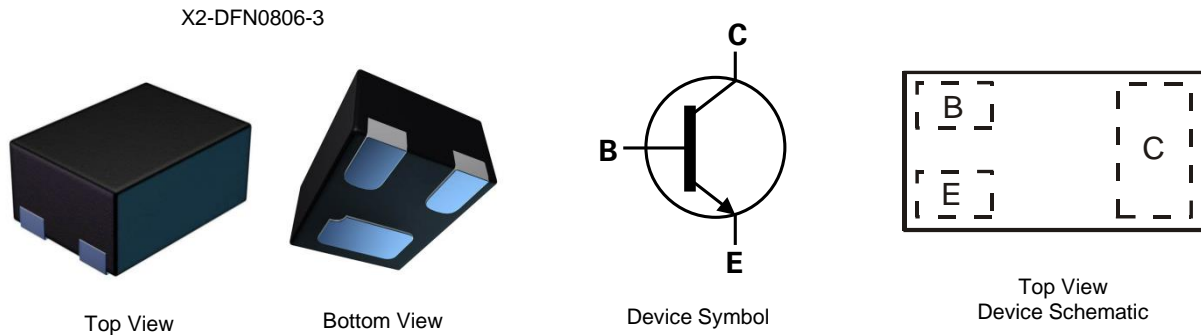


Features

- $BV_{CE0} > 40V$
- $I_C = 200mA$ High Collector Current
- $P_D = 435mW$ Power Dissipation
- $0.48mm^2$ Package Footprint, 16 Times Smaller than SOT23
- 0.4mm Height Package Minimizing Off-Board Profile
- Complementary PNP Type MMBT3906FA
- **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 refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**

Mechanical Data

- Package: X2-DFN0806-3
- 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)

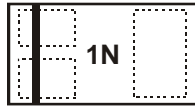


Ordering Information (Note 4)

Orderable Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
MMBT3904FA-7B	X2-DFN0806-3	1N	7	8mm	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



1N = Product Type Marking Code

Top View
Bar Denotes Base and Emitter Side

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CB0}	60	V
Collector-Emitter Voltage	V _{CEO}	40	V
Emitter-Base Voltage	V _{EBO}	6.0	V
Continuous Collector Current	I _C	200	mA
Peak Pulse Collector Current	I _{CM}	500	mA

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	435	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	287	°C/W
Thermal Resistance, Junction to Lead (Note 6)	R _{θJL}	150	°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	V	3A
Electrostatic Discharge - Machine Model	ESD MM	200	V	B

- Notes:
5. 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.
 6. Thermal resistance from junction to solder-point (on the exposed collector pad).
 7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristics and Derating Curves

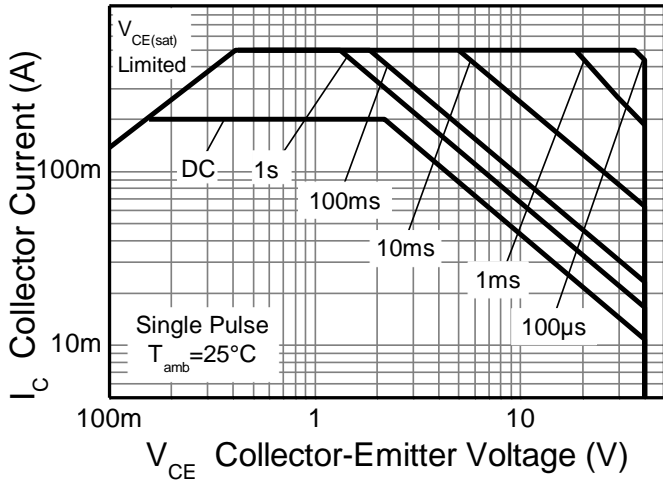


Figure 1. Safe Operating Area

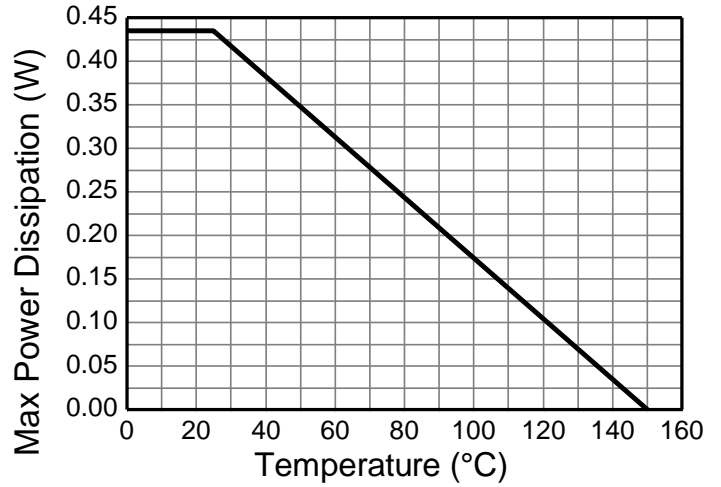


Figure 2. Derating Curve

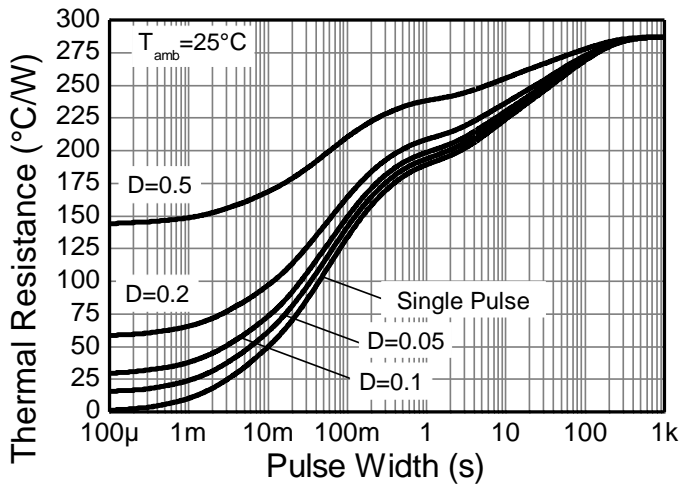


Figure 3. Transient Thermal Impedance

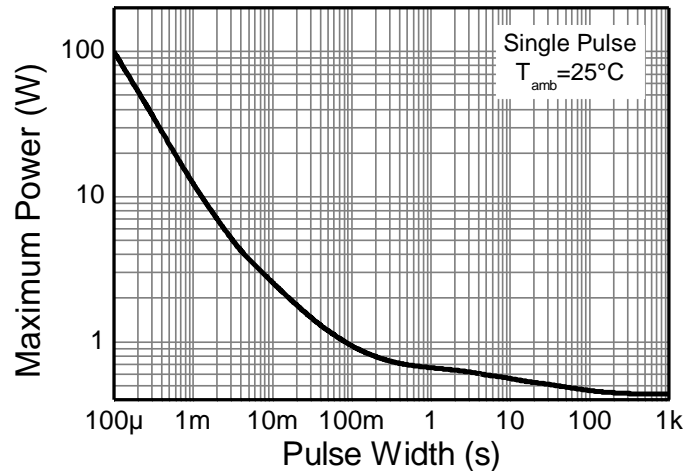


Figure 4. Pulse Power Dissipation

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

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV _{CB0}	60	—	V	I _C = 10μA, I _E = 0
Collector-Emitter Breakdown Voltage (Note 8)	BV _{CEO}	40	—	V	I _C = 1.0mA, I _B = 0
Emitter-Base Breakdown Voltage	BV _{EB0}	6.0	—	V	I _E = 10μA, I _C = 0
Collector Cutoff Current	I _{CEX}	—	50	nA	V _{CE} = 30V, V _{EB(OFF)} = 3.0V
Base Cutoff Current	I _{BL}	—	50	nA	V _{CE} = 30V, V _{EB(OFF)} = 3.0V
ON CHARACTERISTICS (Note 8)					
DC Current Gain	h _{FE}	40	—	—	I _C = 100μA, V _{CE} = 1.0V
		70	—		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)}	—	0.20 0.30	V	I _C = 10mA, I _B = 1.0mA I _C = 50mA, I _B = 5.0mA
Base-Emitter Saturation Voltage	V _{BE(sat)}	0.65 —	0.85 0.95	V	I _C = 10mA, I _B = 1.0mA I _C = 50mA, I _B = 5.0mA
SMALL-SIGNAL CHARACTERISTICS					
Output Capacitance	C _{obo}	—	4.0	pF	V _{CB} = 5.0V, f = 1.0MHz, I _E = 0
Input Capacitance	C _{ibo}	—	8.5	pF	V _{EB} = 0.5V, f = 1.0MHz, I _C = 0
Input Impedance	h _{ie}	1.0	10	kΩ	V _{CE} = 10V, I _C = 1.0mA f = 1.0kHz
Voltage Feedback Ratio	h _{re}	0.5	8.0	x 10 ⁻⁴	
Small-Signal Current Gain	h _{fe}	100	400	—	
Output Admittance	h _{oe}	1.0	40	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	—	200	ns	V _{CC} = 3.0V, I _C = 10mA I _{B1} = I _{B2} = 1.0mA
Fall Time	t _f	—	50	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.)

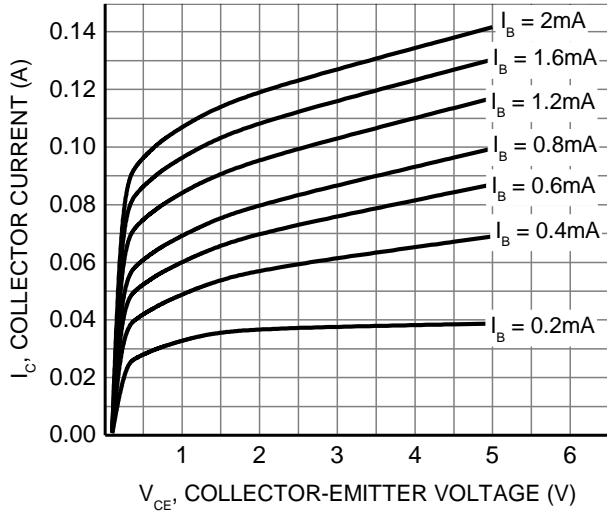


Figure 5. Typical I_c vs. V_{ce}

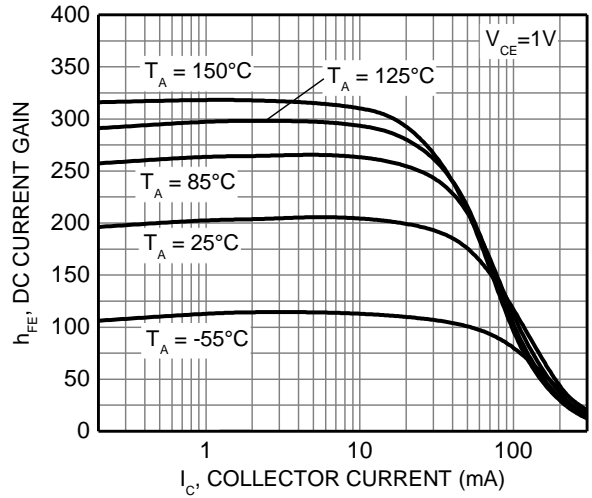


Figure 6. Typical h_{FE} vs. I_c

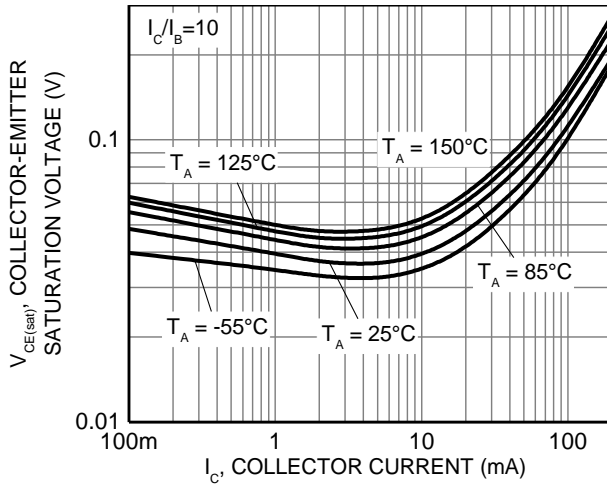


Figure 7. Typical $V_{ce(sat)}$ vs. I_c

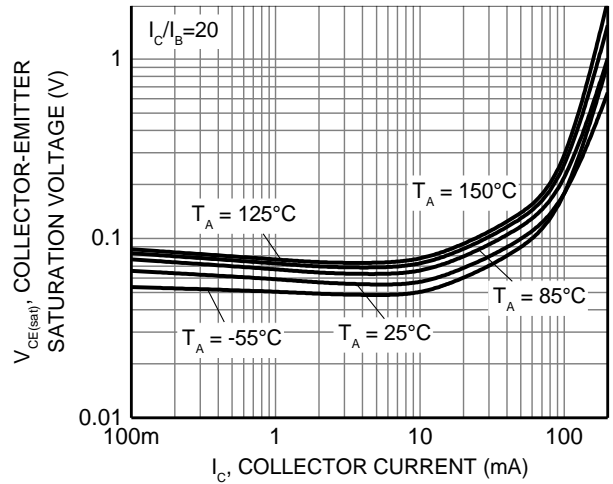


Figure 8. Typical $V_{ce(sat)}$ vs. I_c

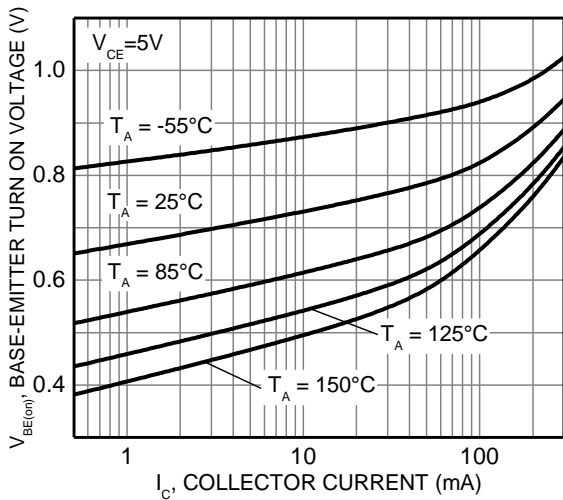


Figure 9. $V_{BE(on)}$ vs. I_c

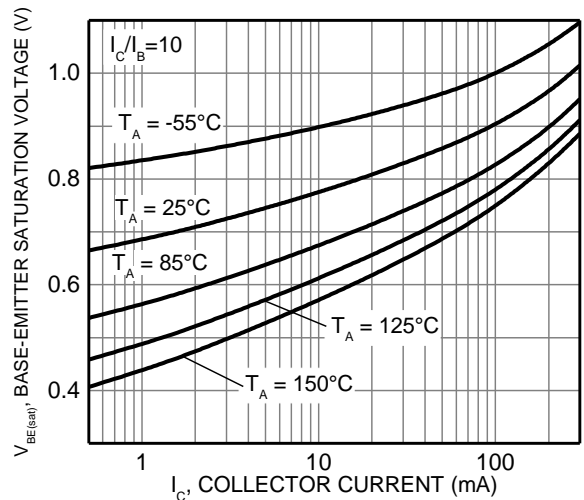
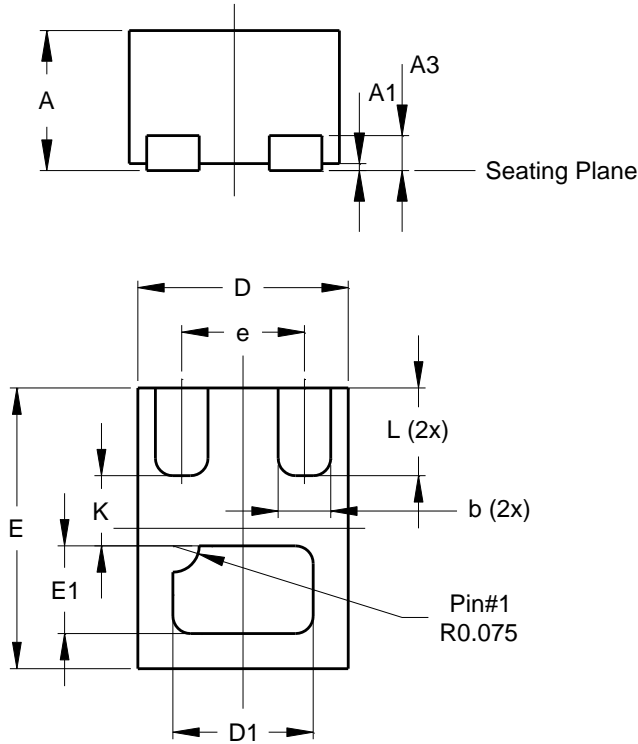


Figure 10. Typical $V_{BE(sat)}$ vs. I_c

Package Outline Dimensions

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

X2-DFN0806-3

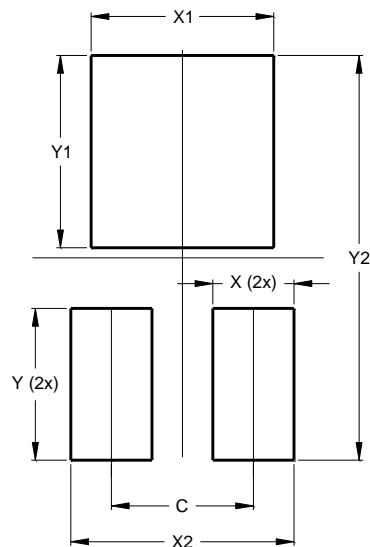


X2-DFN0806-3			
Dim	Min	Max	Typ
A	0.375	0.40	0.39
A1	0	0.05	0.02
A3	-	-	0.10
b	0.10	0.20	0.15
D	0.55	0.65	0.60
D1	0.35	0.45	0.40
E	0.75	0.85	0.80
E1	0.20	0.30	0.25
e	-	-	0.35
K	-	-	0.20
L	0.20	0.30	0.25
All Dimensions in mm			

Suggested Pad Layout

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

X2-DFN0806-3



Dimensions	Value (in mm)
C	0.350
X	0.200
X1	0.450
X2	0.550
Y	0.375
Y1	0.475
Y2	1.000

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