

Features

- $BV_{CEO} > 40V$
- $I_C = 200mA$ Collector Current
- Epitaxial Planar Die Construction
- Ultra-Small Surface Mount Package
- Complementary PNP Type: MMBT3906T
- **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**

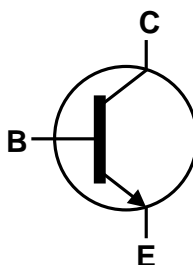
Mechanical Data

- Case: SOT523
- Case Material: Molded Plastic. "Green" Molding Compound.
UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads
Solderable per MIL-STD-202, Method 208 (B3)
- Weight: 0.002 grams (Approximate)

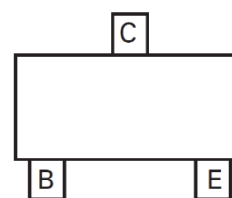
SOT523



Top View



Device Symbol



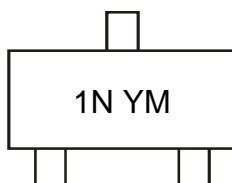
Pin-Out Top View

Ordering Information (Note 4)

Product	Status	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
MMBT3904T-7-F	Active	AEC-Q101	1N	7	8	3,000
MMBT3904T-13-F	Active	AEC-Q101	1N	13	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 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



1N = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: A = 2013)
 M or \bar{M} = Month (ex: 9 = September)

Date Code Key

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Code	A	B	C	D	E	F	G	H	I	J	K

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	60	V
Collector-Emitter Voltage	V _{CEO}	40	V
Emitter-Base Voltage	V _{EBO}	6	V
Collector Current	I _C	200	mA

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	150	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	833	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

ESD Ratings (Note 6)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

Notes: 5. For a device mounted with the collector lead 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 a steady-state.
 6. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

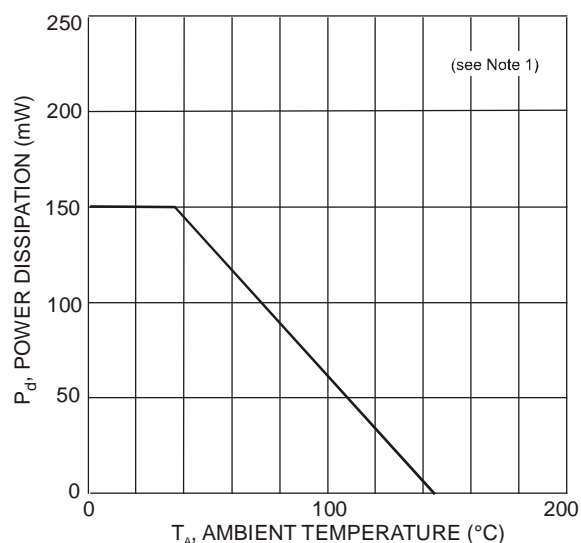
Thermal Characteristics and Derating Information


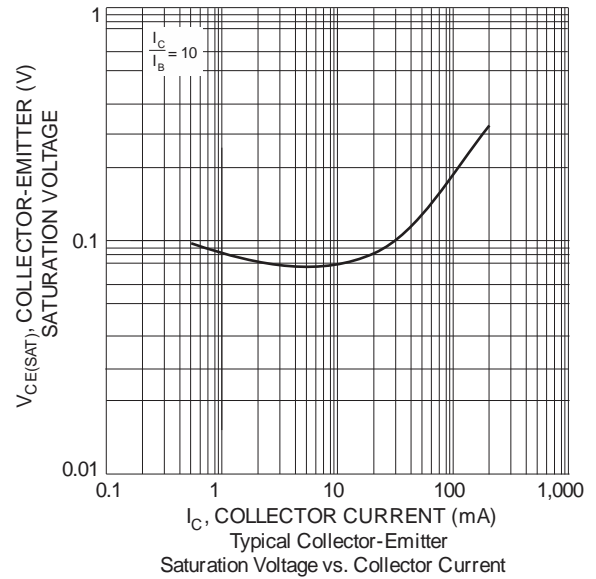
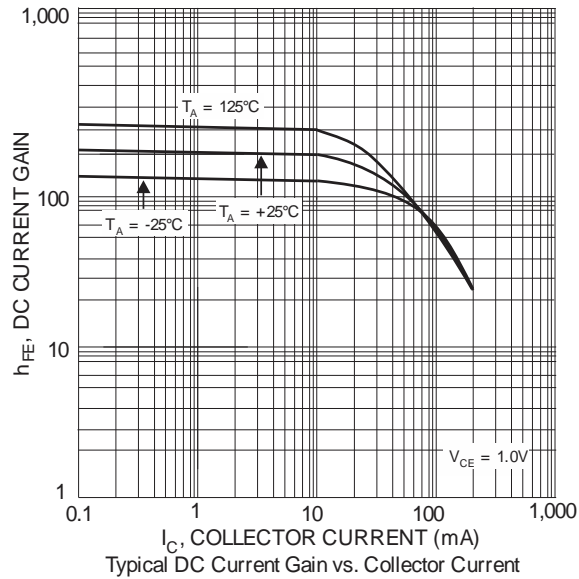
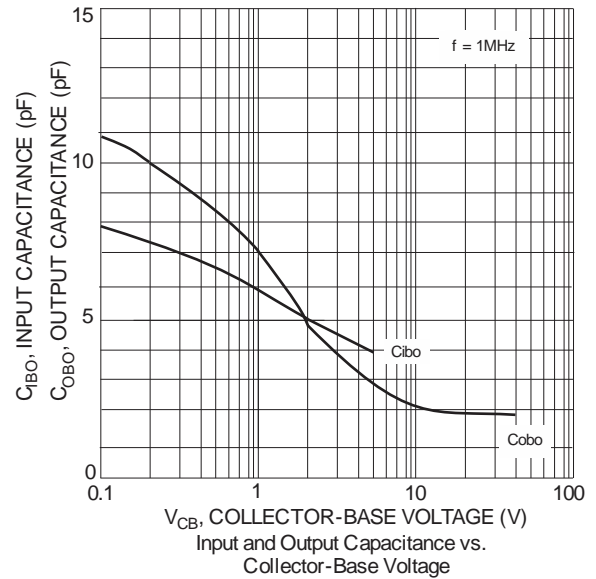
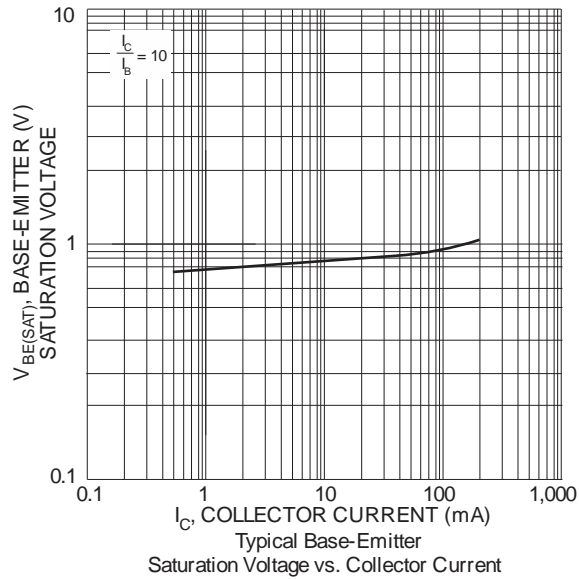
Fig. 1, Power Derating Curve

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

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)					
Collector-Base Breakdown Voltage	BV _{CBO}	60	—	V	I _C = 10μA, I _E = 0
Collector-Emitter Breakdown Voltage	BV _{CEO}	40	—	V	I _C = 1mA, I _B = 0
Emitter-Base Breakdown Voltage	BV _{EBO}	6	—	V	I _E = 10μA, I _C = 0
Collector Cutoff Current	I _{CEX}	—	50	nA	V _{CE} = 30V, V _{EB(OFF)} = 3V
Base Cutoff Current	I _{BL}	—	50	nA	V _{CE} = 30V, V _{EB(OFF)} = 3V
ON CHARACTERISTICS (Note 7)					
DC Current Gain	h _{FE}	40	—	—	I _C = 100μA, V _{CE} = 1V
		70	—		I _C = 1mA, V _{CE} = 1V
		100	300		I _C = 10mA, V _{CE} = 1V
		60	—		I _C = 50mA, V _{CE} = 1V
		30	—		I _C = 100mA, V _{CE} = 1V
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	—	0.20 0.30	V	I _C = 10mA, I _B = 1mA I _C = 50mA, I _B = 5mA
Base-Emitter Saturation Voltage	V _{BE(SAT)}	0.65 —	0.85 0.95	V	I _C = 10mA, I _B = 1mA I _C = 50mA, I _B = 5mA
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C _{OBO}	—	4	pF	V _{CB} = 5V, f = 1.0MHz, I _E = 0
Input Capacitance	C _{IBO}	—	8	pF	V _{EB} = 0.5V, f = 1.0MHz, I _C = 0
Input Impedance	h _{IE}	1	10	kΩ	V _{CE} = 10V, I _C = 1mA, f = 1.0MHz
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	40	μS	
Current Gain-Bandwidth Product	f _T	300	—	MHz	V _{CE} = 20V, I _C = 10mA, f = 100MHz
Noise Figure	NF	—	5	dB	V _{CC} = 5V, I _C = 100μA, R _S = 1kΩ, f = 1MHz
SWITCHING CHARACTERISTICS					
Delay Time	t _D	—	35	ns	V _{CC} = 3V, I _C = 10mA, V _{BE(OFF)} = -0.5V, I _{B1} = 1mA
Rise Time	t _R	—	35	ns	
Storage Time	t _S	—	200	ns	V _{CC} = 3.0V, I _C = 10mA
Fall Time	t _F	—	50	ns	I _{B1} = - I _{B2} = 1.0mA

Note: 7. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

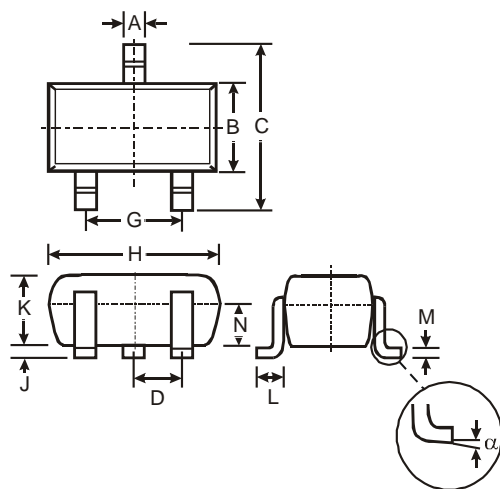
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



Package Outline Dimensions

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

SOT523

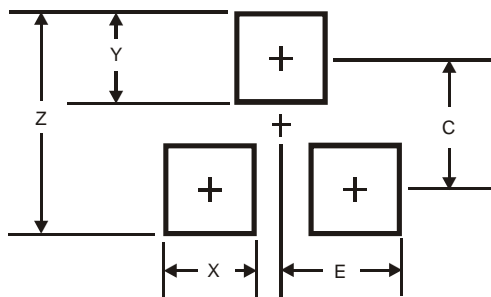


SOT523			
Dim	Min	Max	Typ
A	0.15	0.30	0.22
B	0.75	0.85	0.80
C	1.45	1.75	1.60
D	—	—	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
J	0.00	0.10	0.05
K	0.60	0.80	0.75
L	0.10	0.30	0.22
M	0.10	0.20	0.12
N	0.45	0.65	0.50
α	0°	8°	—
All Dimensions in mm			

Suggested Pad Layout

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

SOT523



Dimensions	Value (in mm)
Z	1.8
X	0.4
Y	0.51
C	1.3
E	0.7

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