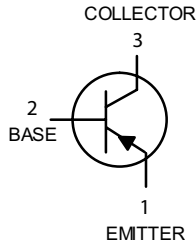
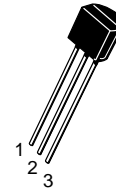


RoHS Compliant Product

A suffix of "-C" specifies halogen & lead-free



TO-92



● **FEATURES**

- . Epitaxial Planar Die Construction
- . Complementary NPN Type Available (MPS2222A)
- . Ideal for Medium Power Amplification and Switching

● **MAXIMUM RATINGS**

RATING	SYMBOL	VALUE	UNIT
Collector - Emitter Voltage	V_{CEO}	-60	V
Collector - Base Voltage	V_{CBO}	-60	V
Emitter - Base Voltage	V_{EBO}	-5.0	V
Collector Current - Continuous	I_C	-600	mA
Total Device Dissipation @ $T_A = 25^\circ\text{C}$	P_D	625	mW
Derate Above 25°C		5.0	mW / $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$	P_D	1.5	Watts
Derate Above 25°C		12	mW / $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 ~ +150	$^\circ\text{C}$

● **THERMAL CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	$^\circ\text{C} / \text{W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	$^\circ\text{C} / \text{W}$

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

CHARACTERISTIC	SYMBOL	Min.	Max.	UNIT
OFF CHARACTERISTICS				
Collector - Emitter Breakdown Voltage ⁽¹⁾ ($I_C = -10\text{ mA}, I_B = 0$)	$V_{(BR)CEO}$	-40	-	V
Collector - Base Breakdown Voltage ($I_C = -10\text{ }\mu\text{A}, I_E = 0$)	$V_{(BR)CBO}$	-60	-	V
Emitter - Base Breakdown Voltage ($I_E = -10\text{ }\mu\text{A}, I_C = 0$)	$V_{(BR)EBO}$	-5.0	-	V
Collector Cut-off Current ($V_{CE} = -50\text{ V}, V_{EB(OFF)} = -0.5\text{ V}$)	I_{CEX}	-	-50	nA
Collector Cut-off Current ($V_{CB} = -50\text{ V}, I_E = 0$)	I_{CBO}	-	-0.10	μA
($V_{CB} = -50\text{ V}, I_E = 0, T_A = 150^\circ\text{C}$)		-	-15	
Emitter Cut-off Current ($V_{EB} = -3.0\text{ V}, I_C = 0$)	I_{EBO}	-	-100	nA
Collector Cut-off Current ($V_{CE} = -35\text{ V}$)	I_{CEO}	-	-100	nA
Base Cut-off Current ($V_{CE} = -30\text{ V}, V_{EB(OFF)} = -0.5\text{ V}$)	I_{BEX}	-	-50	nA

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

● **ELECTRICAL CHARACTERISTICS** ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) (Continued)

CHARACTERISTIC	SYMBOL	Min.	Max.	UNIT
ON CHARACTERISTICS				
DC Current Gain ($I_C = -0.1\text{ mA}$, $V_{CE} = -10\text{ V}$) ($I_C = -1.0\text{ mA}$, $V_{CE} = -10\text{ V}$) ($I_C = -10\text{ mA}$, $V_{CE} = -10\text{ V}$) ($I_C = -150\text{ mA}$, $V_{CE} = -10\text{ V}$) ⁽¹⁾ ($I_C = -500\text{ mA}$, $V_{CE} = -10\text{ V}$) ⁽¹⁾	h_{FE}	75 50 100 100 50	- - - 300 -	-
Collector - Emitter Saturation Voltage ⁽¹⁾ ($I_C = -150\text{ mA}$, $I_B = -15\text{ mA}$) ($I_C = -500\text{ mA}$, $I_B = -50\text{ mA}$)	$V_{CE(sat)}$	- -	-0.3 -1.0	V
Base - Emitter Saturation Voltage ⁽¹⁾ ($I_C = -150\text{ mA}$, $I_B = -15\text{ mA}$) ($I_C = -500\text{ mA}$, $I_B = -50\text{ mA}$)	$V_{BE(sat)}$	- -	-1.3 -2.0	V

SMALL - SIGNAL CHARACTERISTICS

Current - Gain - Bandwidth Product ^{(1) (2)} ($I_C = -50\text{ mA}$, $V_{CE} = -20\text{ V}$, $f = 100\text{ MHz}$)	f_T	200	-	MHz
Output Capacitance ($V_{CB} = -10\text{ V}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	-	8.0	pF
Input Capacitance ($V_{EB} = -2.0\text{ V}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	-	30	pF

SWITCHING CHARACTERISTICS

Turn-On Time	$(V_{CC} = -30\text{ V}$, $I_C = -150\text{ mA}$, $I_{B1} = -15\text{ mA}$) (Figure 1 and 5)	t_{on}	-	50	ns
Delay Time		t_d	-	10	ns
Rise Time		t_r	-	40	ns
Turn-Off Time	$(V_{CC} = -6.0\text{ V}$, $I_C = -150\text{ mA}$, $I_{B1} = I_{B2} = -15\text{ mA}$) (Figure 2)	t_{off}	-	110	ns
Storage Time		t_s	-	80	ns
Fall Time		t_f	-	30	ns

1. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.
2. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

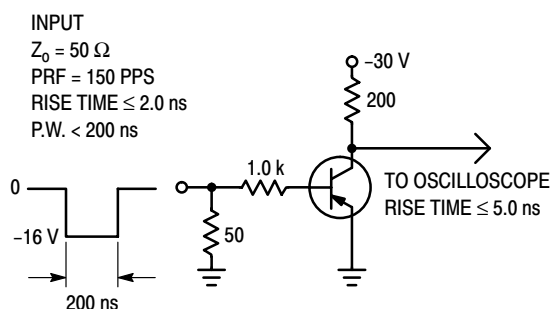


Figure 1. Delay and Rise Time Test Circuit

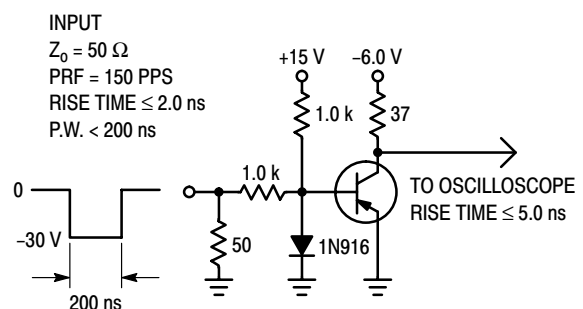


Figure 2. Storage and Fall Time Test Circuit

● TYPICAL CHARACTERISTICS

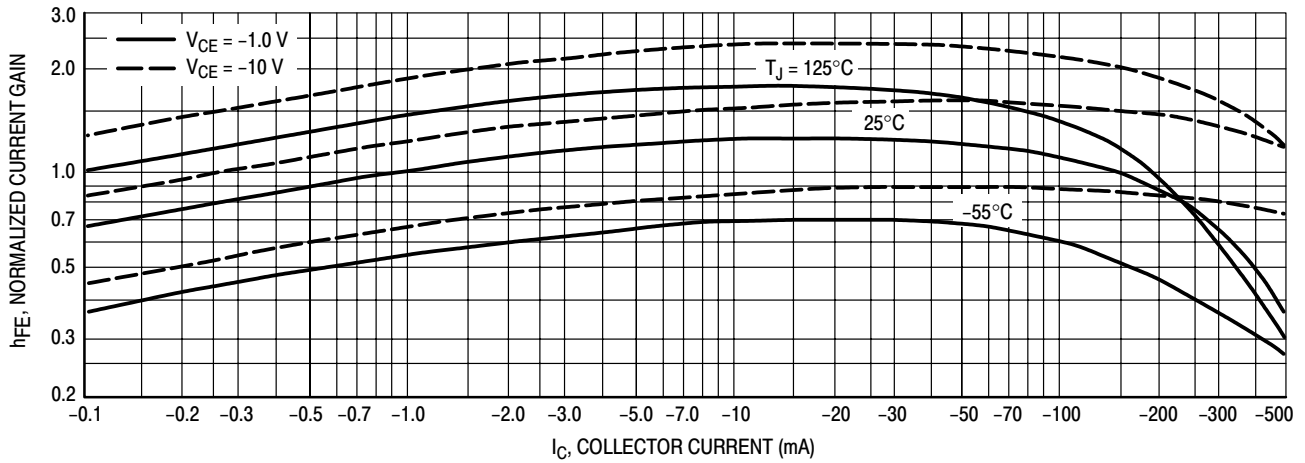


Figure 3. DC Current Gain

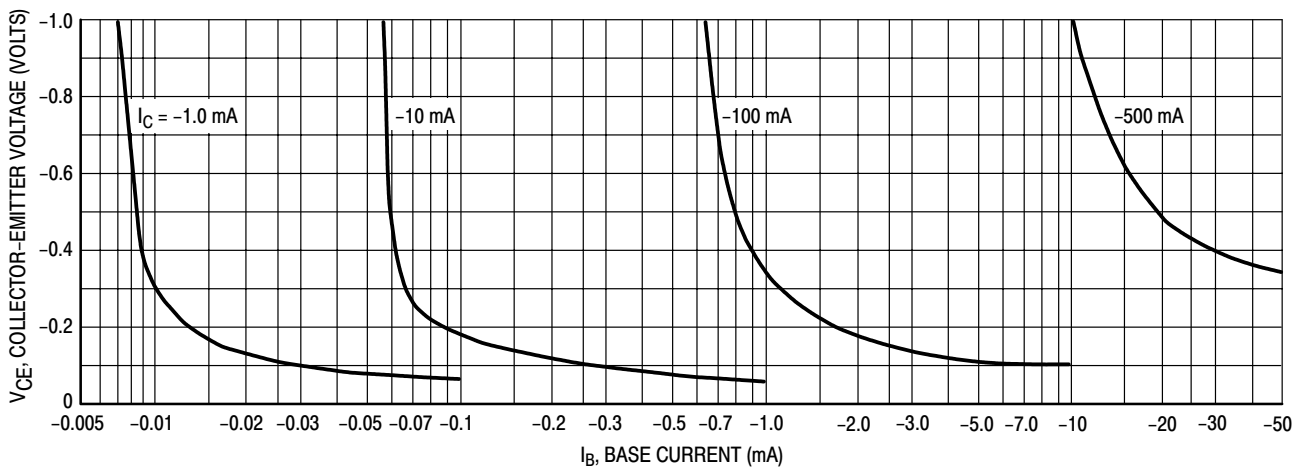


Figure 4. Collector Saturation Region

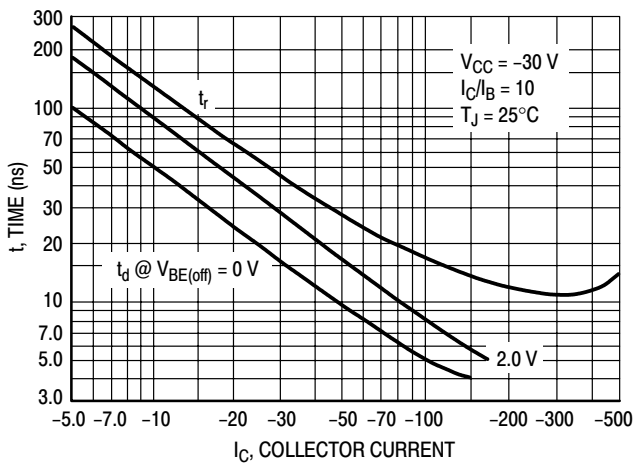


Figure 5. Turn-On Time

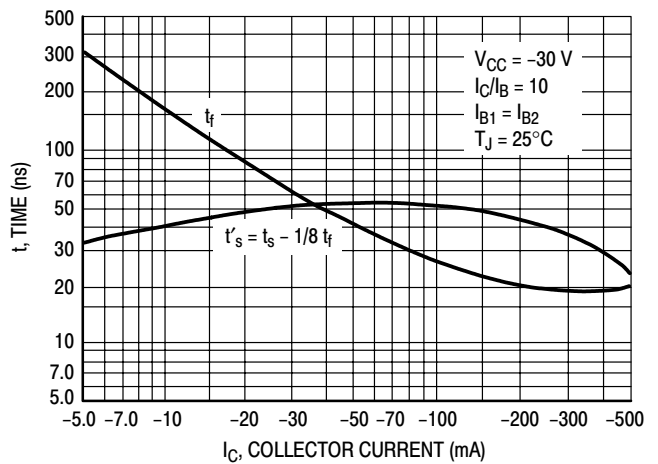


Figure 6. Turn-Off Time

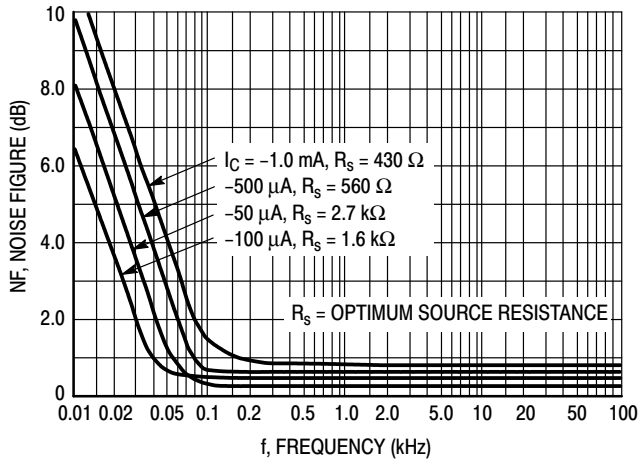


Figure 7. Frequency Effects

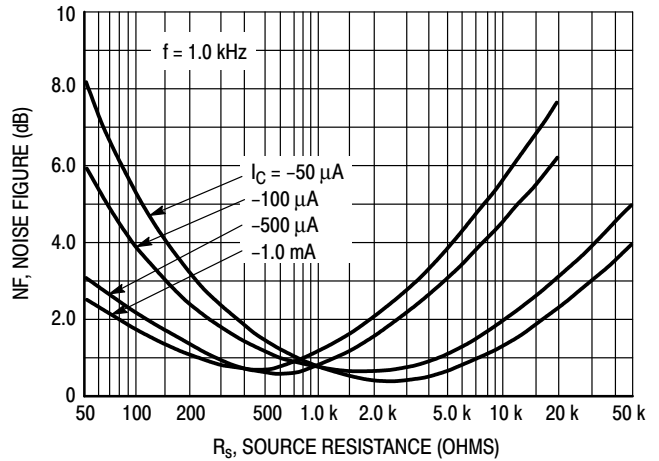


Figure 8. Source Resistance Effects

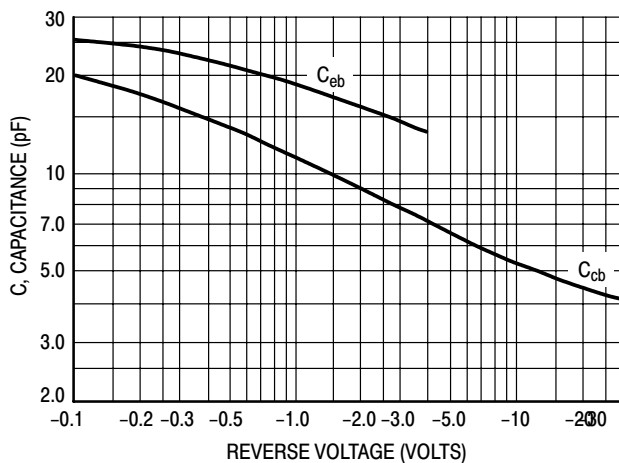


Figure 9. Capacitances

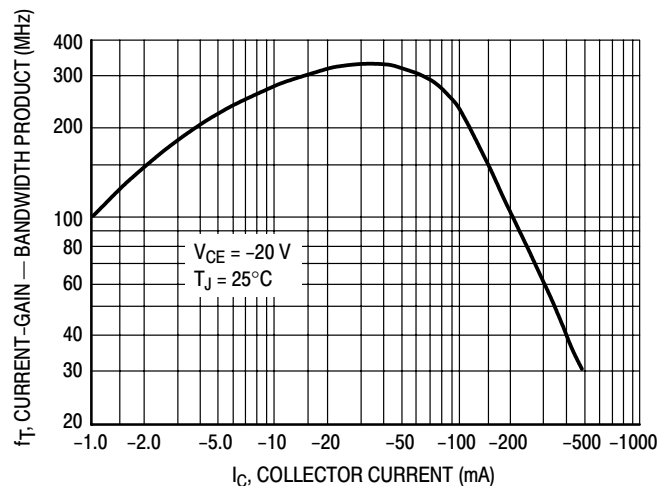


Figure 10. Current-Gain — Bandwidth Product

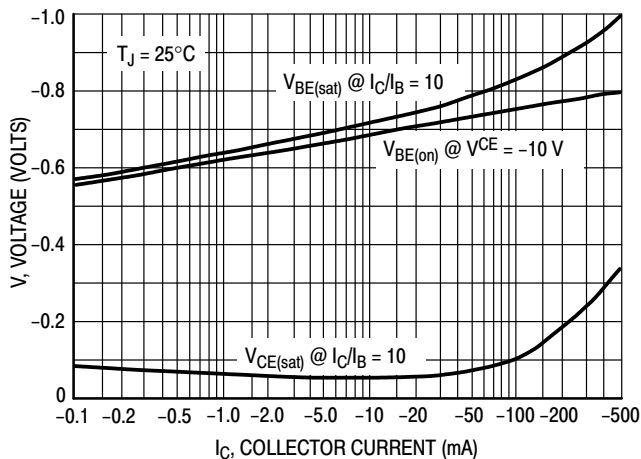


Figure 11. "On" Voltage

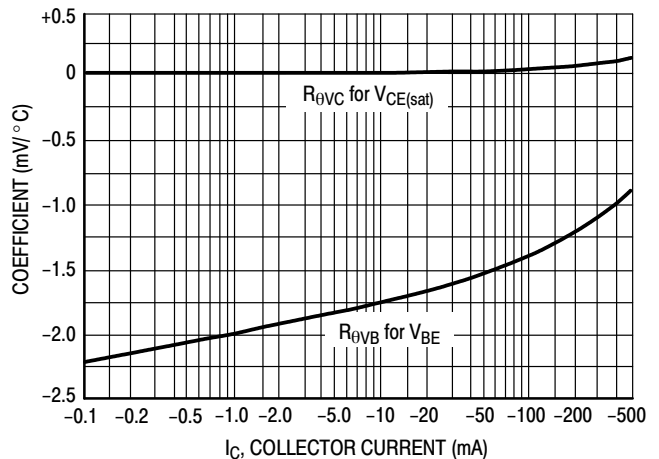
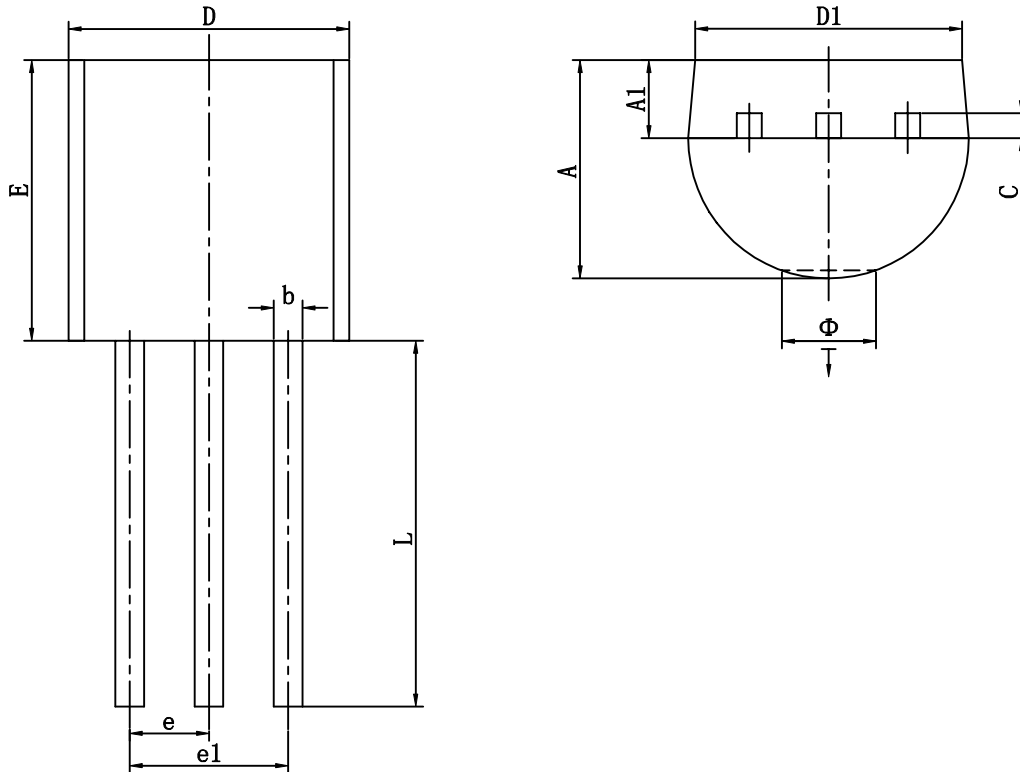


Figure 12. Temperature Coefficients

● TO-92 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270TYP		0.050TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Ø		1.600		0.063
↓	0.000	0.380	0.000	0.015