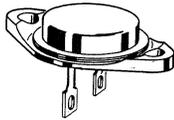


2N2357 thru 2N2359 (Germanium)



CASE 161
(TO-41)

Collector Connected to Case

PNP Germanium power transistors designed for very high-current switching applications requiring low saturation voltages, fast switching times and good safe operating area.

MAXIMUM RATINGS

Rating	Symbol	2N2357	2N2358	2N2359	Unit
Collector-Emitter Voltage	V_{CEO}	30	60	80	Vdc
Collector-Base Voltage	V_{CB}	60	100	120	Vdc
Emitter-Base Voltage	V_{EB}	←	2.5	→	Vdc
Collector Current - Continuous	I_C	←	50	→	Adc
Base Current - Continuous	I_B	←	10	→	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	←	170 2.0	→	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	←	-65 to +110	→	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	0.5	$^\circ\text{C/W}$

FIGURE 1 – SUSTAINING VOLTAGE TEST CIRCUIT

$R_1 = 1.0 \text{ Ohm, } 20 \text{ Watts}$
 $R_2 = 10 \text{ Ohms, } 2.0 \text{ Watts}$
 $R_3 = 0.1 \text{ Ohm, } 1.0\%$
 $R_4 = 0.04 \text{ Ohm}$

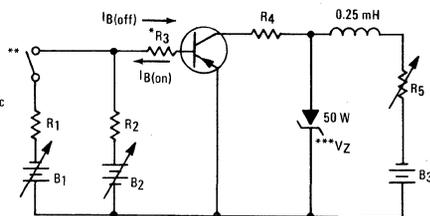
$R_5: I_C \text{ Adjust @ } V_{CE} = V_Z$
 $B_1: \text{ Adjust for } I_B(\text{on}) = \frac{I_C}{10}$
 $B_2 = 2.0 \text{ Vdc, Adjust for } I_B(\text{off}) = 0.2 \text{ Adc}$
 $B_3 = 12 \text{ Vdc}$

**Not required if current probe is used to read I_B

**PRF $\approx 60 \text{ Hz}$

***Zener selected to establish Sustaining Voltage.

NOTE: Series impedance and inductance must be kept to a minimum.



2N2357 thru 2N2359 (continued)

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage ($I_C = 100 \text{ mAdc}$, $I_B = 0$)	$2N2357$ $2N2358$ $2N2359$	V_{CEO}	30 60 80	- - -	- - -	Vdc
Collector-Emitter Sustaining Voltage (See Figure 1) ($I_C = 50 \text{ Adc}$)	$2N2357$ $2N2358$ $2N2359$	$V_{CE(sus)}$	35 40 45	- - -	- - -	Vdc
Collector -Emitter Cutoff Current ($V_{CE} = 60 \text{ Vdc}$, $V_{BE} = 0$) ($V_{CE} = 100 \text{ Vdc}$, $V_{BE} = 0$) ($V_{CE} = 120 \text{ Vdc}$, $V_{BE} = 0$)	$2N2357$ $2N2358$ $2N2359$	I_{CES}	- - -	- - -	50 50 50	mAdc
Collector Cutoff Current ($V_{CB} = 2.0 \text{ Vdc}$, $I_E = 0$)		I_{CBO}	-	-	200	μAdc
Collector-Emitter Cutoff Current ($V_{CE} = 40 \text{ Vdc}$, $V_{BE(off)} = 0.2 \text{ Vdc}$) ($V_{CE} = 80 \text{ Vdc}$, $V_{BE(off)} = 0.2 \text{ Vdc}$) ($V_{CE} = 100 \text{ Vdc}$, $V_{BE(off)} = 0.2 \text{ Vdc}$)	$2N2357$ $2N2358$ $2N2359$	I_{CEX}	- - -	- - -	5.0 5.0 5.0	mAdc
($V_{CE} = 40 \text{ Vdc}$, $V_{BE(off)} = 0.2 \text{ Vdc}$, $T_C = 100^\circ\text{C}$) (+0, -3.0 $^\circ\text{C}$)	$2N2357$		-	-	35	
($V_{CE} = 80 \text{ Vdc}$, $V_{BE(off)} = 0.2 \text{ Vdc}$, $T_C = 100^\circ\text{C}$) (+0, -3.0 $^\circ\text{C}$)	$2N2358$		-	-	35	
($V_{CE} = 100 \text{ Vdc}$, $V_{BE(off)} = 0.2 \text{ Vdc}$, $T_C = 100^\circ\text{C}$) (+0, -3.0 $^\circ\text{C}$)	$2N2359$		-	-	35	
Emitter Cutoff Current ($V_{EB} = 2.5 \text{ Vdc}$, $I_C = 0$)		I_{EBO}	-	-	50	mAdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 20 \text{ Adc}$, $V_{CE} = 1.5 \text{ Vdc}$) ($I_C = 50 \text{ Adc}$, $V_{CE} = 1.5 \text{ Vdc}$)	h_{FE}	30 15	- -	90 -	-
Collector-Emitter Saturation Voltage ($I_C = 50 \text{ Adc}$, $I_B = 5.0 \text{ Adc}$)	$V_{CE(sat)}$	-	-	0.5	Vdc
Base-Emitter Saturation Voltage ($I_C = 50 \text{ Adc}$, $I_B = 5.0 \text{ Adc}$)	$V_{BE(sat)}$	-	-	0.9	Vdc

SMALL-SIGNAL CHARACTERISTICS

Small-Signal Current Gain ($I_C = 0.5 \text{ Adc}$, $V_{CE} = 6.0 \text{ Vdc}$, $f = 30 \text{ kHz}$)	h_{fe}	20	-	-	-
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SWITCHING CHARACTERISTICS

Rise Time	$V_{CC} = -28 \text{ Vdc}$, $I_C = 50 \text{ Adc}$, $I_{B1} = 5.0 \text{ Adc}$, $I_{B2} = 3.0 \text{ Adc}$ (See Figure 3)	t_r	-	12	-	μs
Storage Time		t_s	-	5.0	-	μs
Fall Time		t_f	-	6.0	-	μs

FIGURE 2 – SWITCHING TIMES

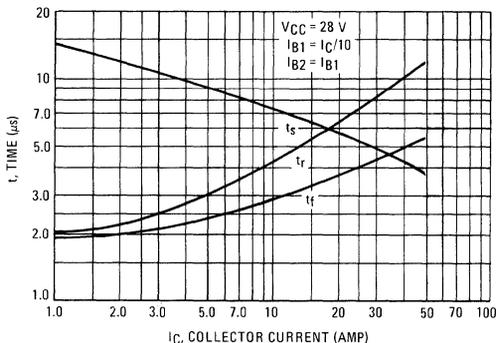


FIGURE 3 – SWITCHING TIME TEST CIRCUIT

