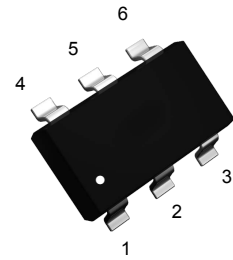


MMBT2227A NPN+PNP Transistor

Features

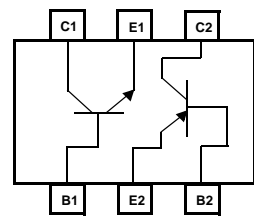
- Complementary pair
- One 2222A-Type NPN
- One 2907A-Type PNP



SOT-23-6L

Applications

- Power amplification and switching



Schematic Diagram

Absolute Maximum Ratings

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

Parameter	Symbol	Rating	Unit
Total Power Dissipation	P_d	200	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	625	$^\circ\text{C/W}$
Operating and Storage and Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

NPN Absolute Maximum Ratings

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

Parameter	Symbol	Rating	Unit
Collector to Base Voltage	V_{CBO}	75	V
Collector to Emitter Voltage	V_{CEO}	40	V
Emitter to Base Voltage	V_{EBO}	6.0	V
Collector Current	I_C	600	mA

PNP Absolute Maximum Ratings

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

Parameter	Symbol	Rating	Unit
Collector to Base Voltage	V_{CBO}	-60	V
Collector to Emitter Voltage	V_{CEO}	-60	V
Emitter to Base Voltage	V_{EBO}	-5.0	V
Collector Current	I_C	-600	mA

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector–Base Breakdown Voltage	V_{CBO}	$I_C = 10\mu\text{A}$ $I_E = 0$	75	-	-	V
Collector–Emitter Breakdown Voltage	V_{CEO}	$I_C = 10\text{mA}$ $I_B = 0$	40	-	-	V
Emitter–Base Breakdown Voltage	V_{EBO}	$I_E = 10\mu\text{A}$ $I_C = 0$	6.0	-	-	V
Collector Cut-Off Current	I_{CEX}	$V_{CE}=60\text{V}$ $V_{EB(off)}=3\text{V}$	-	-	10	nA
Collector Cut-Off Current	I_{CBO}	$V_{CB}=60\text{V}$ $I_E=0$	-	-	0.01	μA
		$V_{CB}=60\text{V}$ $I_E=0$ $T_A=125^\circ\text{C}$	-	-	10	μA
Emitter Cut-Off Current	I_{EBO}	$V_{EB}=3.0\text{V}$ $I_C=0$	-	-	10	nA
Base Cut-Off Current	I_{BL}	$V_{CE}=60\text{V}$ $V_{EB(off)}=3\text{V}$	-	-	20	nA
DC Current Gain	$h_{FE(1)}$	$V_{CE}=10\text{V}$ $I_C=0.1\text{mA}$	35	-	-	
	$h_{FE(2)}$	$V_{CE}=10\text{V}$ $I_C=1.0\text{mA}$	50	-	-	
	$h_{FE(3)}$	$V_{CE}=10\text{V}$ $I_C=10\text{mA}$	75	-	-	
	$h_{FE(4)}$	$V_{CE}=10\text{V}$ $I_C=10\text{mA}$ $T_A=-55^\circ\text{C}$	50	-	-	
	$h_{FE(5)}$	$V_{CE}=10\text{V}$ $I_C=150\text{mA}$	100	-	300	
	$h_{FE(6)}$	$V_{CE}=1.0\text{V}$ $I_C=150\text{mA}$	35	-	-	
	$h_{FE(7)}$	$V_{CE}=10\text{V}$ $I_C=500\text{mA}$	40	-	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat) (1)}$	$I_C=150\text{mA}$ $I_B=15\text{mA}$	-	-	0.3	V
	$V_{CE(sat) (2)}$	$I_C=500\text{mA}$ $I_B=50\text{mA}$	-	-	1.0	V
Base-Emitter Saturation Voltage	$V_{BE(sat) (1)}$	$I_C=150\text{mA}$ $I_B=15\text{mA}$	0.6	-	1.2	V
	$V_{BE(sat) (2)}$	$I_C=500\text{mA}$ $I_B=50\text{mA}$	-	-	2.0	V
Transition Frequency(Note 3)	f_T	$V_{CE}=20\text{V}$ $I_C=20\text{mA}$ $f=100\text{MHz}$	300	-	-	MHz
Output Capacitance	C_{obo}	$V_{CB}=10\text{V}$ $I_E=0$ $f=1.0\text{MHz}$	-	-	8.0	pF
Input Capacitance	C_{ibo}	$V_{EB}=0.5\text{V}$ $I_C=0$ $f=1.0\text{MHz}$	-	-	25	
Noise Figure	NF	$I_C=100\mu\text{A}$ $V_{CE}=10\text{V}$ $R_S=1.0\text{k}\Omega$ $f=1.0\text{kHz}$	-	-	4.0	dB
Turn-on Time	t_d	$V_{CC}=30\text{V}$ $I_C=150\text{mA}$ $V_{BE(OFF)}=-0.5\text{V}$	-	-	10	nS
Rise Time	t_r	$I_{B1}=15\text{mA}$	-	-	25	nS
Storage Time	t_s	$V_{CC}=30\text{V}$ $I_C=150\text{mA}$	-	-	225	nS
Fall Time	t_f	$I_{B1}=I_{B2}=15\text{mA}$	-	-	60	nS

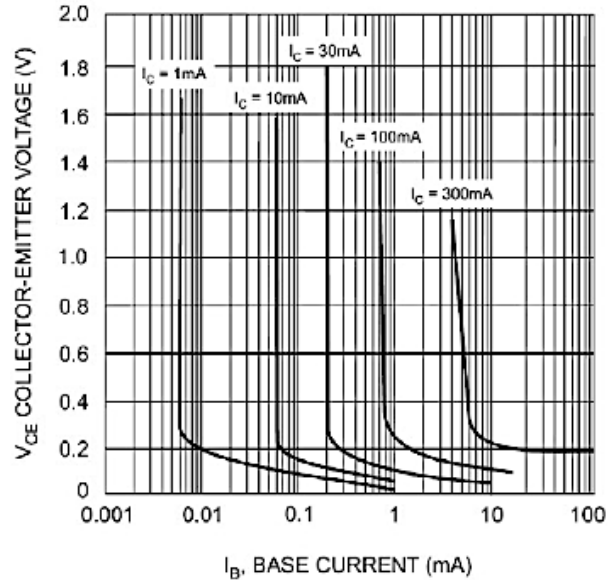
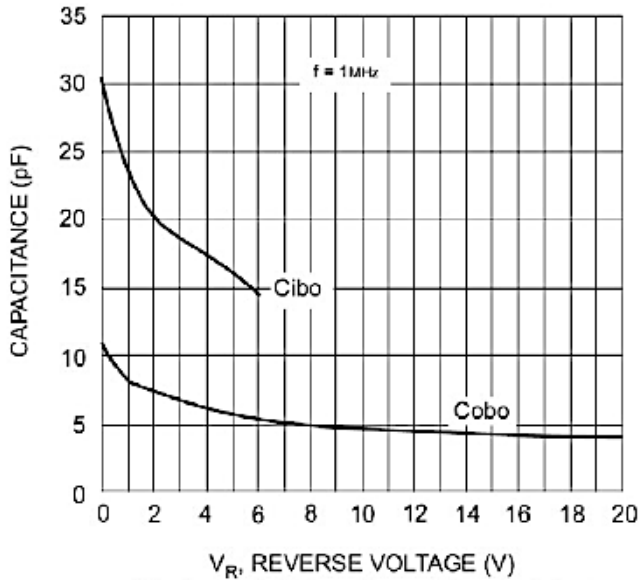
PNP Electrical Characteristics ($T_A=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector to Base Breakdown Voltage	V_{CBO}	$I_C=-10\mu\text{A}$ $I_E=0$	-60	-	-	V
Collector to Emitter Breakdown Voltage	V_{CEO}	$I_C=-10\text{mA}$ $I_B=0$	-60	-	-	V
Emitter to Base Breakdown Voltage	V_{EBO}	$I_E=-10\mu\text{A}$ $I_C=0$	-5.0	-	-	V
Collector Cut-Off Current	I_{CBO}	$V_{CB}=-50\text{V}$ $I_E=0$	-	-	-0.01	μA
	I_{CBO}	$V_{CB}=-50\text{V}$ $I_E=0$ $T_A=125^\circ\text{C}$	-	-	10	μA
Collector Cutoff Current	I_{CEX}	$V_{CE} = -30\text{V}$, $V_{EB(OFF)} = -0.5\text{V}$	-	-	-50	nA
Base Cutoff Current	I_{BL}	$V_{CE} = -30\text{V}$, $V_{EB(OFF)} = -0.5\text{V}$	-	-	-50	nA
DC Current Gain	$h_{FE(1)}$	$V_{CE}=-10\text{V}$ $I_C=-150\text{mA}^*$	100	-	300	
	$h_{FE(2)}$	$V_{CE}=-10\text{V}$ $I_C=-500\text{mA}^*$	50	-	-	
	$h_{FE(3)}$	$V_{CE}=-10\text{V}$ $I_C=-10\text{mA}$	100	-	-	
	$h_{FE(4)}$	$V_{CE}=-10\text{V}$ $I_C=-1.0\text{mA}$	100	-	-	
	$h_{FE(5)}$	$V_{CE}=-10\text{V}$ $I_C=-0.1\text{mA}$	75	-	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat) (1)}$	$I_C=-150\text{mA}$ $I_B=-15\text{mA}$	-	-	-0.4	V
	$V_{CE(sat) (2)}$	$I_C=-500\text{mA}$ $I_B=-50\text{mA}$	-	-	-1.6	V
Base-Emitter Saturation Voltage	$V_{BE(sat) (1)}$	$I_C=-150\text{mA}$ $I_B=-15\text{mA}$	-	-	-1.3	V
	$V_{BE(sat) (2)}$	$I_C=-500\text{mA}$ $I_B=-50\text{mA}$	-	-	-2.6	V
Transition Frequency	f_T	$V_{CE}=-20\text{V}$ $I_C=-50\text{mA}$ $f=100\text{MHz}$	200	-	-	MHz
Output Capacitance	C_{obo}	$V_{CB}=-10\text{V}$ $I_E=0$ $f=1.0\text{MHz}$	-	-	8.0	pF
Input Capacitance	C_{ibo}	$V_{EB}=-2\text{V}$ $I_C=0$ $f=1.0\text{MHz}$	-	-	30	
Turn-On Time	t_{on}		-	-	45	nS
Delay Time	t_d	$V_{CC}=-30\text{V}$ $I_C=-150\text{mA}$	-	-	10	
Rise Time	t_r	$I_{B1}=-15\text{mA}$	-	-	40	
Storage Time	t_s	$V_{CC}=-6\text{V}$ $I_C=-150\text{mA}$	-	-	80	
Fall Time	t_f	$I_{B1}=I_{B1}=-15\text{mA}$	-	-	30	
Turn-Off Time	t_{off}		-	-	100	nS

*Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$

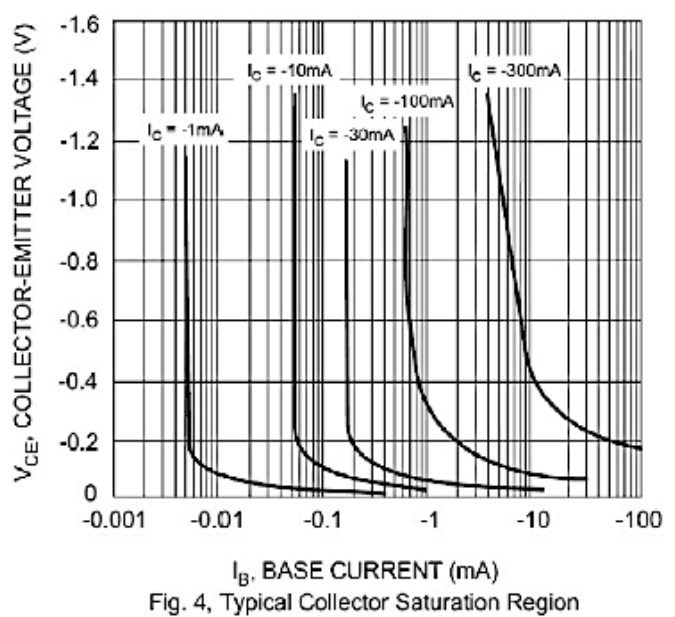
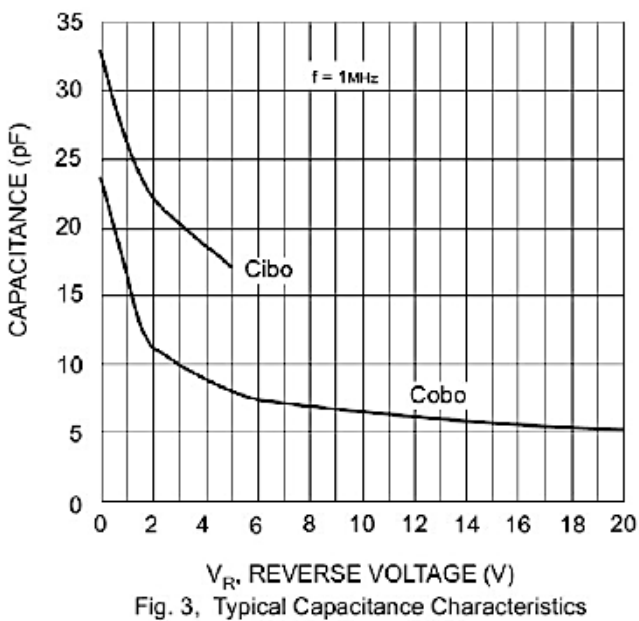
NPN Typical Characteristic Curves

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

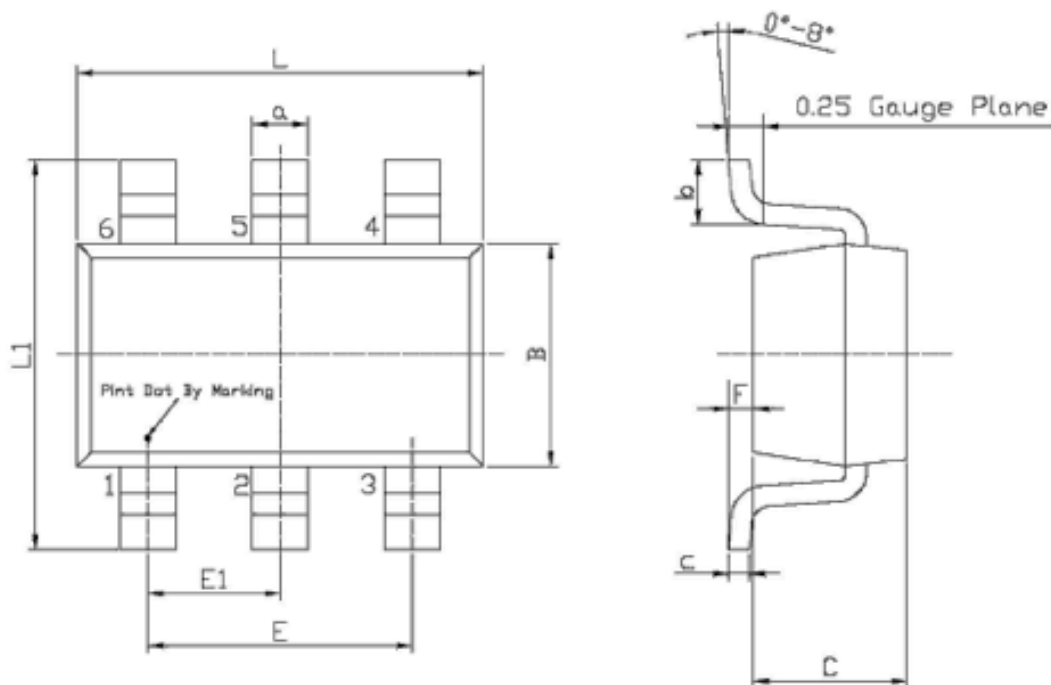


PNP Typical Characteristic Curves,

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



Package Outline Dimensions SOT-23-6L



Unit: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
L	2.82	3.02	E1	0.65	1.05
B	1.50	1.70	a	0.35	0.50
C	0.90	1.30	c	0.10	0.20
L1	2.60	3.00	b	0.35	0.55
E	1.80	2.00	F	a	0.15

Marking and Ordering Information

Device	Package	Marking	Quantity	HSF Status
MMBT2227A	SOT-23-6L	H27	3000pcs / Reel	RoHS Compliant