



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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## Features

- $BV_{ceo} > -60V$
- $I_C = -600mA$  Collector Current
- Ultra-Small Surface Mount Package
- Complementary NPN Type: NK-MMDT2222V

## Mechanical Data

- Case: SOT-563
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Plated Leads Solderable per MIL-STD-202, Method 208 
- Weight: 0.003 grams (Approximate)

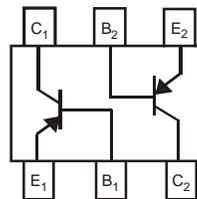
SOT-563



Top View



Bottom View



Device Schematic

### Absolute Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	-60	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-60	V
Emitter-Base Voltage	V <sub>EBO</sub>	-5	V
Collector Current	I <sub>C</sub>	-600	mA

### Thermal Characteristics

Total Power Dissipation (Note 5)	P <sub>D</sub>	150	mW
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	833	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-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 the device mounted on minimum recommended pad layout FR4 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 Characteristics and Derating Information

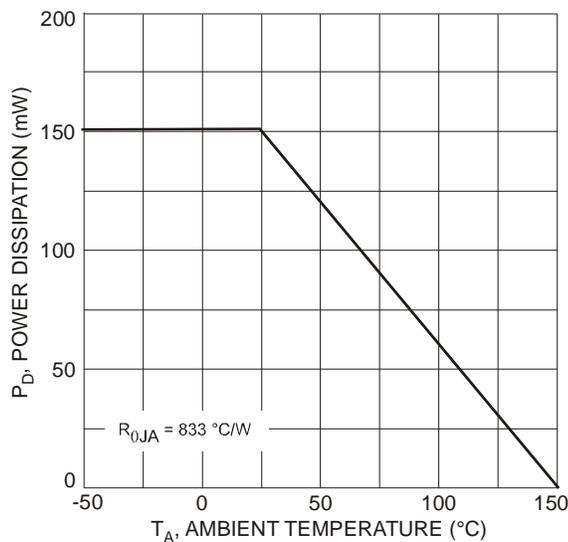


Fig. 1 Power Dissipation vs. Ambient Temperature (Note 3)

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

Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>					
Collector-Base Breakdown Voltage	$BV_{CBO}$	-60	—	V	$I_C = -10\mu\text{A}, I_E = 0$
Collector-Emitter Breakdown Voltage ( Note 7)	$BV_{CEO}$	-60	—	V	$I_C = -10\text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-5	—	V	$I_E = -10\mu\text{A}, I_C = 0$
Collector Cut-Off Current	$I_{CBO}$	—	-10	nA	$V_{CB} = -50\text{V}, I_E = 0$
Collector Cut-Off Current	$I_{CEX}$	—	-50	$\mu\text{A}$	$V_{CB} = -50\text{V}, I_E = 0, T_A = +125^\circ\text{C}$
Base Cut-Off Current	$I_{BL}$	—	-50	nA	$V_{CE} = -30\text{V}, V_{EB(OFF)} = -0.5\text{V}$
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( Note 7)	$h_{FE}$	75 100 100 100 50	— — — 300 —	—	$I_C = -100\mu\text{A}, V_{CE} = -10\text{V}$ $I_C = -1.0\text{mA}, V_{CE} = -10\text{V}$ $I_C = -10\text{mA}, V_{CE} = -10\text{V}$ $I_C = -150\text{mA}, V_{CE} = -10\text{V}$ $I_C = -500\text{mA}, V_{CE} = -10\text{V}$
Collector-Emitter Saturation Voltage ( Note 7)	$V_{CE(SAT)}$	—	-0.4 -1.6	V	$I_C = -150\text{mA}, I_B = -15\text{mA}$ $I_C = -500\text{mA}, I_B = -50\text{mA}$
Base-Emitter Saturation Voltage ( Note 7)	$V_{BE(SAT)}$	—	-1.3 -2.6	V	$I_C = -150\text{mA}, I_B = -15\text{mA}$ $I_C = -500\text{mA}, I_B = -50\text{mA}$
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	$C_{obo}$	—	8.0	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}, I_E = 0$
Input Capacitance	$C_{ibo}$	—	30	pF	$V_{EB} = -2\text{V}, f = 1\text{MHz}, I_C = 0$
Current Gain-Bandwidth Product	$f_T$	200	—	MHz	$V_{CE} = -20\text{V}, I_C = -50\text{mA}, f = 100\text{MHz}$
<b>SWITCHING CHARACTERISTICS</b>					
Turn-On Time	$t_{off}$	—	45	ns	$V_{CC} = -30\text{V}, I_C = -150\text{mA}, I_{B1} = -15\text{mA}$
Delay Time	$t_d$	—	10	ns	
Rise Time	$t_r$	—	40	ns	
Turn-Off Time	$t_{off}$	—	100	ns	$V_{CC} = -6\text{V}, I_C = -150\text{mA}, I_{B1} = I_{B2} = -15\text{mA}$
Storage Time	$t_s$	—	80	ns	
Fall Time	$t_f$	—	30	ns	

 Note: 7. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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

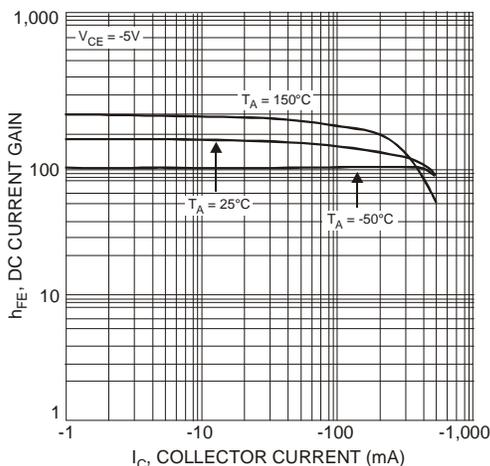


Fig. 2 Typical DC Current Gain vs. Collector Current

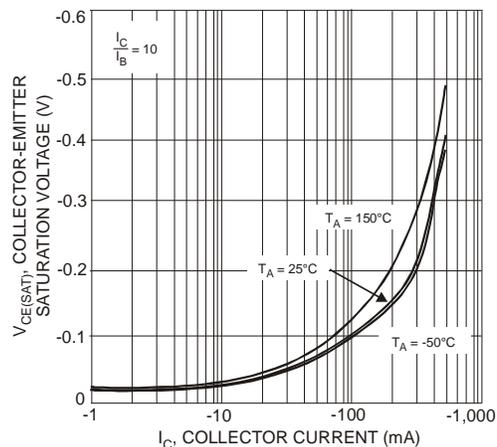


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

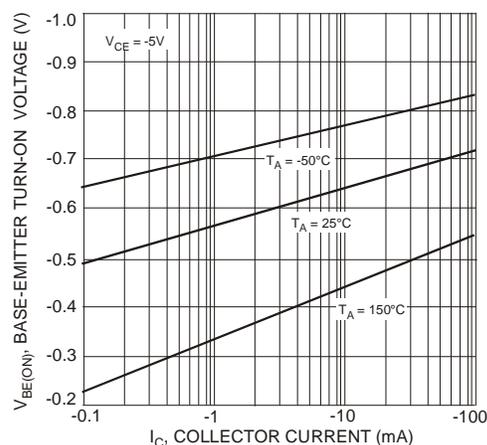


Fig. 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current

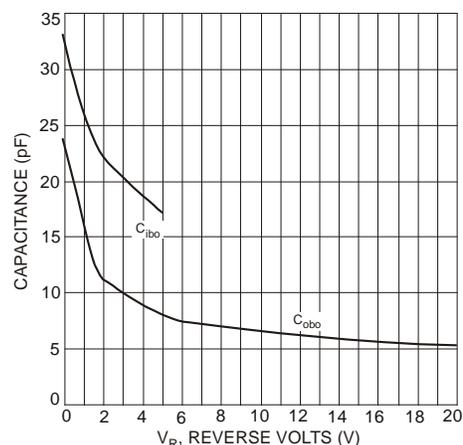


Fig. 5 Typical Capacitance Characteristics

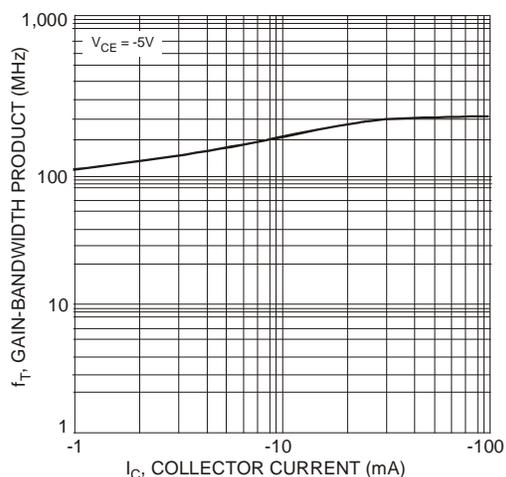


Fig. 6 Typical Gain-Bandwidth Product vs. Collector Current

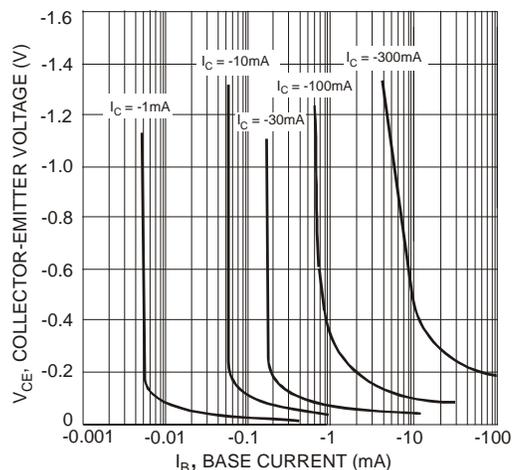
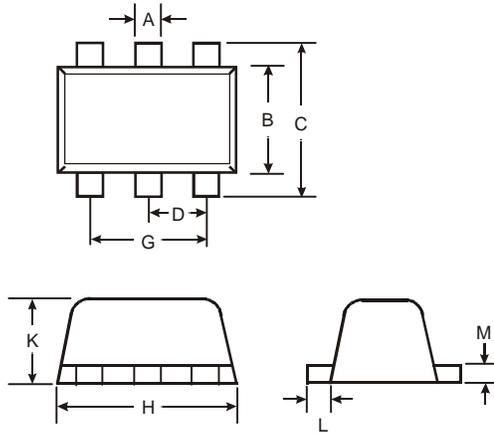


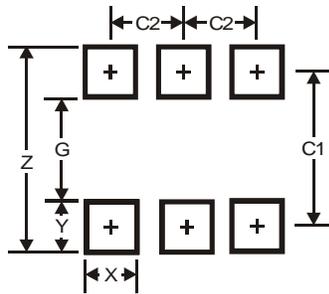
Fig. 7 Typical Collector Saturation Region

### Package Outline Dimensions



SOT- 563			
Dim	Min	Max	Typ
A	0.15	0.30	0.20
B	1.10	1.25	1.20
C	1.55	1.70	1.60
D	-	-	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
K	0.55	0.60	0.60
L	0.10	0.30	0.20
M	0.10	0.18	0.11
All Dimensions in mm			

### Suggested Pad Layout



Dimensions	Value (in mm)
Z	2.2
G	1.2
X	0.375
Y	0.5
C1	1.7
C2	0.5