

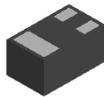
Features

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

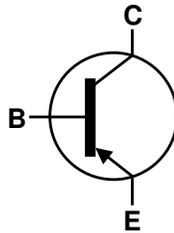
Mechanical Data

- 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)

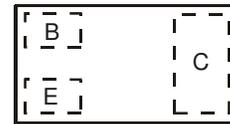
X1-DFN1006-3



Bottom View



Device Symbol

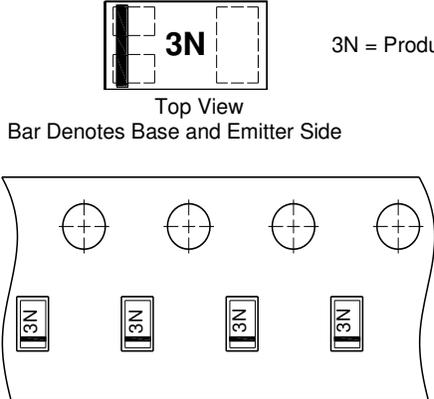
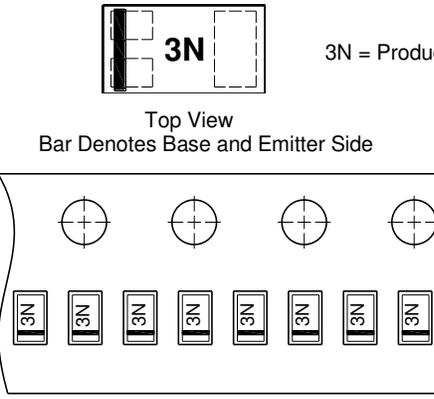

 Top View
Device Schematic

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

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CB0}	-40	V
Collector-Emitter Voltage	V _{CEO}	-40	V
Emitter-Base Voltage	V _{EB0}	-6	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	(Note 5) 400	mW
		(Note 6) 1000	
Thermal Resistance, Junction to Ambient	R _{θJA}	(Note 5) 310	°C/W
		(Note 6) 120	
Thermal Resistance, Junction to Case	R _{θJC}	60	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-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

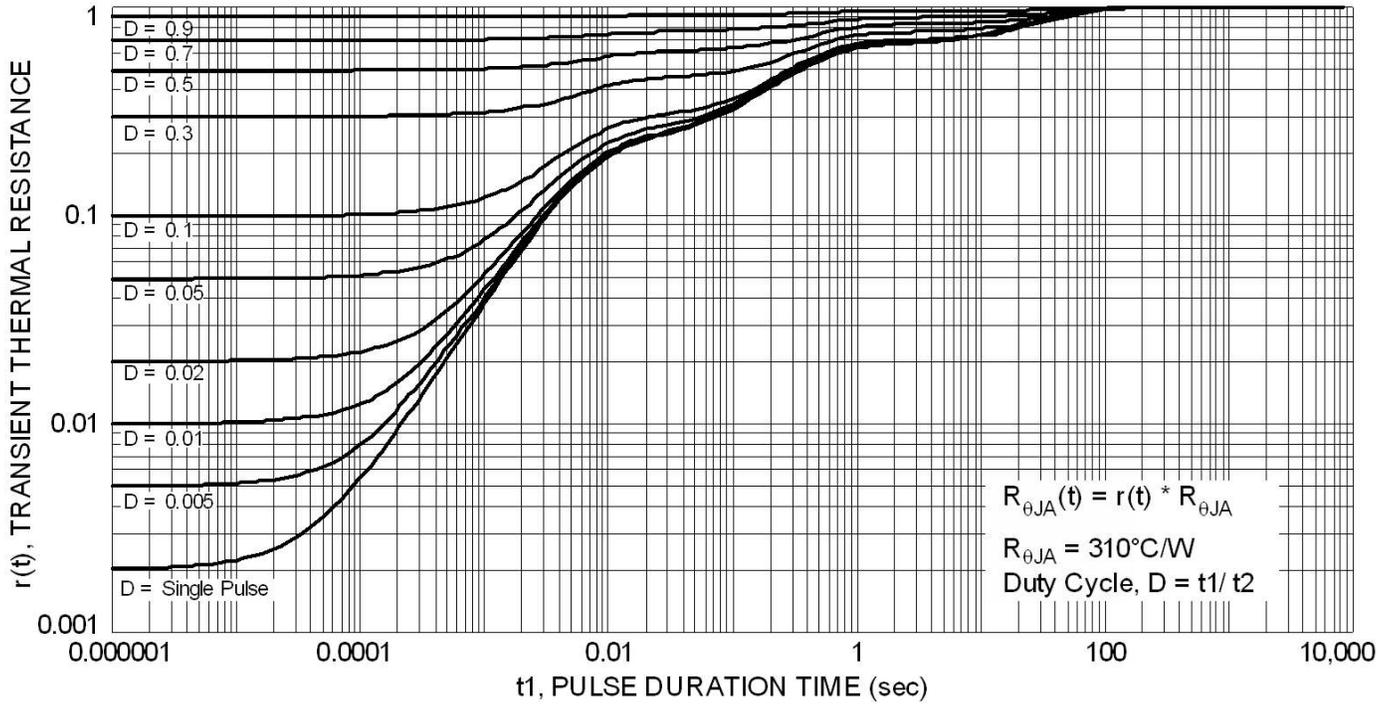


Fig. 1 Transient Thermal Resistance

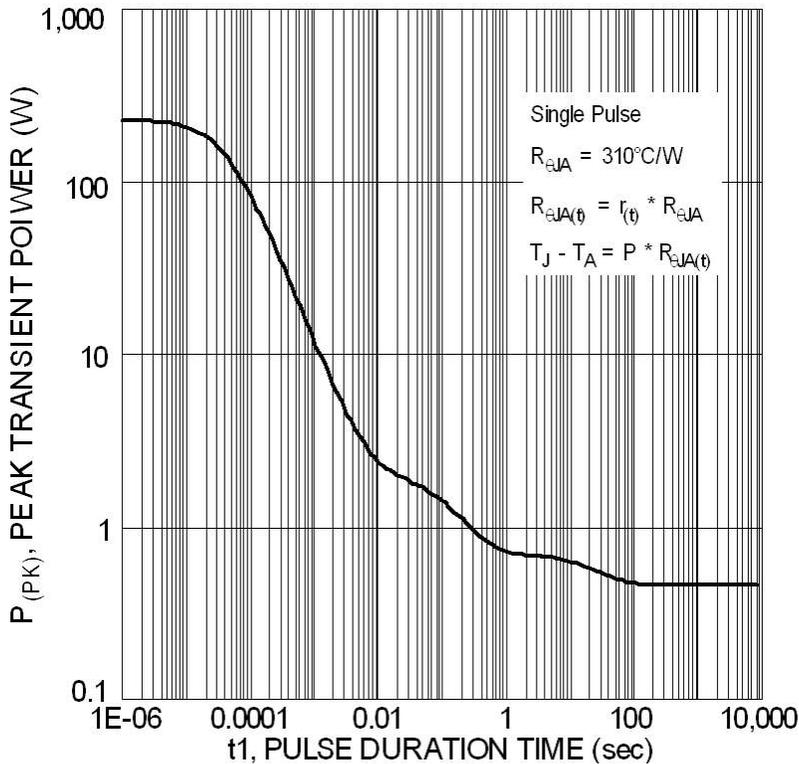


Fig. 2 Single Pulse Maximum Power Dissipation

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

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

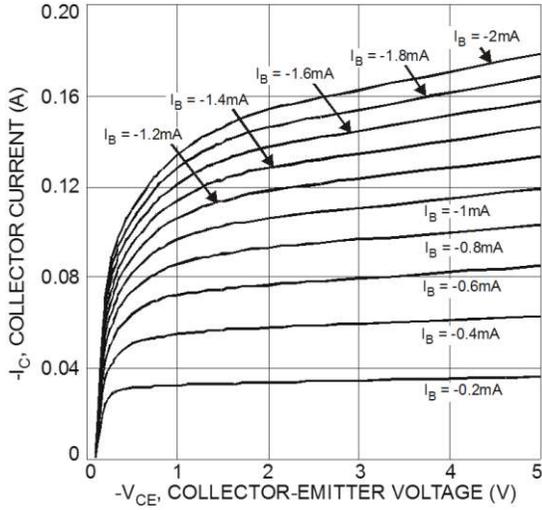


Fig. 3 Typical Collector Current vs. Collector-Emitter Voltage

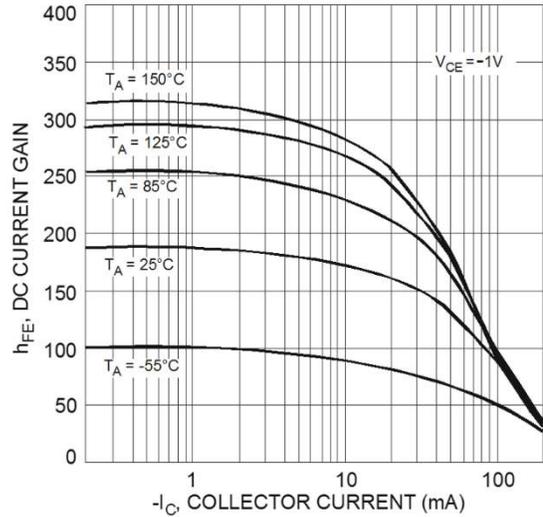


Fig. 4 Typical DC Current vs. Collector Current

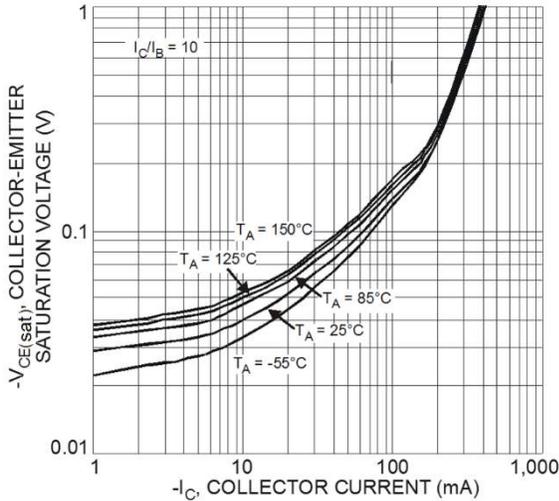


Fig. 5 Typical Collector-Emitter Saturation Voltage vs. Collector Current

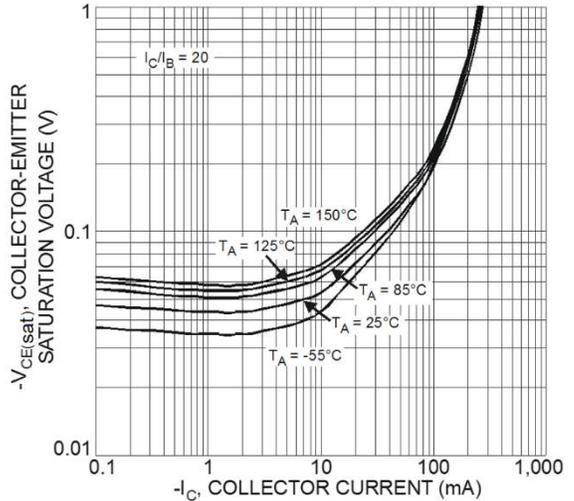


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

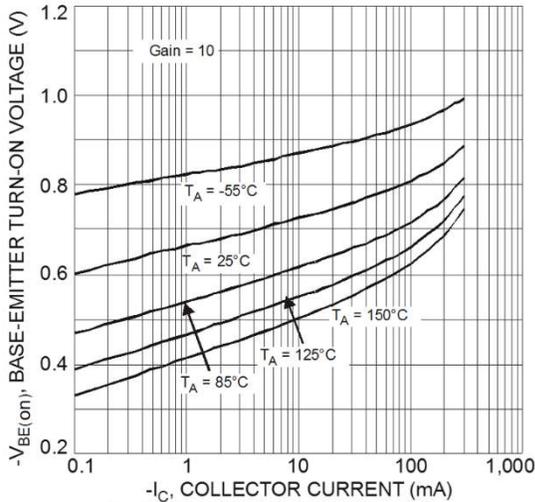


Fig. 7 Typical Base-Emitter Turn-On Voltage vs. Collector Current

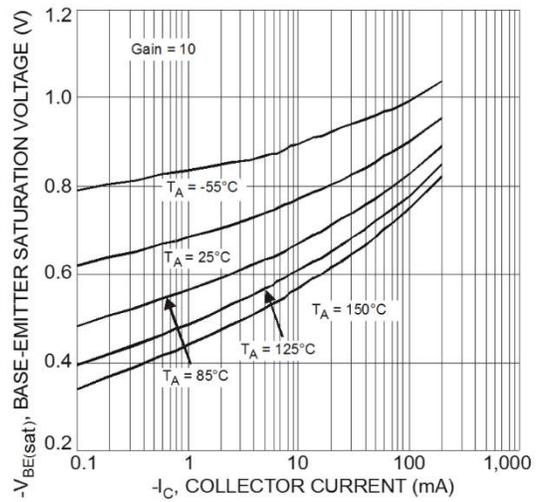
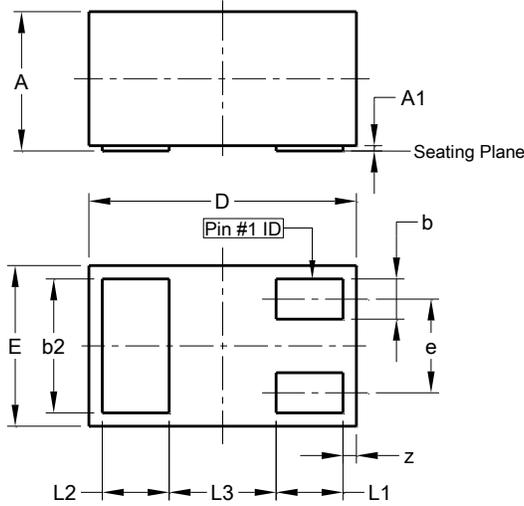


Fig. 8 Typical Base-Emitter Saturation Voltage vs. Collector Current

Package Outline Dimensions

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

X1-DFN1006-3

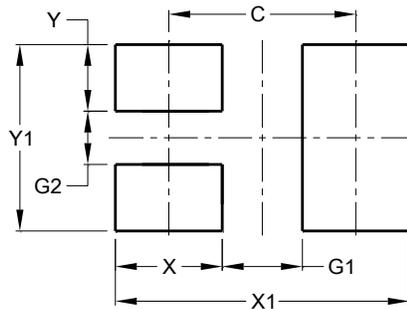


X1-DFN1006-3			
Dim	Min	Max	Typ
A	0.47	0.53	0.50
A1	0.00	0.05	0.03
b	0.10	0.20	0.15
b2	0.45	0.55	0.50
D	0.95	1.075	1.00
E	0.55	0.675	0.60
e	-	-	0.35
L1	0.20	0.30	0.25
L2	0.20	0.30	0.25
L3	-	-	0.40
z	0.02	0.08	0.05
All Dimensions in mm			

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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