40V PNP SMALL SIGNAL SURFACE MOUNT TRANSISTOR

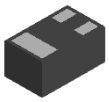
Features

- Complementary NPN Type Available (MMBT3904LP)
- Ultra-Small Leadless Surface Mount Package
- **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**

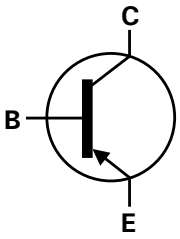
Mechanical Data

- 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)

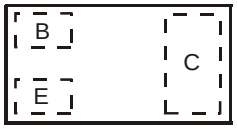
X1-DFN1006-3



Bottom View



Device Symbol



Top View
Device Schematic

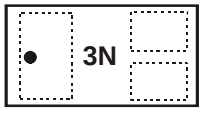
Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
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 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.

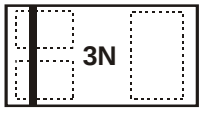
Marking Information

MMBT3906LP-7



Top View
Dot Denotes
Collector Side

MMBT3906LP-7B



Top View
Bar Denotes Base
and Emitter Side

3N = Product Type Marking Code

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-40	V
Collector-Emitter Voltage	V_{CEO}	-40	V
Emitter-Base Voltage	V_{EBO}	-6.0	V
Collector Current - Continuous (Note 5)	I_C	-200	mA

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	460	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	272	°C/W
Thermal Resistance, Junction to Leads (Note 6)	$R_{\theta JL}$	110	°C/W
Operating and Storage and 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 to <8,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	200 to <400	V	B

Notes:
5. For a device surface mounted on minimum recommended pad layout FR-4 PCB with single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition. The entire exposed collector pad is attached to the heat sink.
6. Thermal resistance from junction to solder-point (at the end of the collector lead).
7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics

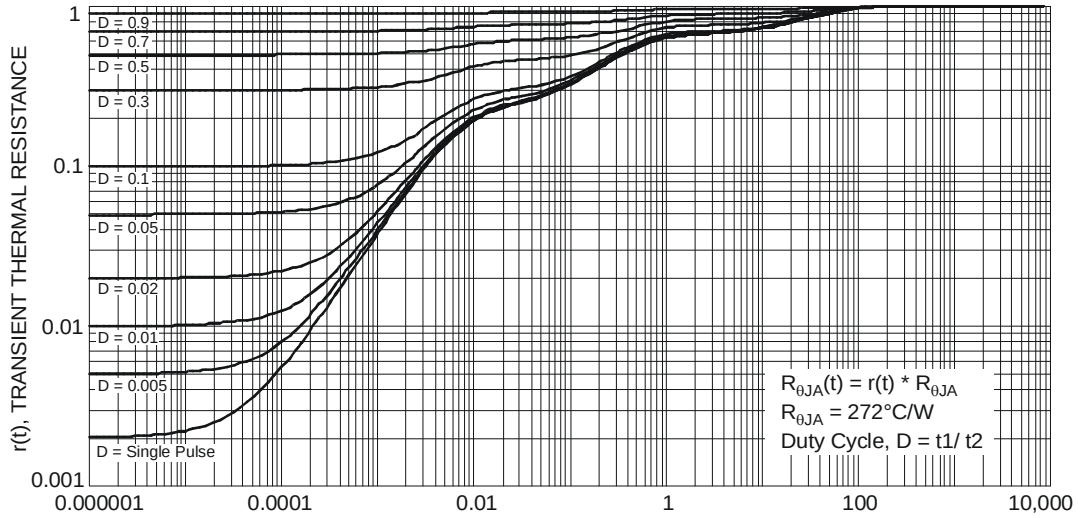


Fig. 1 Transient Thermal Resistance

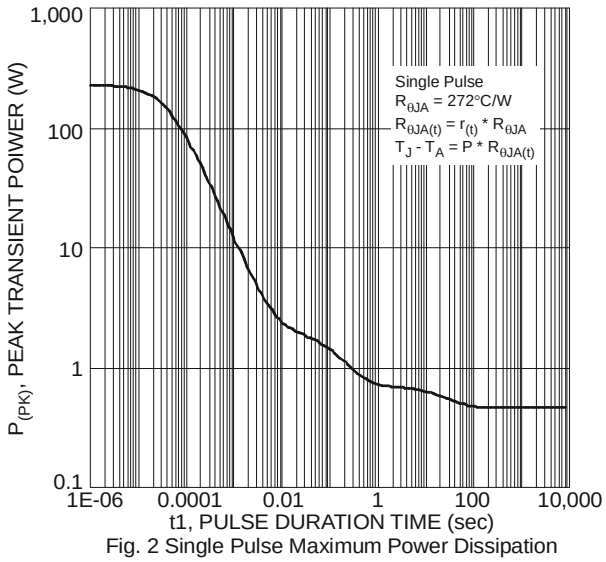


Fig. 2 Single Pulse Maximum Power Dissipation

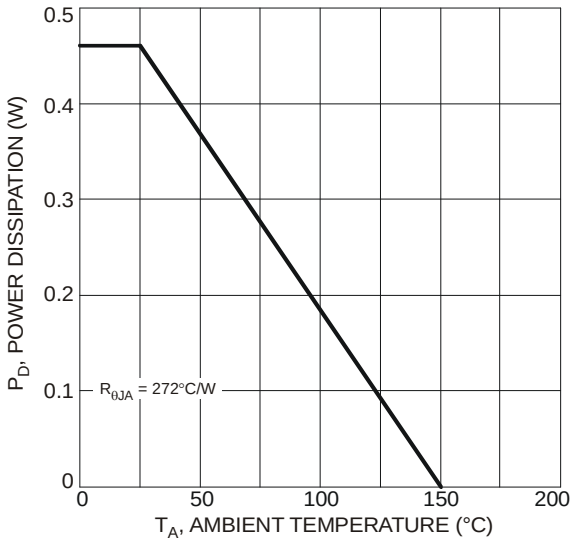


Fig. 3 Power Dissipation vs. Ambient Temperature

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, I_E = 0
Collector-Emitter Breakdown Voltage (Note 8)	BV_{CEO}	-40	—	V	I_C = -10.0mA, I_B = 0
Emitter-Base Breakdown Voltage	BV_{EBO}	-6.0	—	V	I_E = -100μA, I_C = 0
Collector Cutoff Current	I_{CEX}	—	-50	nA	V_{CE} = -30V, $V_{EB(OFF)}$ = -3.0V
	I_{CBO}	—	-50	nA	V_{CB} = -30V, I_E = 0
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, I_E = 0
Input Capacitance	C_{ibo}	—	10	pF	V_{EB} = -0.5V, f = 1.0MHz, I_C = 0
Input Impedance	h_{ie}	2.0	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}	3.0	60	μS	
Current Gain-Bandwidth Product	f_T	300	—	MHz	V_{CE} = -20V, I_C = -10mA, f = 100MHz
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	35	ns	V_{CC} = -3.0V, I_C = -10mA, $V_{BE(off)}$ = 0.5V, I_{B1} = -1.0mA
Rise Time	t_r	—	35	ns	
Storage Time	t_s	—	225	ns	V_{CC} = -3.0V, I_C = -10mA, I_{B1} = I_{B2} = -1.0mA
Fall Time	t_f	—	75	ns	

Notes: 8. Short duration pulse test used to minimize self-heating effect.

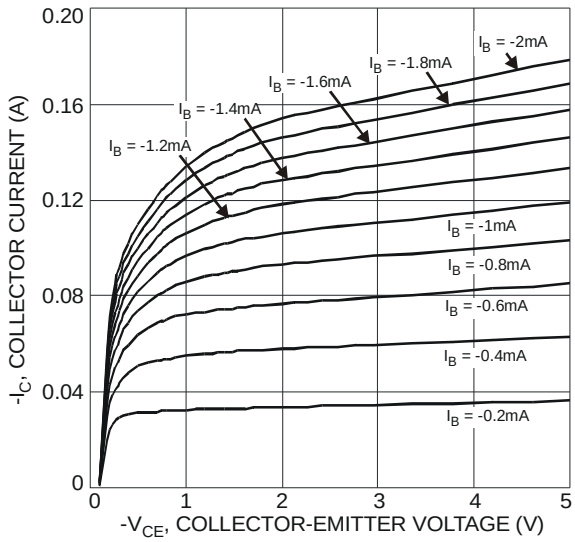


Fig. 4 Typical Collector Current vs. Collector-Emitter Voltage

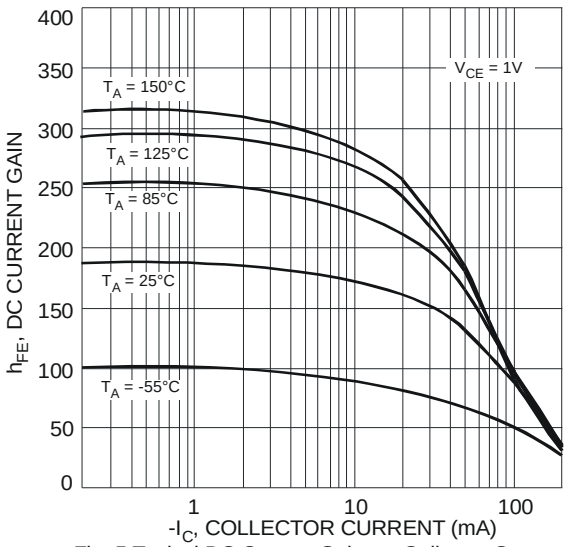


Fig. 5 Typical DC Current Gain vs. Collector Current

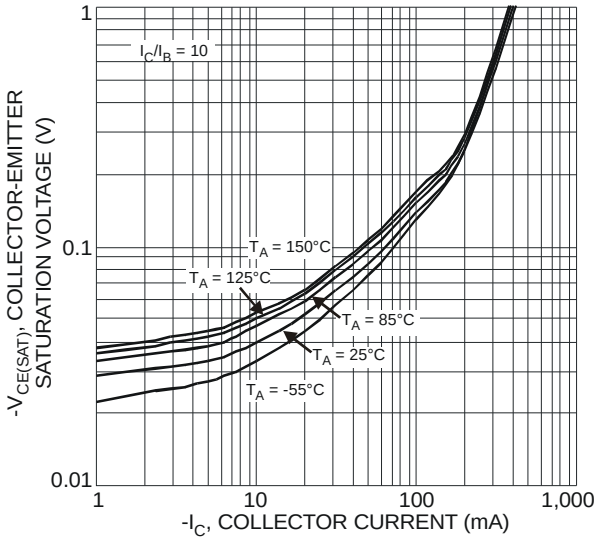


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

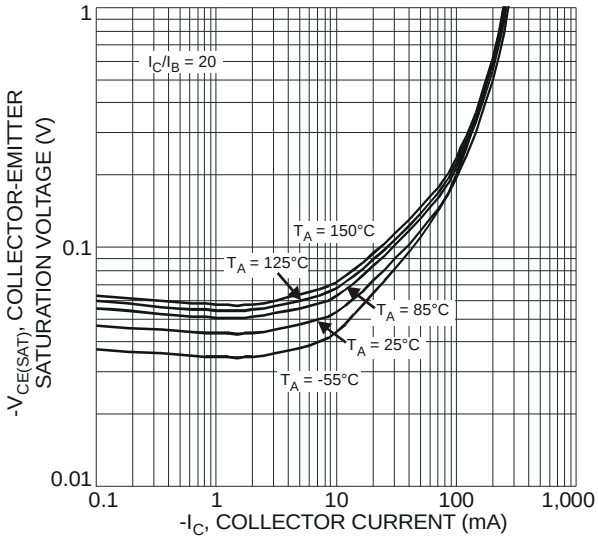


Fig. 7 Typical Collector-Emitter Saturation Voltage vs. Collector Current

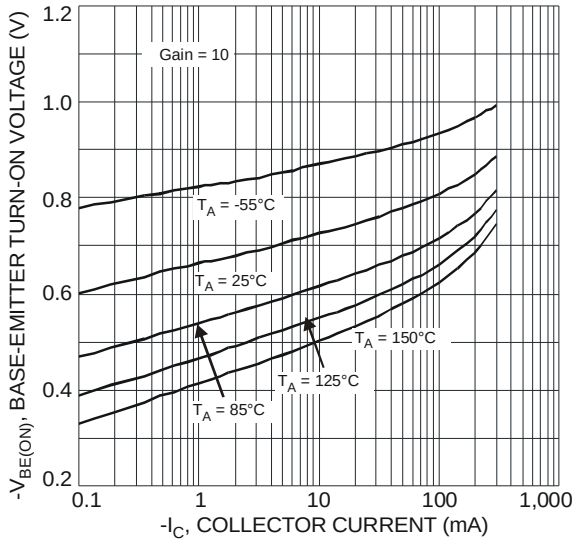


Fig. 8 Typical Base-Emitter Saturation Voltage vs. Collector Current

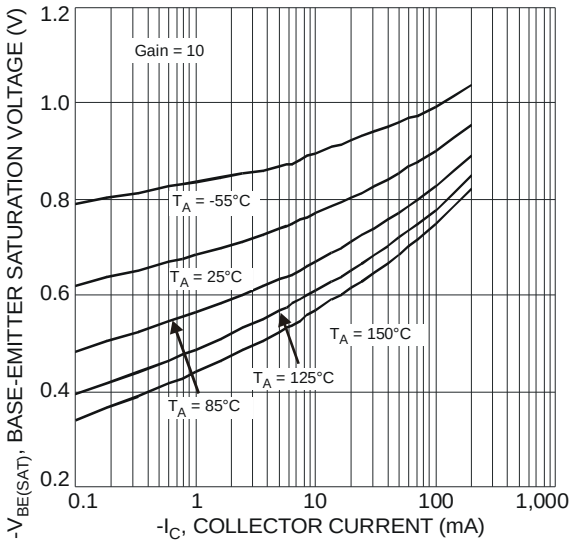
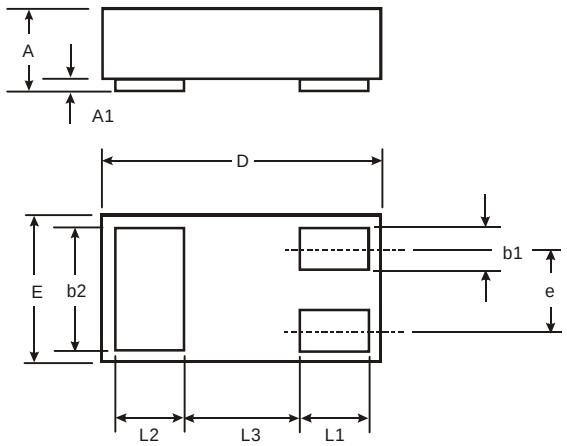


Fig. 9 Typical Base-Emitter Saturation Voltage vs. Collector Current

Package Outline Dimensions

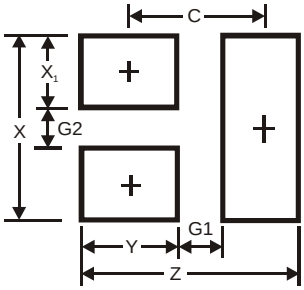
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



X1-DFN1006-3			
Dim	**Min**	**Max**	**Typ**
A	0.47	0.53	0.50
A1	0	0.05	0.03
b1	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
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)
Z	1.1
G1	0.3
G2	0.2
X	0.7
X1	0.25
Y	0.4
C	0.7