

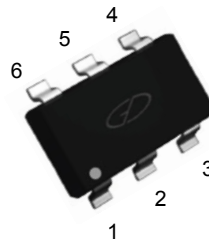
MMDT2227M NPN+PNP Transistor

Features

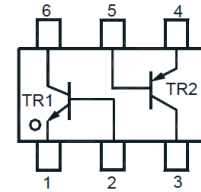
- Complementary pair

Applications

- Ideal for low power amplification and switching



SOT-23-6L



TR1: 1. Emitter 2. Base 6. Collector
TR2: 4. Emitter 5. Base 3. Collector

Schematic Diagram

NPN Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	75	V
Collector to Emitter Voltage	V_{CEO}	40	V
Emitter Base Voltage	V_{EBO}	6	V
Collector Current	I_C	600	mA

PNP Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector to Base Voltage	V_{CBO}	-60	V
Collector to Emitter Voltage	V_{CEO}	-60	V
Emitter Base Voltage	V_{EBO}	-5	V
Collector Current	I_C	-600	mA

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Total Power Dissipation	P_{tot}	350	mW
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^\circ\text{C}$
Thermal Resistance Junction to Ambient ¹	$R_{\theta JA}$	357	$^\circ\text{C/W}$

Notes:

- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

NPN Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Max	Unit
DC Current Gain	h_{FE}	$V_{CE}=10\text{V}, I_C=0.1\text{mA}$	35	-	-
		$V_{CE}=10\text{V}, I_C=1.0\text{mA}$	50	-	-
		$V_{CE}=10\text{V}, I_C=10\text{mA}$	75	-	-
		$V_{CE}=1\text{V}, I_C=150\text{mA}$	50	-	-
		$V_{CE}=10\text{V}, I_C=150\text{mA}$	100	300	-
		$V_{CE}=10\text{V}, I_C=500\text{mA}$	40	-	-
Collector Base Cut-Off Current	I_{CBO}	$V_{CB}=60\text{V}$	-	10	nA
Emitter Base Cut-Off Current	I_{EBO}	$V_{EB}=3.0\text{V}$	-	100	nA
Collector Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=10\mu\text{A}$	75	-	V
Collector Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=10\text{mA}$	40	-	V
Emitter Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=10\mu\text{A}$	6	-	V
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=150\text{mA}, I_B=15\text{mA}$	-	0.3	V
		$I_C=500\text{mA}, I_B=50\text{mA}$	-	1.0	V
Base Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C=150\text{mA}, I_B=15\text{mA}$	0.6	1.2	V
		$I_C=500\text{mA}, I_B=50\text{mA}$	-	2.0	V
Transition Frequency	f_T	$V_{CE}=20\text{V}, I_E=-20\text{mA}, F=100\text{MHz}$	300	-	MHz
Collector Output Capacitance	C_{ob}	$V_{CB}=10\text{V}, F=100\text{KHz}$	-	8	pF
Delay Time	t_d	$V_{CC}=30\text{V}, V_{BE(OFF)}=0.5\text{V}$ $I_C=150\text{mA}, I_{B1}=15\text{mA}$	-	10	nS
Rise Time	t_r		-	25	nS
Storage Time	t_{stg}	$V_{CC}=30\text{V}, I_C=150\text{mA},$ $I_{B1}=-I_{B2}=15\text{mA}$	-	225	nS
Fall Time	t_f		-	60	nS

PNP Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Max	Unit
DC Current Gain	h_{FE}	$V_{CE}=-10\text{V}, I_C=-0.1\text{mA}$	75	-	-
		$V_{CE}=-10\text{V}, I_C=-1.0\text{mA}$	100	-	-
		$V_{CE}=-10\text{V}, I_C=-10\text{mA}$	100	-	-
		$V_{CE}=-10\text{V}, I_C=-150\text{mA}$	100	300	-
		$V_{CE}=-10\text{V}, I_C=-500\text{mA}$	50	-	-
Collector Base Cut Off Current	I_{CBO}	$V_{CB}=-50\text{V}$	-	-10	nA
Collector Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=-10\mu\text{A}$	-60	-	V
Collector Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=-10\text{mA}$	-60	-	V
Emitter Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=-10\mu\text{A}$	-5	-	V
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=-150\text{mA}, I_B=-15\text{mA}$	-	-0.4	V
		$I_C=-500\text{mA}, I_B=-50\text{mA}$	-	-1.6	V
Base Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C=-150\text{mA}, I_B=-15\text{mA}$	-	-1.3	V
		$I_C=-500\text{mA}, I_B=-50\text{mA}$	-	-2.6	V
Gain Bandwidth Product	f_T	$V_{CE}=-20\text{V}, I_C=-50\text{mA}, F=100\text{MHz}$	200	-	MHz
Collector Output Capacitance	C_{ob}	$V_{CB}=-10\text{V}, F=1.0\text{MHz}$	-	8	pF
Turn-on Time	t_{on}	$V_{CC}=-30\text{V}, I_C=-150\text{mA}, I_{B1}=-15\text{mA}$	-	45	nS
Delay Time	t_d		-	10	nS
Rise Time	t_r		-	40	nS
Turn-off Time	t_{off}	$V_{CC}=-6\text{V}, I_C=-150\text{mA}, I_{B1}=I_{B2}=-15\text{mA}$	-	100	nS
Storage Time	t_{stg}		-	80	nS
Fall Time	t_f		-	30	nS

PNP Typical Characteristic Curves ($T_A=25^\circ\text{C}$ unless otherwise specified)

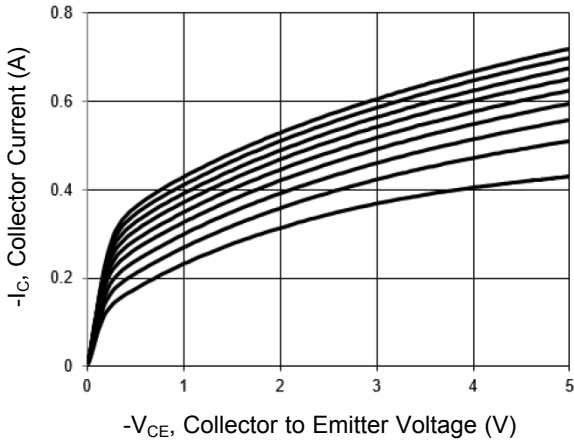


Figure 1. Output Characteristics Curve

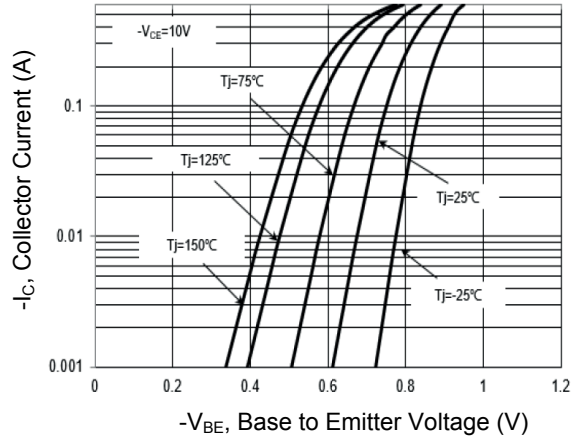


Figure 2. Collector Current Vs. Base to Emitter Voltage

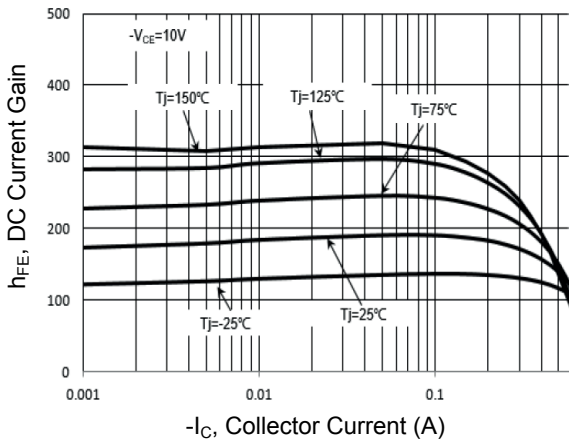


Figure 3. DC Current Gain Vs. Collector Current

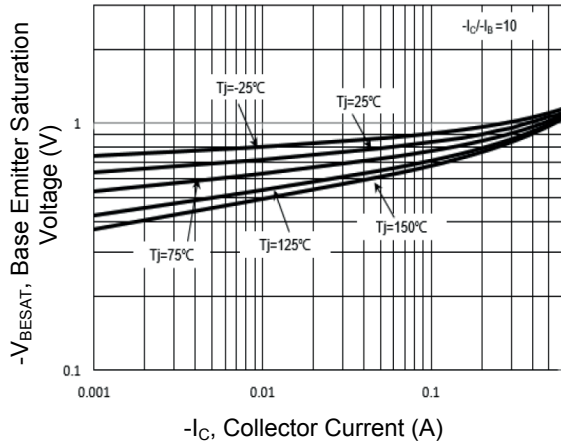


Figure 4. V_{BESAT} Vs. Collector Current

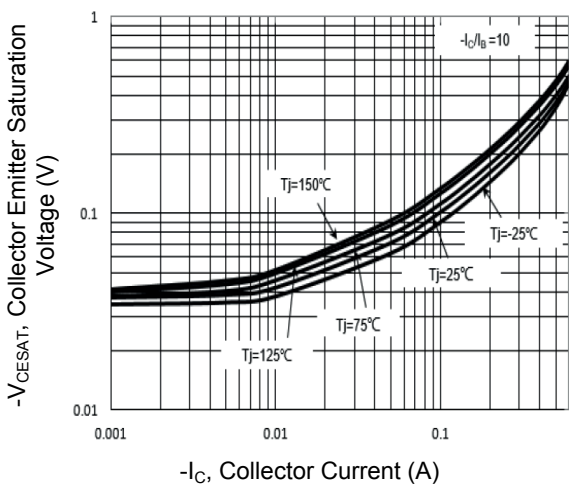


Figure 5. V_{CESAT} Vs. Collector Current

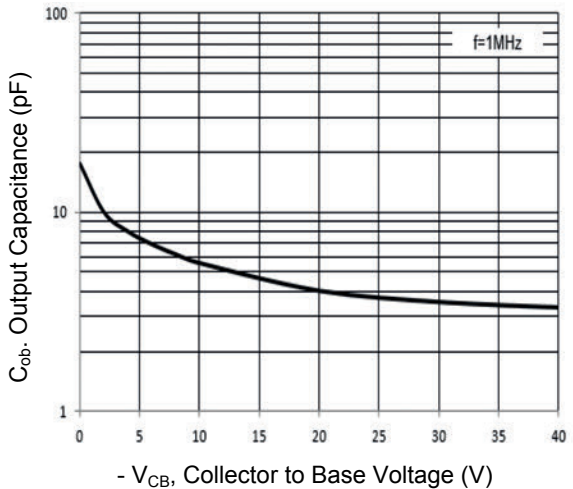
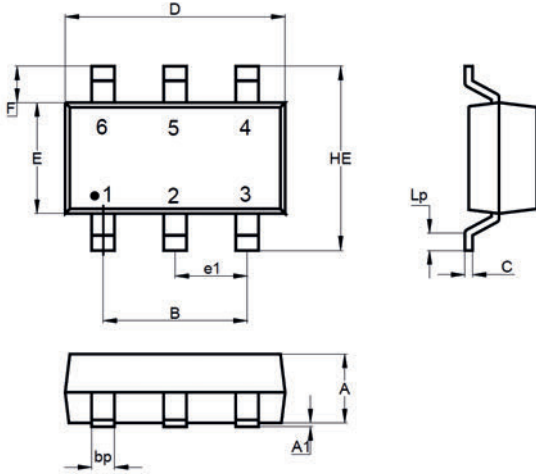


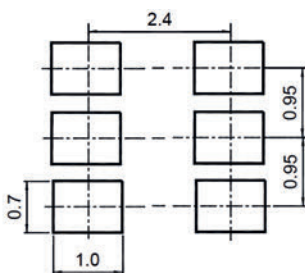
Figure 6. Output Capacitance

Package Outline Dimensions (SOT-23-6L)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.00	1.20	0.039	0.047
A1	0.00	0.10	0.000	0.004
B	1.70	2.10	0.067	0.083
C	0.08	0.20	0.003	0.008
D	2.70	3.10	0.106	0.122
E	1.30	1.70	0.051	0.067
e1	0.95 typ		0.037 typ	
F	0.60	0.65	0.024	0.026
HE	2.60	3.00	0.102	0.118
Lp	0.20	0.60	0.008	0.024
bp	0.30	0.50	0.012	0.020

Recommended Pad Layout



Unit: mm

Order Information

Device	Package	Marking	Quantity	HSF Status
MMDT2227M	SOT-23-6L	WK	3,000pcs / Reel	RoHS Compliant