40V DUAL NPN SMALL SIGNAL TRANSISTOR IN SOT563

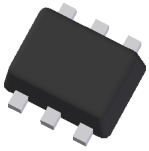
Features

- BV_{CEO} > 40V
- I_C = 200mA High Collector Current
- Epitaxial Planar Die Construction
- Ideal for Medium Power Amplification and Switching
- Ultra-Small Surface Mount Package
- **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 or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

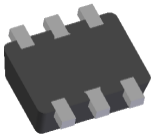
Mechanical Data

- Package: SOT563
- package Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish—Matte Tin Finish; Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.003 grams (Approximate)

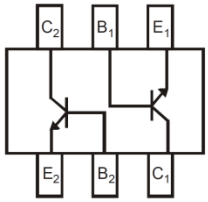
SOT563



Top View



Bottom View



Device Schematic
Top View

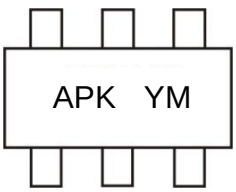
Ordering Information (Note 4)

Part Number	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
MMDT3904VC-7	Standard	APK	7	8	3000

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

SOT563



APK = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: J = 2022)
M or $\overline{M}$ = Month (ex: 9 = September)

Date Code Key

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Code	I	J	K	L	M	N	O	P	R	S	T	U

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}	6.0	V
Collector Current	I_C	200	mA

Thermal Characteristics

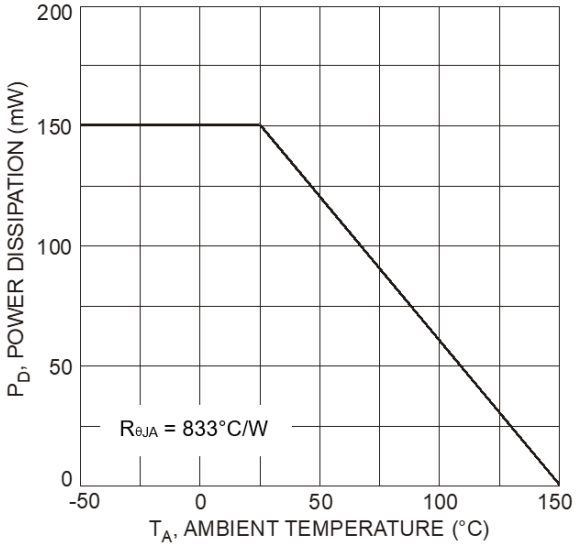
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	150	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\Theta JA}$	833	°C/W
Operating and Storage and Temperature Range	T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 6)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge—Human Body Model	ESD HBM	4000	V	3A
Electrostatic Discharge—Machine Model	ESD MM	400	V	C

Notes: 5. For the device mounted on minimum recommended pad layout FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
6. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

Thermal Characteristic and Derating Information



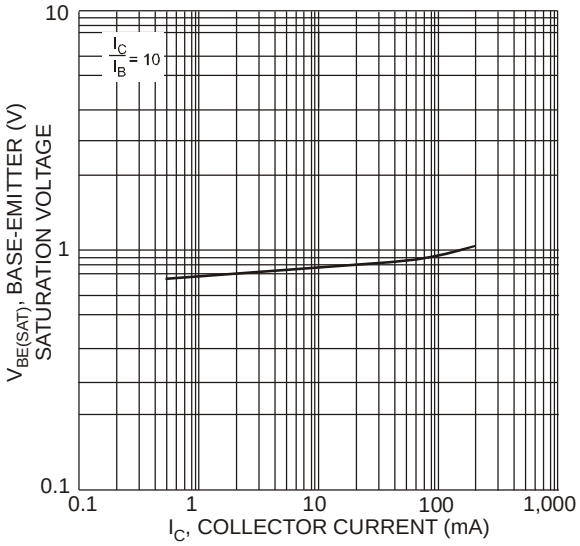
Derating Curve - Total

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

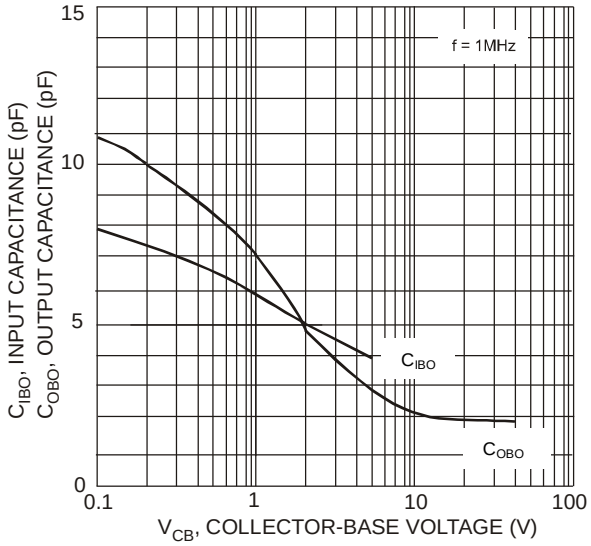
Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV_{CBO}	60	—	V	I_C = 100µA, I_E = 0
Collector-Emitter Breakdown Voltage (Note 7)	BV_{CEO}	40	—	V	I_C = 1mA, I_B = 0
Emitter-Base Breakdown Voltage	BV_{EBO}	6	—	V	I_E = 100µA, I_C = 0
Collector-Emitter Cut-Off Current	I_{CEV}	—	50	nA	V_{CE} = 30V, $V_{EB(OFF)}$ = 3V
Emitter-Base Cut-Off Current	I_{EBO}	—	50	nA	V_{EB} = 6V
ON CHARACTERISTICS (Note 7)					
DC Current Gain	h_{FE}	40 70 100 60 30	— — 300 — —	—	I_C = 100µA, V_{CE} = 1V I_C = 1mA, V_{CE} = 1V I_C = 10mA, V_{CE} = 1V I_C = 50mA, V_{CE} = 1V 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 = 1MHz, I_E = 0
Input Capacitance	C_{ibo}	—	8	pF	V_{EB} = 0.5V, f = 1MHz, I_C = 0
Input Impedance	h_{ie}	1	10	kΩ	V_{CE} = 10V, I_C = 1mA, f = 1kHz
Voltage Feedback Ratio	h_{re}	0.5	8.0	$\times 10^{-4}$	
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	—	5.0	dB	V_{CE} = 5V, I_C = 100µA, R_S = 1kΩ, f = 1kHz
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} = 3V, I_C = 10mA, I_{B1} = $-I_{B2}$ = 1mA
Fall Time	t_f	—	50	ns	

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

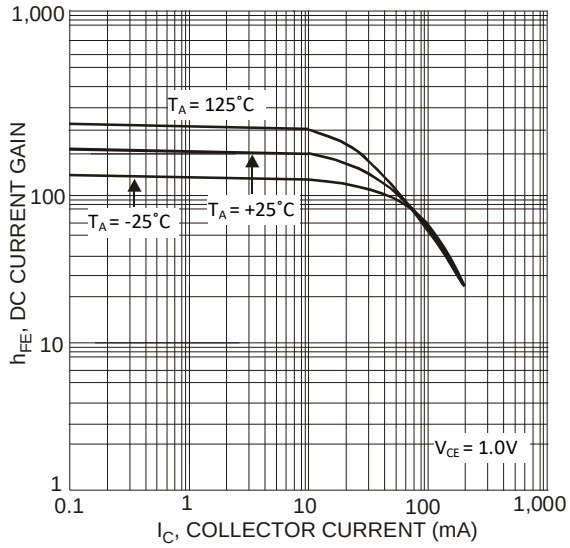
Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



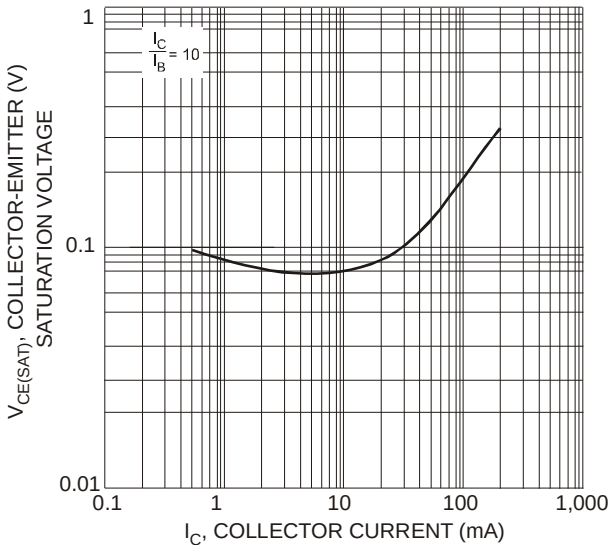
Typical Base-Emitter Saturation Voltage vs. Collector Current



Input and Output Capacitance vs. Collector-Base Voltage



Typical DC Current Gain vs. Collector Current

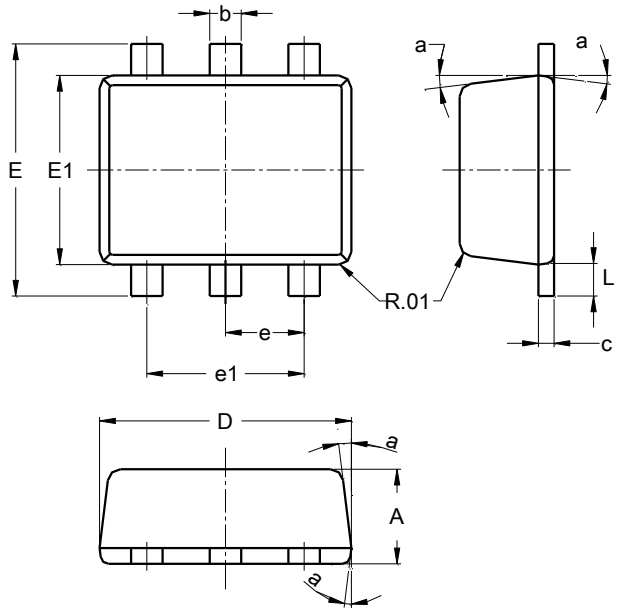


Typical Collector-Emitter Saturation Voltage vs. Collector Current

Package Outline Dimensions

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

SOT563

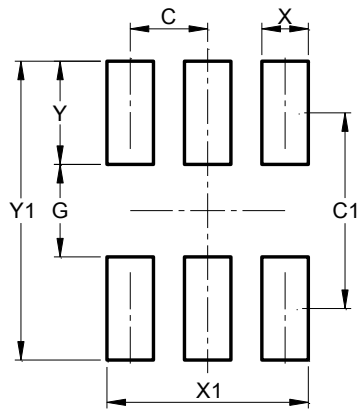


SOT563			
Dim	**Min**	**Max**	**Typ**
A	0.55	0.60	--
b	0.15	0.30	0.20
c	0.10	0.18	0.11
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	--	--	0.50
e1	0.90	1.10	1.00
L	0.10	0.30	0.20
a	8°	9°	7°
All Dimensions in mm			

Suggested Pad Layout

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

SOT563



Dimensions	Value (in mm)
C	0.500
C1	1.270
G	0.600
X	0.300
X1	1.300
Y	0.670
Y1	1.940

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