

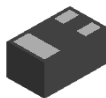
## Features

- $BV_{CEO} > -40V$
- $I_C = -200mA$  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 MMBT3904LP
- **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**

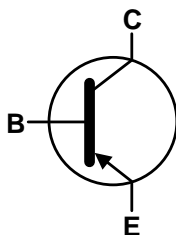
## Mechanical Data

- 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 208④
- Weight: 0.0008 grams (Approximate)

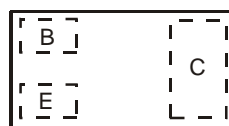
X1-DFN1006-3



Bottom View



Device Symbol

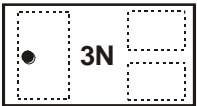
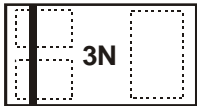
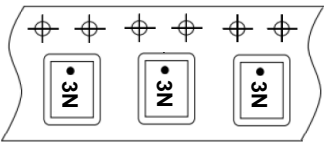
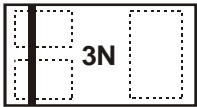
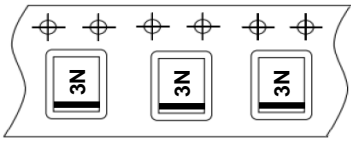

 Top View  
Device Schematic

## Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMBT3906LP-7	3N	7	8	3,000
MMBT3906LP-7B	3N	7	8	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](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/products/packages.html>.

## Marking Information

<b>MMBT3906LP-7</b>	<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">                       Top View Dot Denotes Collector Side                 </div> <div style="text-align: center;">                       Top View Bar Denotes Base and Emitter Side                 </div> </div> <div style="text-align: center; margin-top: 10px;">  </div>
<b>MMBT3906LP-7B</b>	<div style="text-align: center;">                       Top View Bar Denotes Base and Emitter Side                 </div> <div style="text-align: center; margin-top: 10px;">  </div> <div style="text-align: right; margin-top: 20px;"> <b>3N = Product Type Marking Code</b> </div>

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-40	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	V
Emitter-Base Voltage	V <sub>EBO</sub>	-6.0	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.)

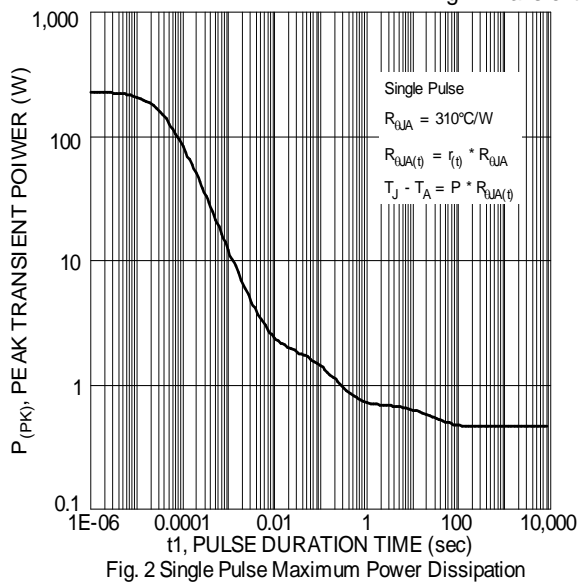
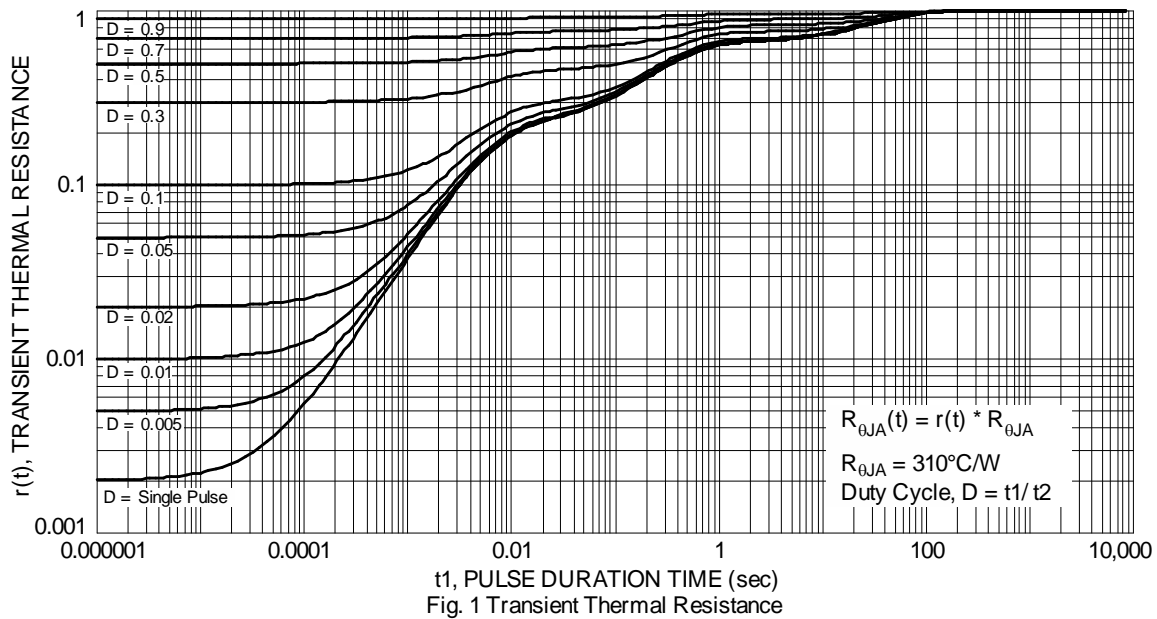
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	400	mW
		1000	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	310	°C/W
		120	
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	120	°C/W
Operating and Storage and Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +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:
- 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.
  - Same as Note 5, except the exposed collector pad is mounted on 25mm x 25mm 2oz copper.
  - Thermal resistance from junction to solder-point (on the exposed collector pad).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics



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

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-40	—	V	I <sub>C</sub> = -100μA, I <sub>E</sub> = 0
Collector-Emitter Breakdown Voltage (Note 9)	BV <sub>CEO</sub>	-40	—	V	I <sub>C</sub> = -10.0mA, I <sub>B</sub> = 0
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-6.0	—	V	I <sub>E</sub> = -100μA, I <sub>C</sub> = 0
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, I <sub>E</sub> = 0
Base Cutoff Current	I <sub>BL</sub>	—	-50	nA	V <sub>CE</sub> = -30V, V <sub>EB(OFF)</sub> = -3.0V
ON CHARACTERISTICS (Note 9)					
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
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C <sub>obo</sub>	—	4.5	pF	V <sub>CB</sub> = -5.0V, f = 1.0MHz, I <sub>E</sub> = 0
Input Capacitance	C <sub>ibo</sub>	—	10	pF	V <sub>EB</sub> = -0.5V, f = 1.0MHz, I <sub>C</sub> = 0
Input Impedance	h <sub>ie</sub>	2.0	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>	3.0	60	μS	
Current Gain-Bandwidth Product	f <sub>T</sub>	300	—	MHz	V <sub>CE</sub> = -20V, I <sub>C</sub> = -10mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Delay Time	t <sub>d</sub>	—	35	ns	V <sub>CC</sub> = -3.0V, I <sub>C</sub> = -10mA, V <sub>BE(off)</sub> = 0.5V, I <sub>B1</sub> = -1.0mA
Rise Time	t <sub>r</sub>	—	35	ns	
Storage Time	t <sub>s</sub>	—	225	ns	V <sub>CC</sub> = -3.0V, I <sub>C</sub> = -10mA, I <sub>B1</sub> = I <sub>B2</sub> = -1.0mA
Fall Time	t <sub>f</sub>	—	75	ns	

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

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

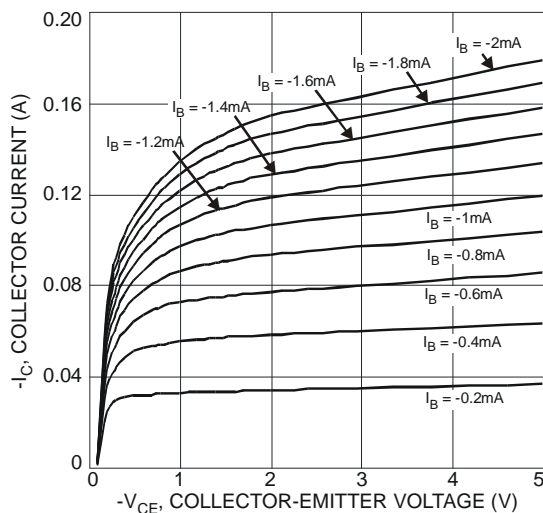


Fig. 4 Typical Collector Current vs. Collector-Emitter Voltage

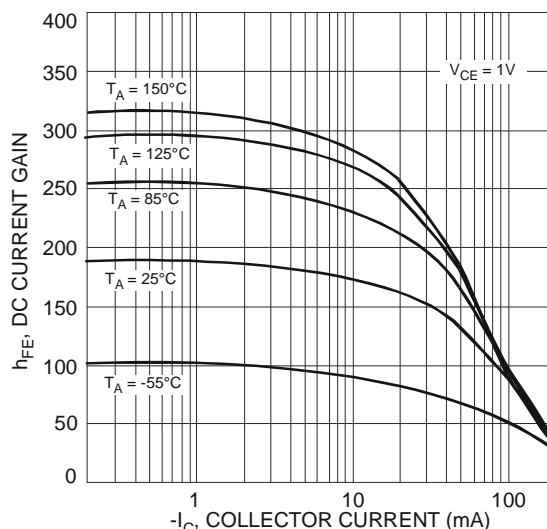


Fig. 5 Typical DC Current Gain vs. Collector Current

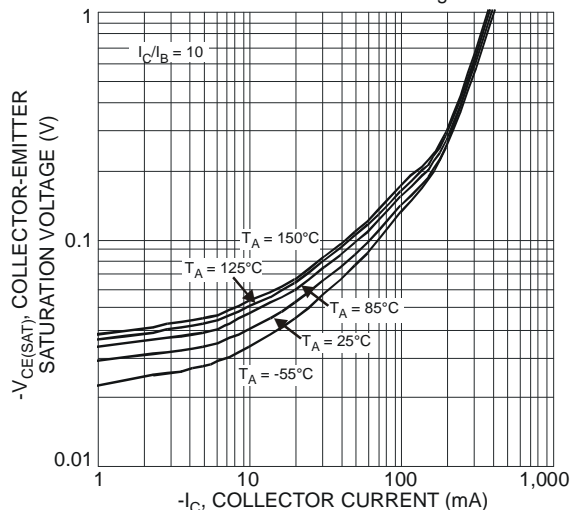


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

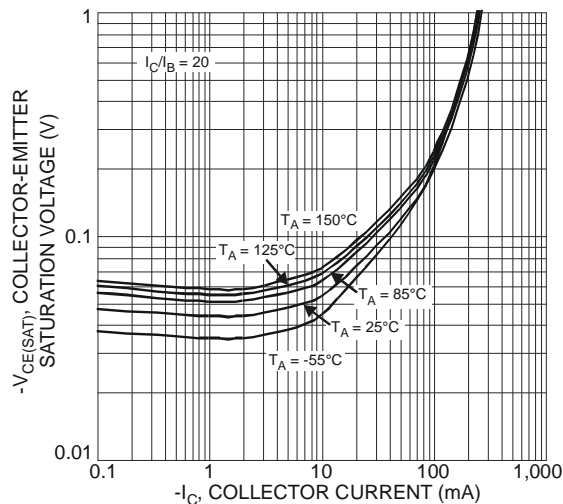


Fig. 7 Typical Collector-Emitter Saturation Voltage vs. Collector Current

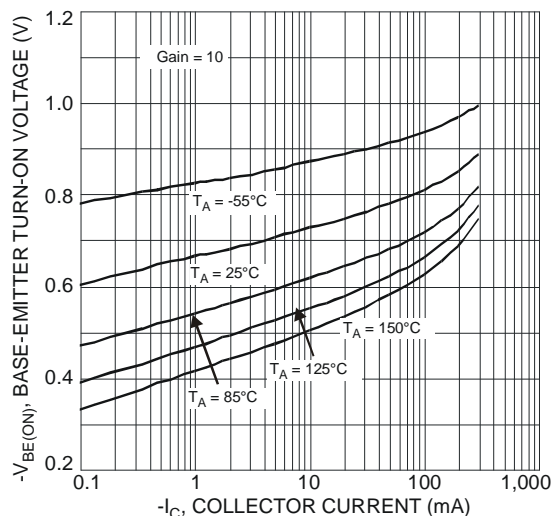


Fig. 8 Typical Base-Emitter Saturation Voltage vs. Collector Current

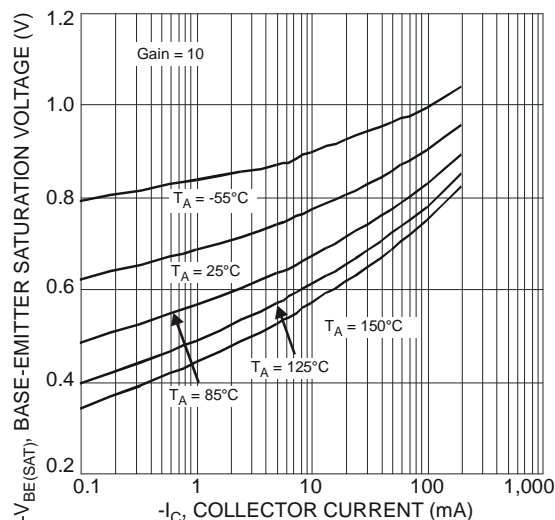
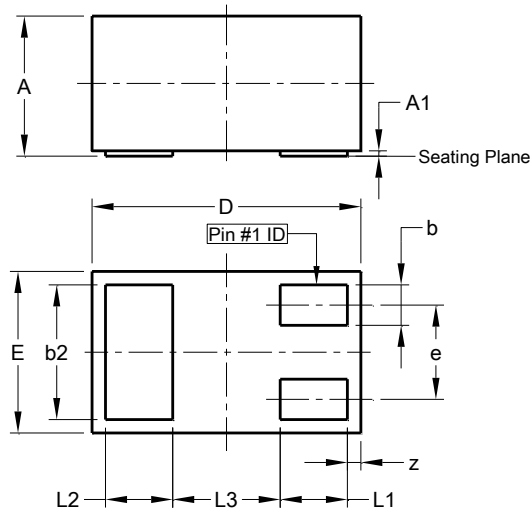


Fig. 9 Typical Base-Emitter Saturation Voltage vs. Collector Current

## Package Outline Dimensions

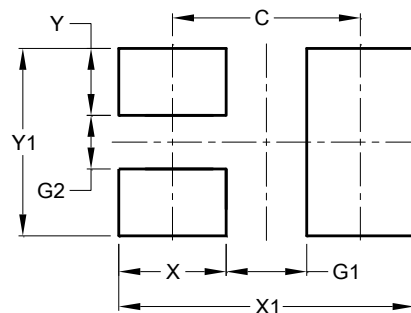
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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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