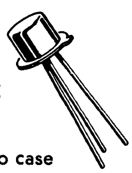
2N960 SERIES (continued)

ELECTRICAL CHARACTERISTICS (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1 MHz)	C_{ob}	-	2.2	4.0	pF
Emitter Transition Capacitance (V_{EB} = 1 Vdc)	C_{Te}	-	2.0	3.5	pF
Turn-On Time — All Types	t_{on}				ns
(I_C = 10 mAdc, I_{B1} = 5 mAdc, $V_{BE(off)}$ = 1.25 Vdc)		-	35	50	
(I_C = 100 mAdc, I_{B1} = 5 mAdc, $V_{BE(off)}$ = 1.25 Vdc)		-	30	50	
Turn-Off Time	t_{off}				ns
(I_C = 10 mAdc, I_{B1} = 1 mAdc, I_{B2} = 0.25 mAdc)					
2N960, 2N961, 2N964, 2N965		-	60	85	
2N962, 2N966		-	80	100	
(I_C = 100 mAdc, I_{B1} = 5 mAdc, I_{B2} = 1.25 mAdc)					
2N960, 2N961, 2N964, 2N965		-	50	85	
2N962, 2N966		-	60	100	
Rise Time Constant	τ_{RE}	-	0.6	-	ns
Hole Storage Factor	K'_s	-	16	-	ns
Fall Time Constant	τ_{FE}	-	0.5	-	ns
Total Control Charge	Q_T				pC
(I_C = 10 mAdc, I_B = 1 mAdc) 2N960, 2N961, 2N964, 2N965		-	50	80	
2N962, 2N966		-	60	90	
(I_C = 100 mAdc, I_B = 5 mAdc) 2N960, 2N961, 2N964, 2N965		-	80	125	
2N962, 2N966		-	100	150	

2N963 (GERMANIUM)
2N967



CASE 22
(TO-18)
Collector connected to case

PNP germanium epitaxial mesa transistors for high-speed switching applications.

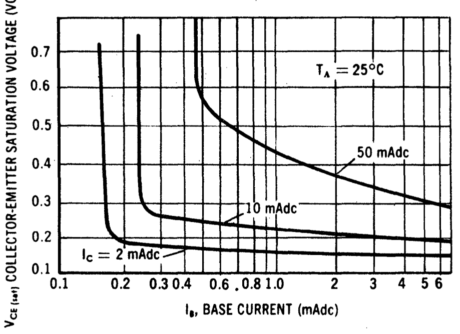
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	12	Vdc
Collector-Base Voltage	V_{CB}	12	Vdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	150 2.0	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	300 4.0	mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	100	°C

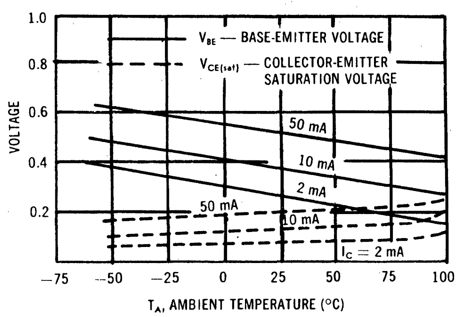
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	BV_{CBO}	12	-	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	BV_{EBO}	2.0	-	Vdc
Collector-Latch-up Voltage (V_{CC} = 10 Vdc)	LV_{CEX}	10	-	Vdc
Collector Cutoff Current (V_{CE} = 12 Vdc, V_{BE} = 0)	I_{CES}	-	100	μAdc
Collector Cutoff Current (V_{CE} = 10 Vdc, V_{BE} = 0.3 Vdc, T_A = 55°C)	I_{CEX}	-	20	μAdc
Collector Cutoff Current (V_{CB} = 6 Vdc, I_E = 0)	I_{CBO}	-	5.0	μAdc
Emitter Cutoff Current (V_{BE} = 5 Vdc, I_C = 0)	I_{EBO}	-	1.0	mAdc
Base Cutoff Current (V_{CE} = 10 Vdc, V_{BE} = 0.3 Vdc, T_A = 55°C)	I_{BL}	-	20	μAdc
DC Current Gain (I_C = 10 mAdc, V_{CE} = 0.3 Vdc) 2N963 / 2N967	h_{FE}	20 / 40	- / -	-
Collector Saturation Voltage (I_C = 10 mAdc, I_B = 1 mAdc	$V_{CE(sat)}$	-	0.2	Vdc
Base-Emitter Saturation Voltage (I_C = 10 mAdc, I_B = 1 mAdc)	$V_{BE(sat)}$	0.3	0.5	Vdc
Current-Gain — Bandwidth Product (I_C = 20 mAdc, V_{CE} = 1 Vdc, f = 100 MHz)	f_T	300	-	MHz
Output Capacitance (V_{CB} = 5 Vdc, I_E = 0, f = 1 MHz)	C_{ob}	-	5.0	pF
Input Capacitance (V_{BE} = 1 Vdc, I_C = 0, f = 100 kHz)	C_{ib}	-	4.0	pF
Turn-On Time (I_C = 10 mAdc, I_{B1} = 1 mAdc, $V_{BE(off)}$ = 1.25 Vdc)	t_{on}	-	60	ns
Turn-Off Time (I_C = 10 mAdc, I_{B1} = 1 mAdc, I_{B2} = 1.25 mAdc)	t_{off}	-	120	ns
Total Control Charge (I_C = 10 mAdc, I_B = 1 mAdc)	Q_T	-	120	pC

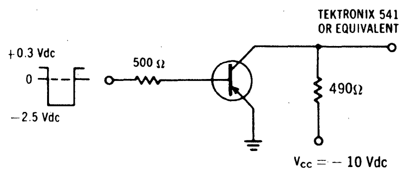
COLLECTOR-EMITTER SATURATION VOLTAGE versus BASE CURRENT



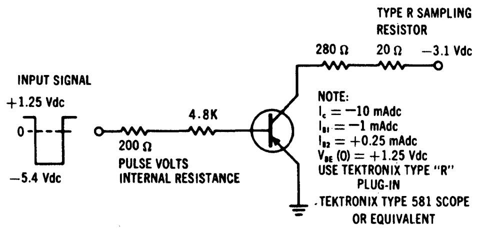
VOLTAGE versus TEMPERATURE CHARACTERISTICS



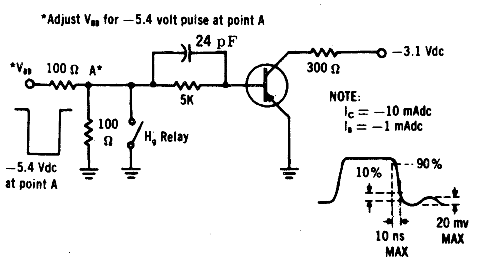
COLLECTOR LATCH-UP VOLTAGE TEST CIRCUIT



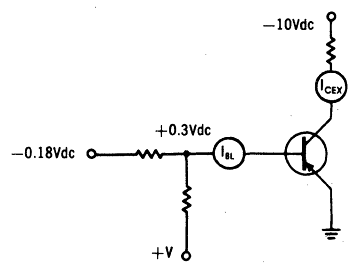
10-mA (I_C) SWITCHING TIME TEST CIRCUIT



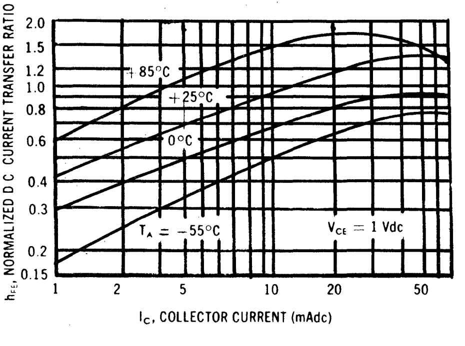
BASE AND COLLECTOR CUTOFF CURRENT TEST CIRCUIT



10-mA (I_C) TOTAL CONTROL CHARGE TEST CIRCUIT



NORMALIZED DC CURRENT TRANSFER RATIO versus COLLECTOR CURRENT



CURRENT GAIN-BANDWIDTH PRODUCT (f_T) versus COLLECTOR CURRENT