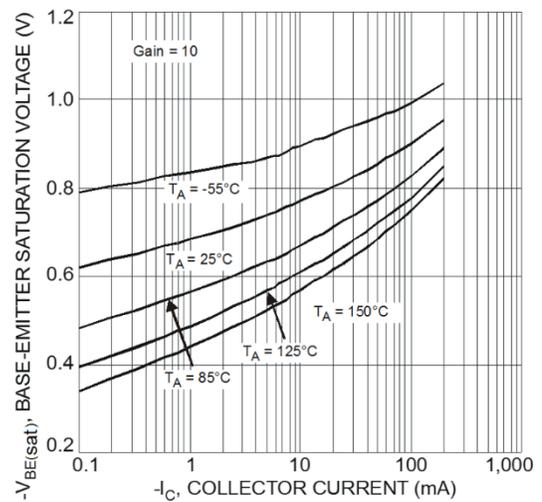
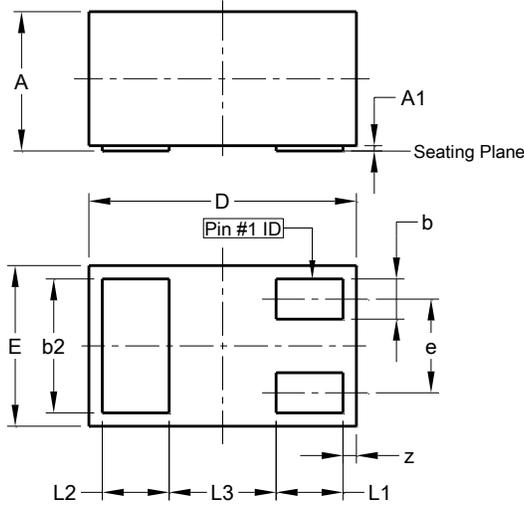


Fig. 8 Typical Base-Emitter Saturation Voltage vs. Collector Current

**Package Outline Dimensions**

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

**X1-DFN1006-3**

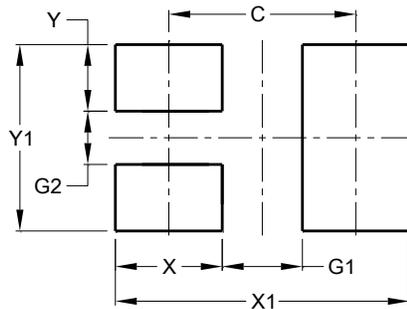


X1-DFN1006-3			
Dim	Min	Max	Typ
A	0.47	0.53	0.50
A1	0.00	0.05	0.03
b	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.075	1.00
E	0.55	0.675	0.60
e	-	-	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	-	-	0.40
z	0.02	0.08	0.05
All Dimensions in mm			

**Suggested Pad Layout**

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

**X1-DFN1006-3**



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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