

40V PNP SMALL SIGNAL SURFACE MOUNT TRANSISTOR

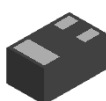
Features

- 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**

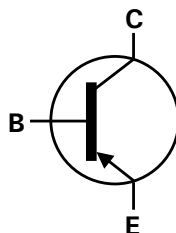
Mechanical Data

- 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 
- Weight: 0.0008 grams (approximate)

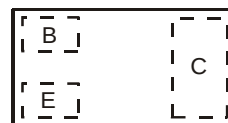
X1-DFN1006-3



Bottom View



Device Symbol



Top View
Device Schematic

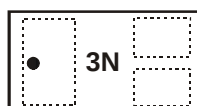
Ordering Information (Note 4)

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>.

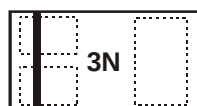
Marking Information

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

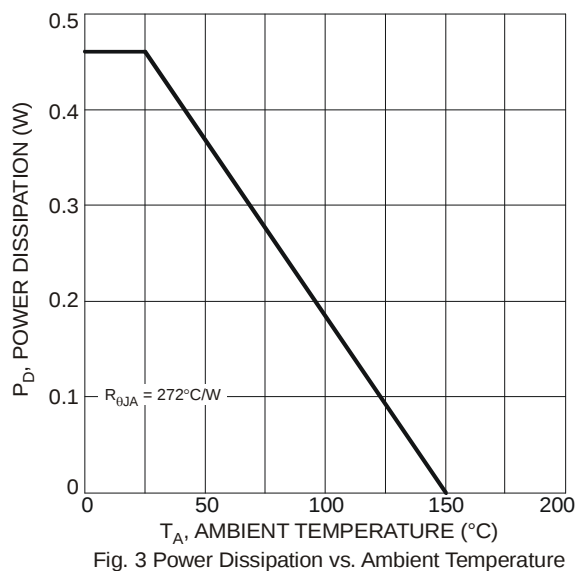
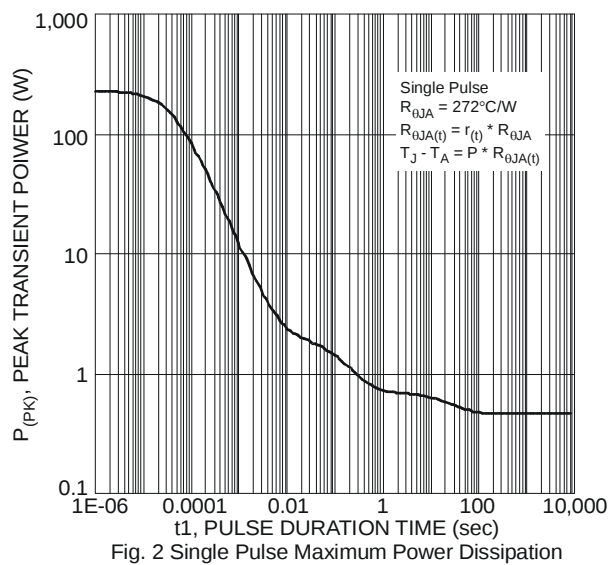
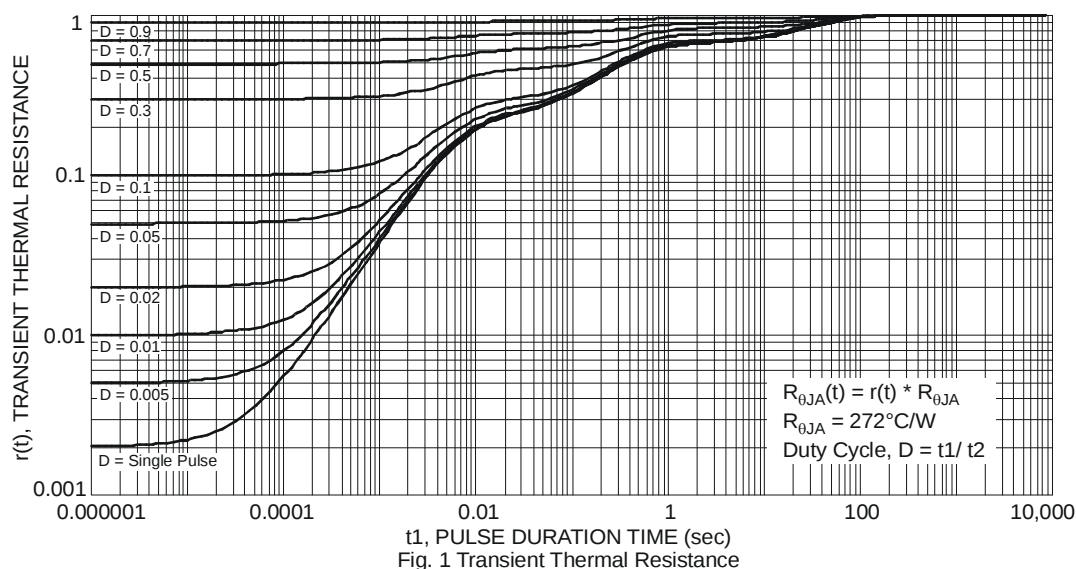
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	460	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	272	°C/W
Thermal Resistance, Junction to Leads (Note 6)	R _{θJL}	110	°C/W
Operating and Storage and Temperature Range	T _J , T _{STG}	-55 to +150	°C

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



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

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV_{CBO}	-40	—	V	$I_C = -100\mu\text{A}$, $I_E = 0$
Collector-Emitter Breakdown Voltage (Note 8)	BV_{CEO}	-40	—	V	$I_C = -10.0\text{mA}$, $I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-6.0	—	V	$I_E = -100\mu\text{A}$, $I_C = 0$
Collector Cutoff Current	I_{CEX}	—	-50	nA	$V_{CE} = -30\text{V}$, $V_{EB(OFF)} = -3.0\text{V}$
	I_{CBO}	—	-50	nA	$V_{CB} = -30\text{V}$, $I_E = 0$
Base Cutoff Current	I_{BL}	—	-50	nA	$V_{CE} = -30\text{V}$, $V_{EB(OFF)} = -3.0\text{V}$
ON CHARACTERISTICS (Note 8)					
DC Current Gain	h_{FE}	60	—	—	$I_C = -100\mu\text{A}$, $V_{CE} = -1.0\text{V}$
		80	—		$I_C = -1.0\text{mA}$, $V_{CE} = -1.0\text{V}$
		100	300		$I_C = -10\text{mA}$, $V_{CE} = -1.0\text{V}$
		60	—		$I_C = -50\text{mA}$, $V_{CE} = -1.0\text{V}$
		30	—		$I_C = -100\text{mA}$, $V_{CE} = -1.0\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	-0.25	V	$I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$
		—	-0.40		$I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	-0.65	-0.85	V	$I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$
		—	-0.95		$I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	—	4.5	pF	$V_{CB} = -5.0\text{V}$, $f = 1.0\text{MHz}$, $I_E = 0$
Input Capacitance	C_{ibo}	—	10	pF	$V_{EB} = -0.5\text{V}$, $f = 1.0\text{MHz}$, $I_C = 0$
Input Impedance	h_{ie}	2.0	12	k Ω	$V_{CE} = 10\text{V}$, $I_C = 1.0\text{mA}$, $f = 1.0\text{kHz}$
Voltage Feedback Ratio	h_{re}	0.1	10	$\times 10^{-4}$	
Small Signal Current Gain	h_{fe}	100	400	—	
Output Admittance	h_{oe}	3.0	60	μS	
Current Gain-Bandwidth Product	f_T	300	—	MHz	$V_{CE} = -20\text{V}$, $I_C = -10\text{mA}$, $f = 100\text{MHz}$
SWITCHING CHARACTERISTICS					
Delay Time	t_d	—	35	ns	$V_{CC} = -3.0\text{V}$, $I_C = -10\text{mA}$, $V_{BE(off)} = 0.5\text{V}$, $I_{B1} = -1.0\text{mA}$
Rise Time	t_r	—	35	ns	
Storage Time	t_s	—	225	ns	$V_{CC} = -3.0\text{V}$, $I_C = -10\text{mA}$, $I_{B1} = I_{B2} = -1.0\text{mA}$
Fall Time	t_f	—	75	ns	

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

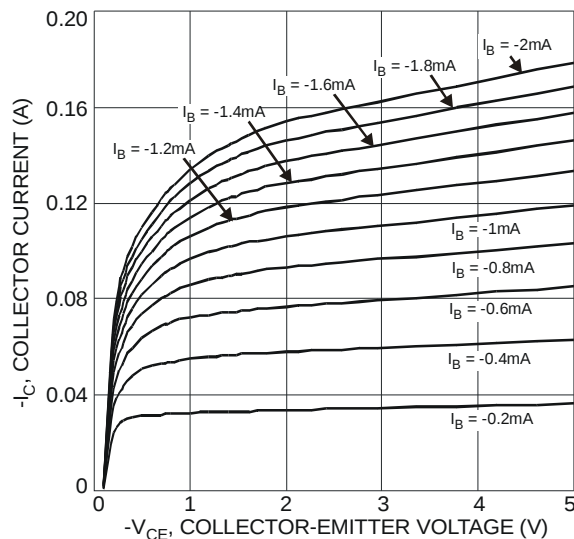


Fig. 4 Typical Collector Current vs. Collector-Emitter Voltage

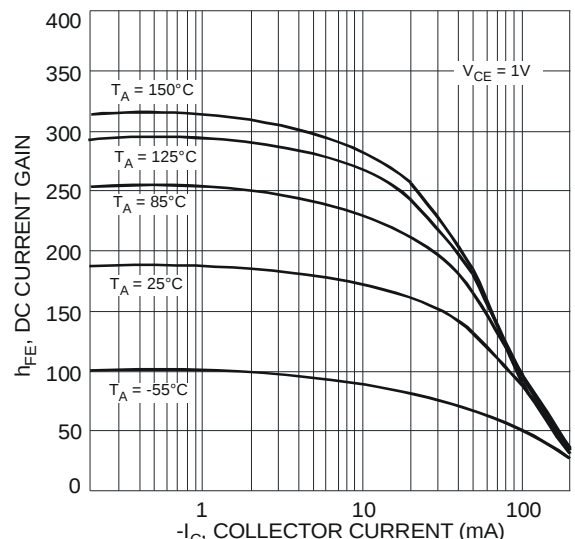


Fig. 5 Typical DC Current Gain vs. Collector Current

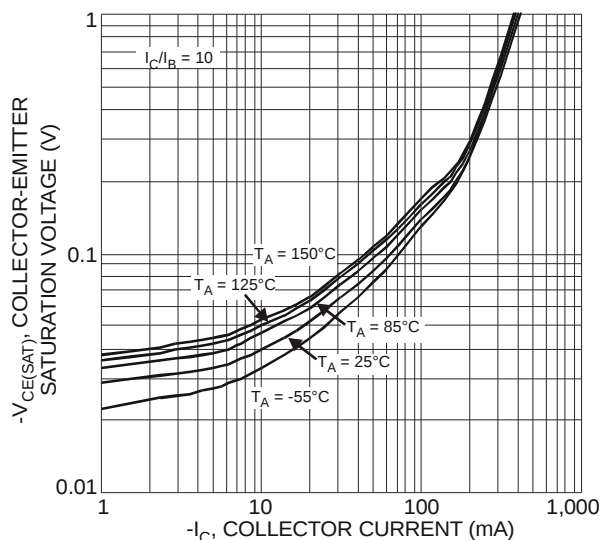


Fig. 6 Typical Collector-Emitter Saturation Voltage vs. Collector Current

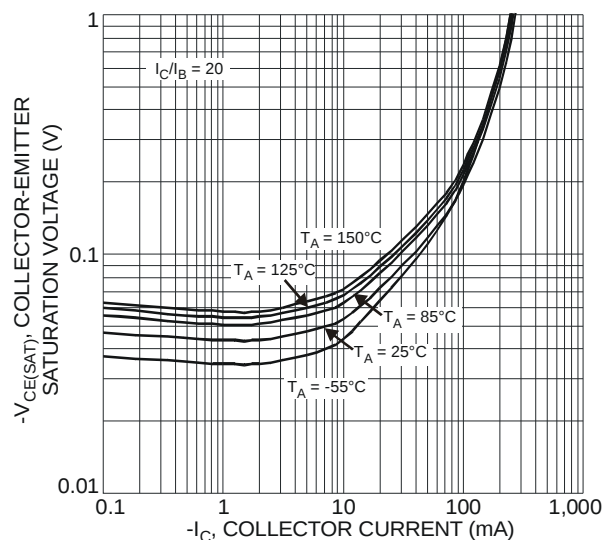


Fig. 7 Typical Collector-Emitter Saturation Voltage vs. Collector Current

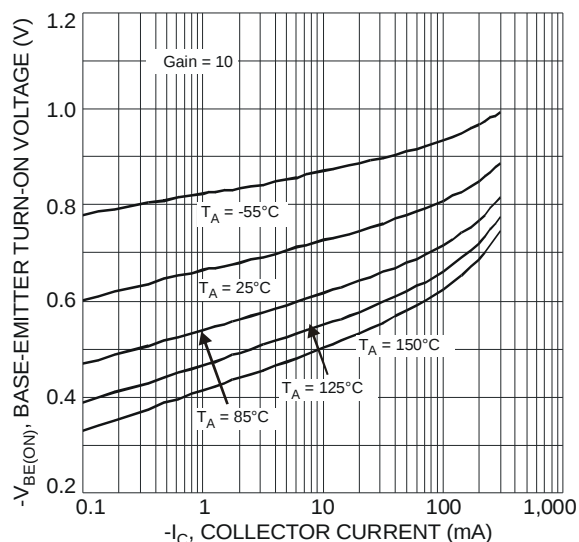


Fig. 8 Typical Base-Emitter Saturation Voltage vs. Collector Current

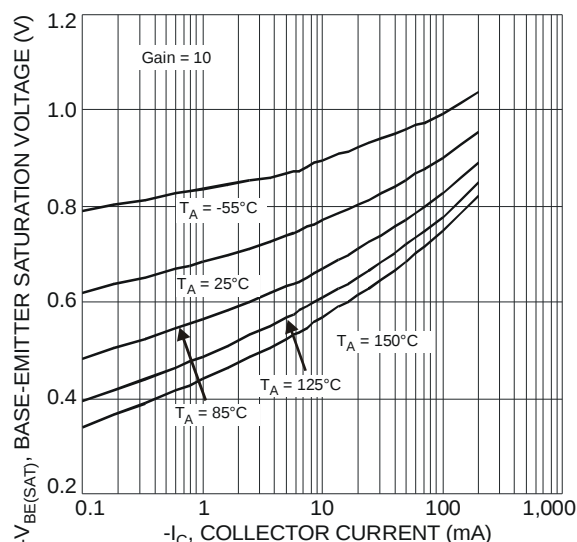
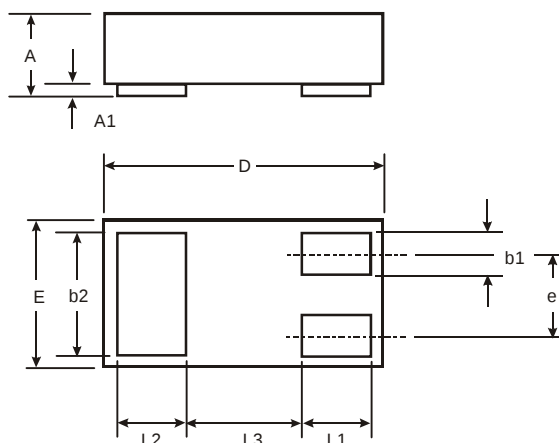


Fig. 9 Typical Base-Emitter Saturation Voltage vs. Collector Current

Package Outline Dimensions

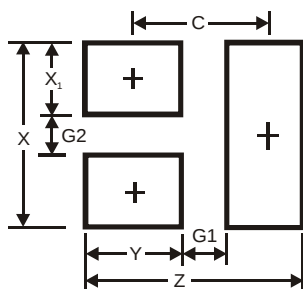
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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

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