General Purpose Transistors

PNP Silicon

COLLECTOR
3

2
BASE

1
EMITTER
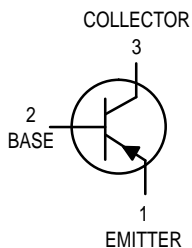
MPS2907
MPS2907A*

*Motorola Preferred Device
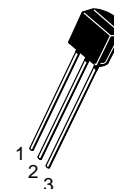
CASE 29–04, STYLE 1
TO–92 (TO–226AA)

MAXIMUM RATINGS

Rating	Symbol	MPS2907	MPS2907A	Unit
Collector–Emitter Voltage	V_{CEO}	−40	−60	Vdc
Collector–Base Voltage	V_{CBO}	−60		Vdc
Emitter–Base Voltage	V_{EBO}	−5.0		Vdc
Collector Current — Continuous	I_C	−600		mAdc

Total Device Dissipation
  @ T_A = 25°C
  Derate above 25°C
	P_D	625
		5.0
				mW
				mW/°C

Total Device Dissipation
  @ T_C = 25°C
  Derate above 25°C
	P_D	1.5
		12
				Watts
				mW/°C

Operating and Storage Junction Temperature Range	T_J, T_{stg}	−500 to +150		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	°C/W

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage[1] (I_C = −10 mAdc, I_B = 0)	MPS2907 MPS2907A	$V_{(BR)CEO}$	−40 −60	— —	Vdc
Collector–Base Breakdown Voltage (I_C = −10 μAdc, I_E = 0)		$V_{(BR)CBO}$	−60	—	Vdc
Emitter–Base Breakdown Voltage (I_E = −10 μAdc, I_C = 0)		$V_{(BR)EBO}$	−5.0	—	Vdc
Collector Cutoff Current (V_{CE} = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc)		I_{CEX}	—	−50	nAdc

Collector Cutoff Current
  (V_{CB} = −50 Vdc, I_E = 0)
 	
  (V_{CB} = −50 Vdc, I_E = 0, T_A = 150°C)
	MPS2907
	MPS2907A
	MPS2907
	MPS2907A
		I_{CBO}	—
			—
			—
			—
				−0.02
				−0.01
				−20
				−10
					μAdc

Base Current (V_{CE} = −30 Vdc, $V_{EB(off)}$ = −0.5 Vdc)		I_B	—	−50	nAdc

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

Preferred devices are Motorola recommended choices for future use and best overall value.

MOTOROLA

MPS2907 MPS2907A

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			—
(I_C = −0.1 mAdc, V_{CE} = −10 Vdc) MPS2907		35	—	
MPS2907A		75	—	
(I_C = −1.0 mAdc, V_{CE} = −10 Vdc) MPS2907		50	—	
MPS2907A		100	—	
(I_C = −10 mAdc, V_{CE} = −10 Vdc) MPS2907		75	—	
MPS2907A		100	—	
(I_C = −150 mAdc, V_{CE} = −10 Vdc)[1] MPS2907, MPS2907A		100	300	
(I_C = −500 mAdc, V_{CE} = −10 Vdc)[1] MPS2907		30	—	
MPS2907A		50	—	
Collector−Emitter Saturation Voltage[1]	$V_{CE(sat)}$			Vdc
(I_C = −150 mAdc, I_B = −15 mAdc)		—	−0.4	
(I_C = −500 mAdc, I_B = −50 mAdc)		—	−1.6	
Base−Emitter Saturation Voltage[1]	$V_{BE(sat)}$			Vdc
(I_C = −150 mAdc, I_B = −15 mAdc)		—	−1.3	
(I_C = −500 mAdc, I_B = −50 mAdc)		—	−2.6	
SMALL−SIGNAL CHARACTERISTICS				
Current−Gain — Bandwidth Product[1], [2]	f_T	200	—	MHz
(I_C = −50 mAdc, V_{CE} = −20 Vdc, f = 100 MHz)				
Output Capacitance	C_{obo}	—	8.0	pF
(V_{CB} = −10 Vdc, I_E = 0, f = 1.0 MHz)				
Input Capacitance	C_{ibo}	—	30	pF
(V_{EB} = −2.0 Vdc, I_C = 0, f = 1.0 MHz)				
SWITCHING CHARACTERISTICS				
Turn−On Time (V_{CC} = −30 Vdc, I_C = −150 mAdc, I_{B1} = −15 mAdc) (Figures 1 and 5)	t_{on}	—	45	ns
Delay Time	t_d	—	10	ns
Rise Time	t_r	—	40	ns
Turn−Off Time (V_{CC} = −6.0 Vdc, I_C = −150 mAdc, I_{B1} = I_{B2} = 15 mAdc) (Figure 2)	t_{off}	—	100	ns
Storage Time	t_s	—	80	ns
Fall Time	t_f	—	30	ns

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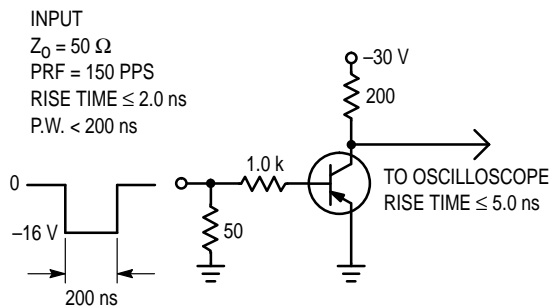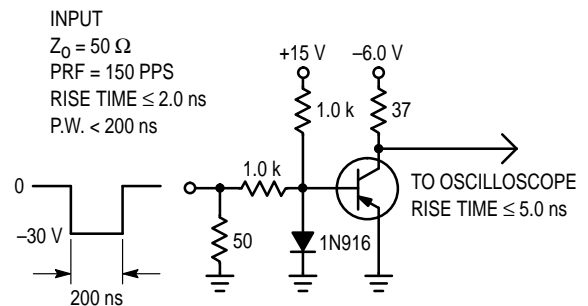

Figure 1. Delay and Rise Time Test Circuit

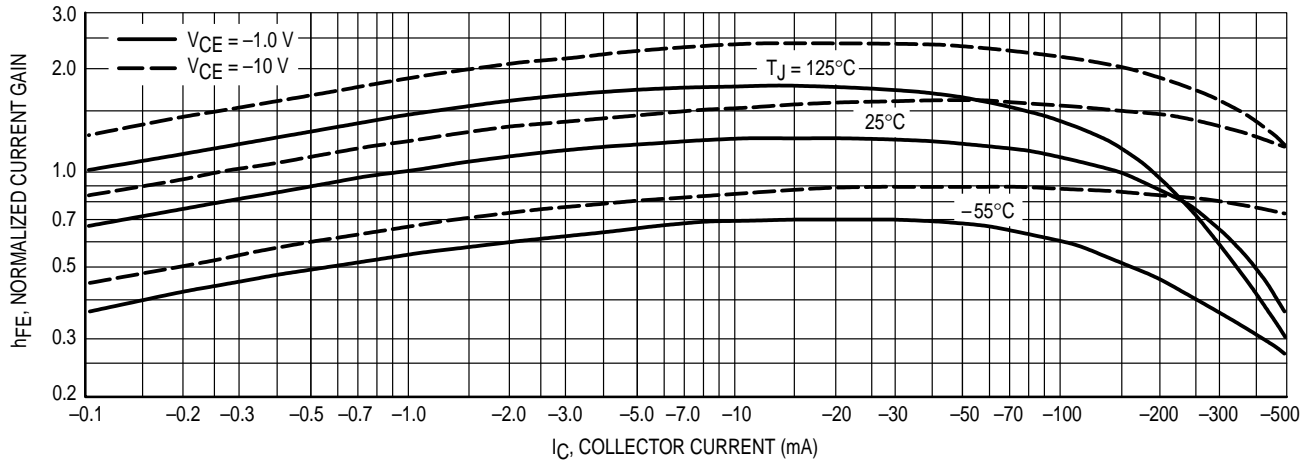Figure 2. Storage and Fall Time Test Circuit

TYPICAL CHARACTERISTICS

Figure 3. DC Current Gain
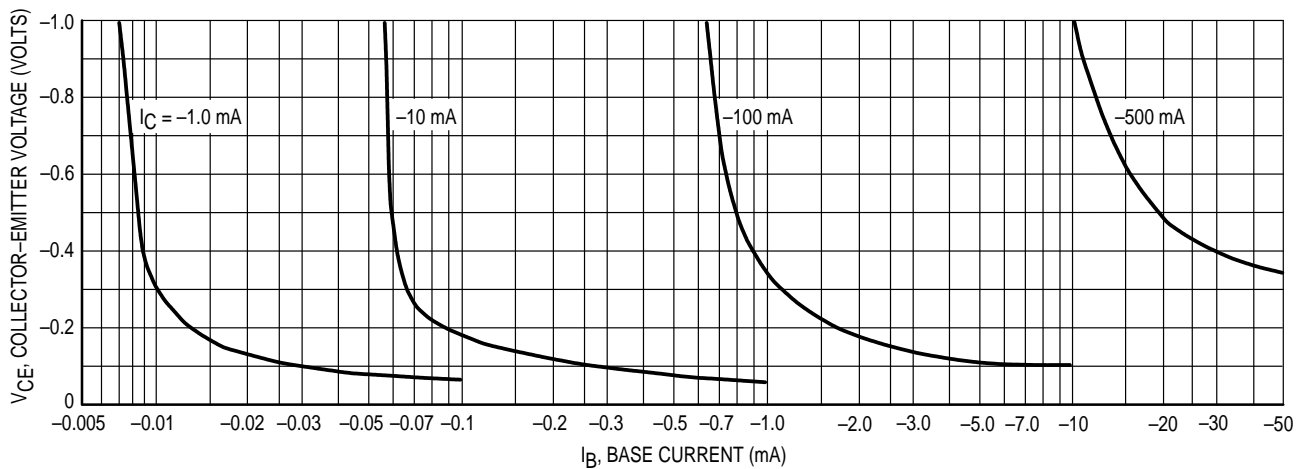
Plot: h_{FE}, NORMALIZED CURRENT GAIN vs I_C, COLLECTOR CURRENT (mA)

Legend: $V_{CE} = -1.0$ V (solid), $V_{CE} = -10$ V (dashed)

Curves labeled $T_J = 125°C$, $25°C$, $-55°C$

Figure 4. Collector Saturation Region

Plot: V_{CE}, COLLECTOR-EMITTER VOLTAGE (VOLTS) vs I_B, BASE CURRENT (mA)

Curves labeled $I_C = -1.0$ mA, -10 mA, -100 mA, -500 mA

Figure 5. Turn-On Time

Plot: t, TIME (ns) vs I_C, COLLECTOR CURRENT

$V_{CC} = -30$ V
$I_C/I_B = 10$
$T_J = 25°C$

t_r, t_d @ $V_{BE(off)} = 0$ V, 2.0 V

Figure 6. Turn-Off Time

Plot: t, TIME (ns) vs I_C, COLLECTOR CURRENT (mA)

$V_{CC} = -30$ V
$I_C/I_B = 10$
$I_{B1} = I_{B2}$
$T_J = 25°C$

t_f, $t'_S = t_S - 1/8\, t_f$
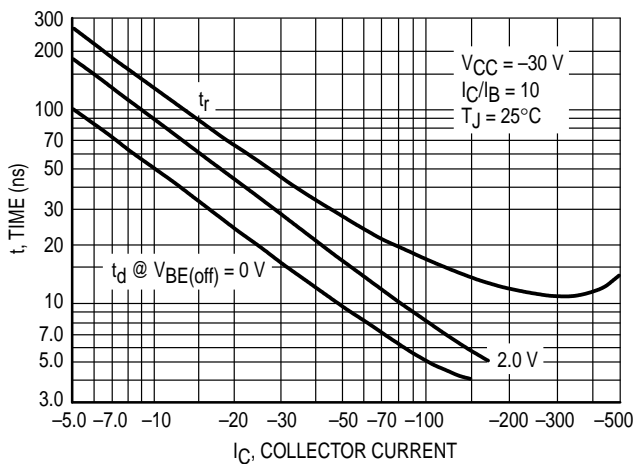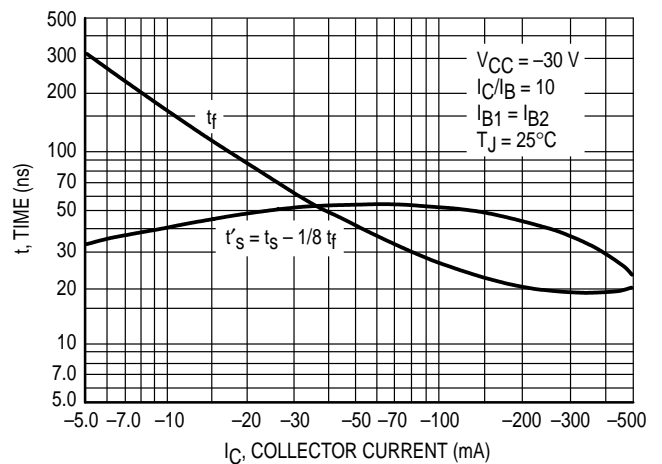
TYPICAL SMALL–SIGNAL CHARACTERISTICS
NOISE FIGURE
V_{CE} = 10 Vdc, T_A = 25°C
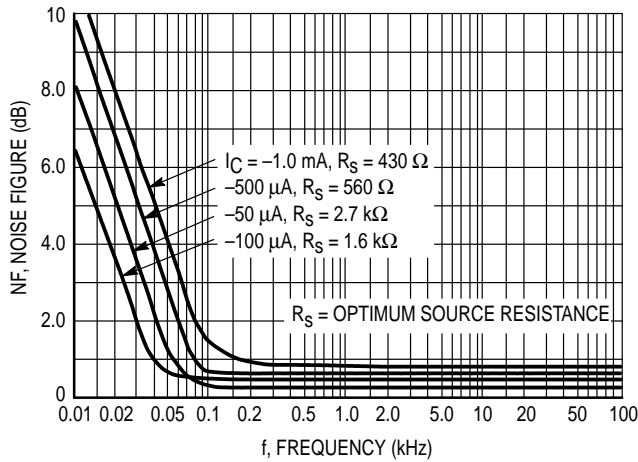
Figure 7. Frequency Effects
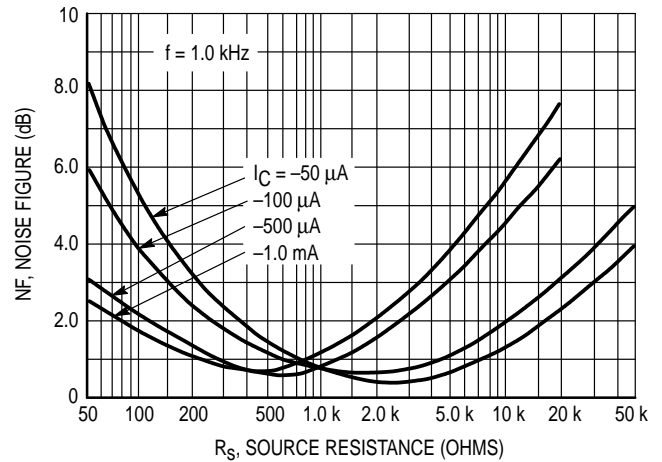
Figure 8. Source Resistance Effects
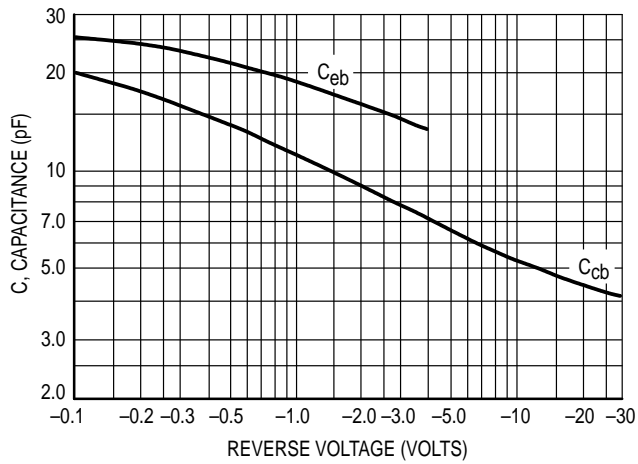
Figure 9. Capacitances
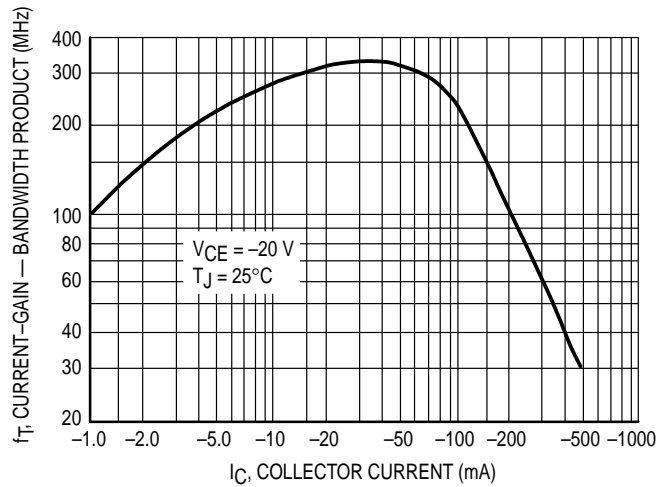
Figure 10. Current–Gain — Bandwidth Product
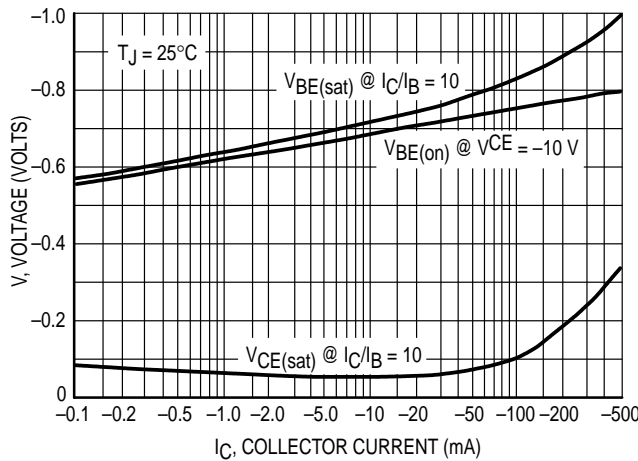
Figure 11. "On" Voltage
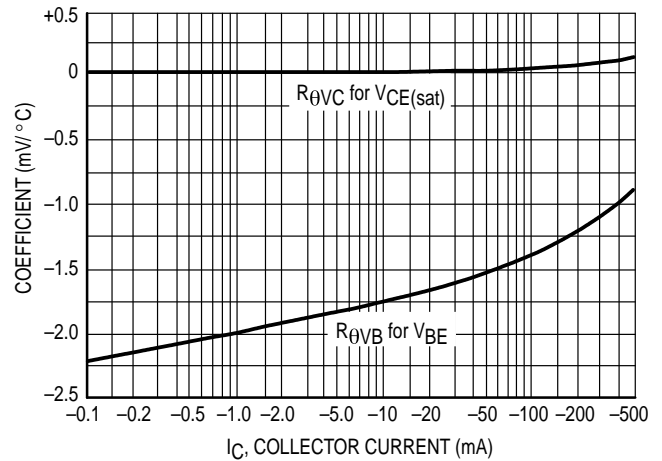
Figure 12. Temperature Coefficients

PACKAGE DIMENSIONS
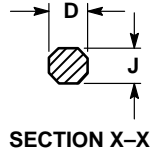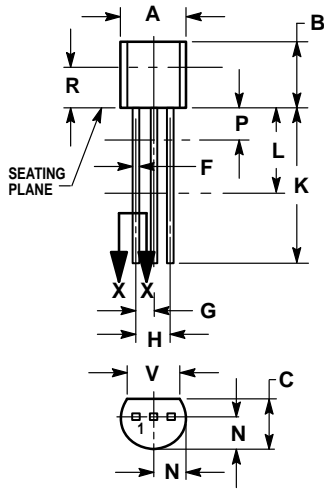
**CASE 029–04
(TO–226AA)
ISSUE AD**

SECTION X–X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

STYLE 1:
PIN 1. EMITTER
    2. BASE
    3. COLLECTOR

MPS2907 MPS2907A

MOTOROLA

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MPS2907/D