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MPS2222, MPS2222A

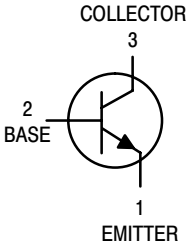
MPS2222A is a Preferred Device

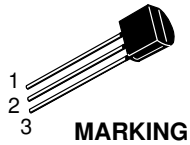
General Purpose Transistors

NPN Silicon

ON Semiconductor™

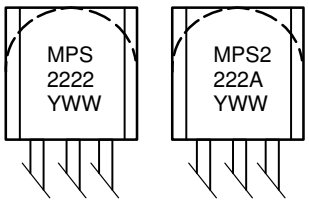
http://onsemi.com





TO–92
CASE 29
STYLE 1

MARKING DIAGRAMS



Y = Year
WW = Work Week

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage MPS2222 MPS2222A	V_{CEO}	 30 40	Vdc
Collector–Base Voltage MPS2222 MPS2222A	V_{CBO}	 60 75	Vdc
Emitter–Base Voltage MPS2222 MPS2222A	V_{EBO}	 5.0 6.0	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}	–55 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

ORDERING INFORMATION

Device	Package	Shipping
MPS2222	TO–92	5000 Units/Box
MPS2222A	TO–92	5000 Units/Box
MPS2222ARLRA	TO–92	2000/Tape & Reel
MPS2222ARLRM	TO–92	2000/Ammo Pack
MPS2222ARLRP	TO–92	2000/Ammo Pack
MPS2222RLRA	TO–92	2000/Tape & Reel
MPS2222RLRM	TO–92	2000/Ammo Pack
MPS2222RLRP	TO–92	2000/Ammo Pack

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

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	MPS2222	$V_{(BR)CEO}$	30	–	Vdc
	MPS2222A		40	–	
Collector–Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	MPS2222	$V_{(BR)CBO}$	60	–	Vdc
	MPS2222A		75	–	
Emitter–Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	MPS2222	$V_{(BR)EBO}$	5.0	–	Vdc
	MPS2222A		6.0	–	
Collector Cutoff Current (V_{CE} = 60 Vdc, $V_{EB(off)}$ = 3.0 Vdc)	MPS2222A	I_{CEX}	–	10	nAdc
Collector Cutoff Current		I_{CBO}			μAdc
(V_{CB} = 50 Vdc, I_E = 0)	MPS2222		–	0.01	
(V_{CB} = 60 Vdc, I_E = 0)	MPS2222A		–	0.01	
(V_{CB} = 50 Vdc, I_E = 0, T_A = 125°C)	MPS2222		–	10	
(V_{CB} = 50 Vdc, I_E = 0, T_A = 125°C)	MPS2222A		–	10	
Emitter Cutoff Current (V_{EB} = 3.0 Vdc, I_C = 0)	MPS2222A	I_{EBO}	–	100	nAdc
Base Cutoff Current (V_{CE} = 60 Vdc, $V_{EB(off)}$ = 3.0 Vdc)	MPS2222A	I_{BL}	–	20	nAdc
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			–
(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)			35	–	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)			50	–	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)			75	–	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, T_A = –55°C)	MPS2222A only		35	–	
(I_C = 150 mAdc, V_{CE} = 10 Vdc) (Note 1.)			100	300	
(I_C = 150 mAdc, V_{CE} = 1.0 Vdc) (Note 1.)			50	–	
(I_C = 500 mAdc, V_{CE} = 10 Vdc) (Note 1.)	MPS2222		30	–	
	MPS2222A		40	–	
Collector–Emitter Saturation Voltage (Note 1.)		$V_{CE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)	MPS2222		–	0.4	
	MPS2222A		–	0.3	
(I_C = 500 mAdc, I_B = 50 mAdc)	MPS2222		–	1.6	
	MPS2222A		–	1.0	
Base–Emitter Saturation Voltage (Note 1.)		$V_{BE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)	MPS2222		–	1.3	
	MPS2222A		0.6	1.2	
(I_C = 500 mAdc, I_B = 50 mAdc)	MPS2222		–	2.6	
	MPS2222A		–	2.0	

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

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

Characteristic		Symbol	Min	Max	Unit
SMALL–SIGNAL CHARACTERISTICS					
Current–Gain – Bandwidth Product (Note 2.) (I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	MPS2222 MPS2222A	f_T	 250 300	 – –	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)		C_{obo}	–	8.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	MPS2222 MPS2222A	C_{ibo}	 – –	 30 25	pF
Input Impedance (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	 MPS2222A MPS2222A	h_{ie}	 2.0 0.25	 8.0 1.25	kΩ
Voltage Feedback Ratio (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	 MPS2222A MPS2222A	h_{re}	 – –	 8.0 4.0	X 10^{-4}
Small–Signal Current Gain (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	 MPS2222A MPS2222A	h_{fe}	 50 75	 300 375	–
Output Admittance (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	 MPS2222A MPS2222A	h_{oe}	 5.0 25	 35 200	μmhos
Collector Base Time Constant (I_E = 20 mAdc, V_{CB} = 20 Vdc, f = 31.8 MHz)	MPS2222A	$rb'C_c$	–	150	ps
Noise Figure (I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 1.0 kΩ, f = 1.0 kHz)	MPS2222A	NF	–	4.0	dB
SWITCHING CHARACTERISTICS MPS2222A only					
Delay Time	(V_{CC} = 30 Vdc, $V_{BE(off)}$ = –0.5 Vdc, I_C = 150 mAdc, I_{B1} = 15 mAdc) (Figure 1)	t_d	–	10	ns
Rise Time		t_r	–	25	ns
Storage Time	(V_{CC} = 30 Vdc, I_C = 150 mAdc, I_{B1} = I_{B2} = 15 mAdc) (Figure 2)	t_s	–	225	ns
Fall Time		t_f	–	60	ns

2. f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

SWITCHING TIME EQUIVALENT TEST CIRCUITS

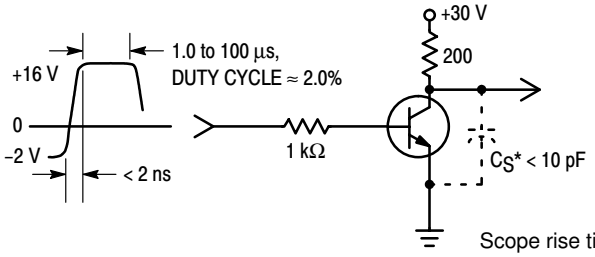


Figure 1. Turn–On Time

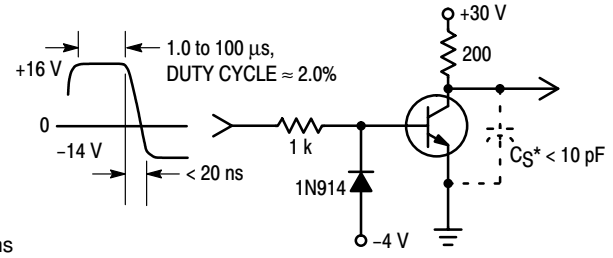


Figure 2. Turn–Off Time

Scope rise time < 4 ns
*Total shunt capacitance of test jig, connectors, and oscilloscope.

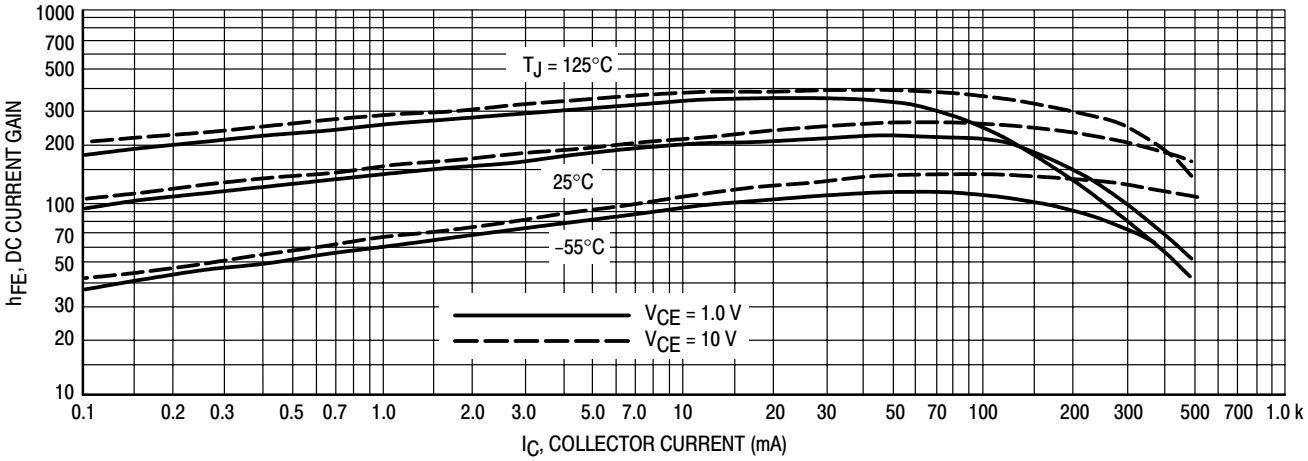


Figure 3. DC Current Gain

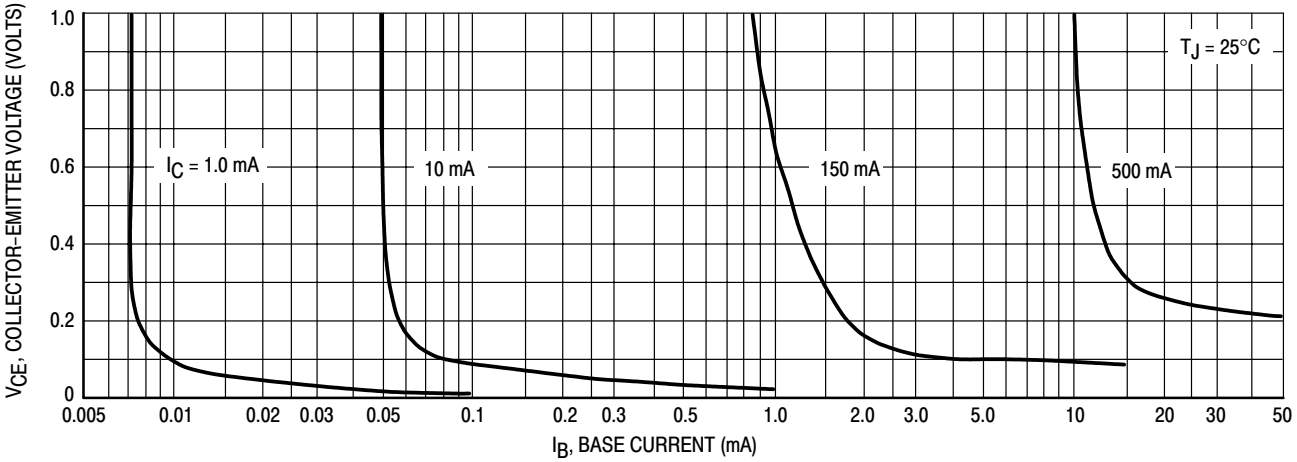


Figure 4. Collector Saturation Region

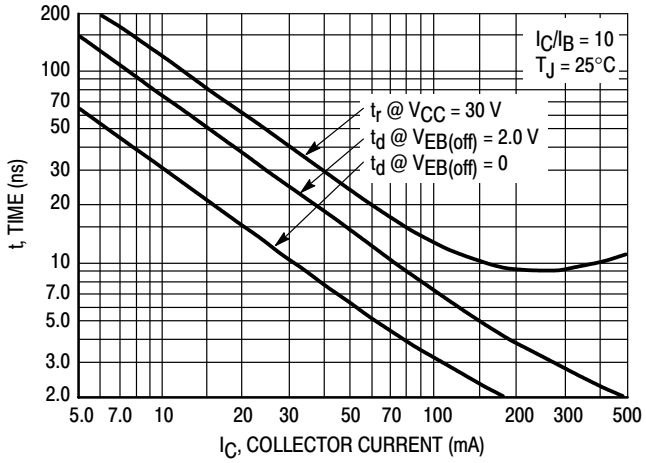


Figure 5. Turn–On Time

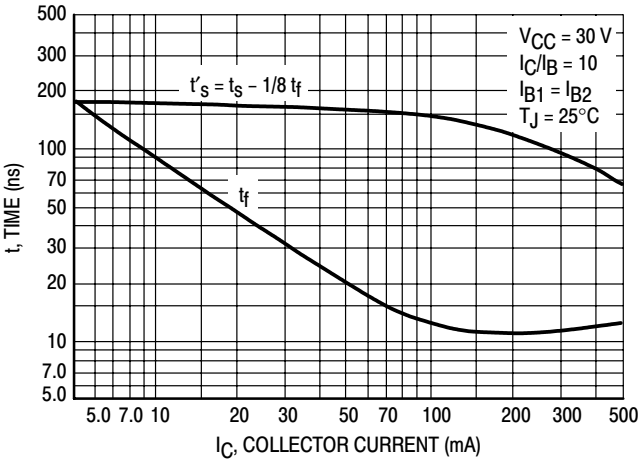


Figure 6. Turn–Off Time

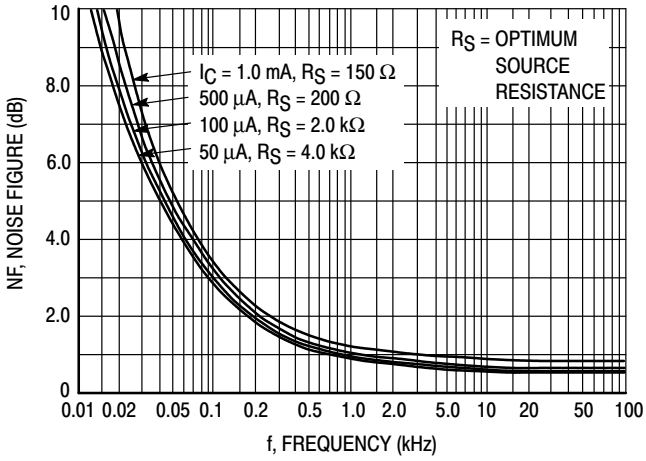


Figure 7. Frequency Effects

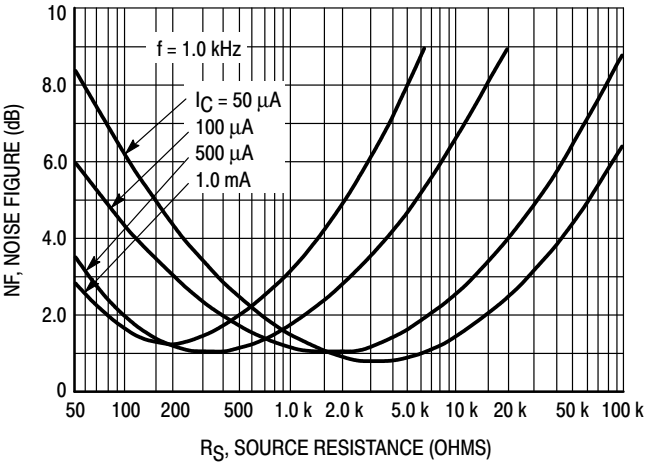


Figure 8. Source Resistance Effects

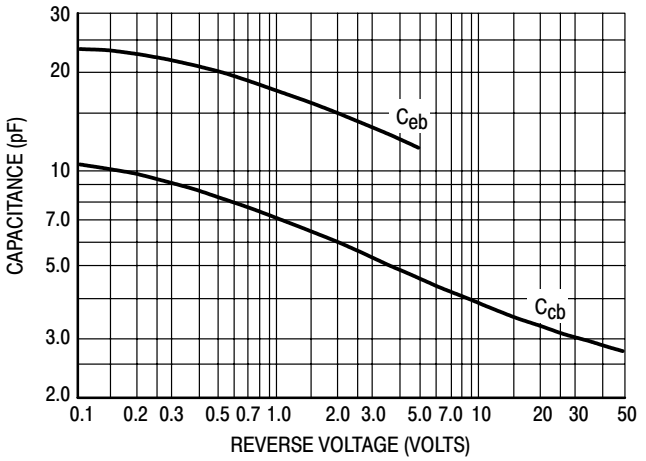


Figure 9. Capacitances

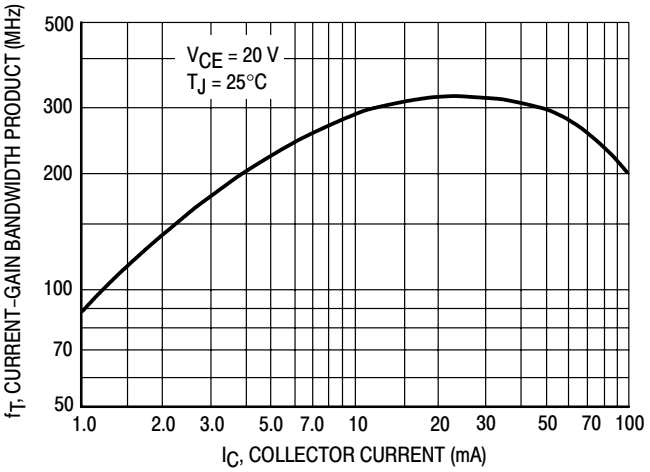


Figure 10. Current–Gain Bandwidth Product

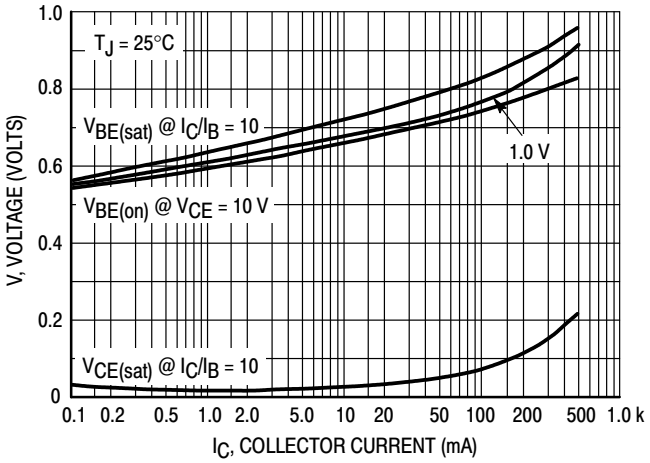


Figure 11. “On” Voltages

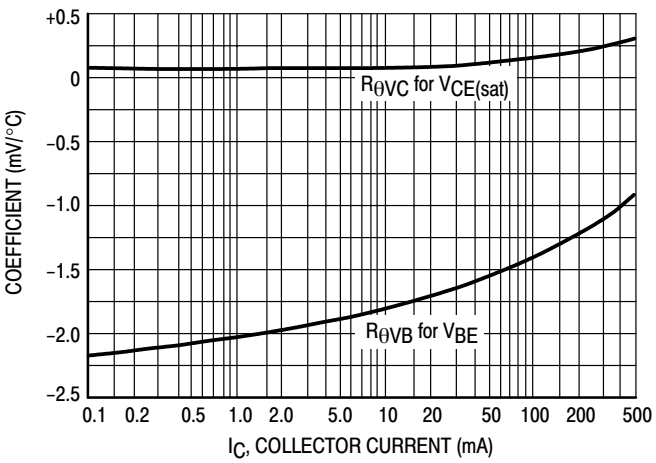
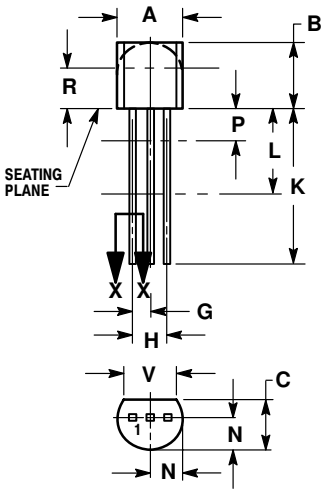
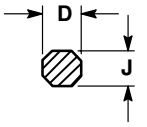


Figure 12. Temperature Coefficients

PACKAGE DIMENSIONS

TO–92
TO–226AA
CASE 29–11
ISSUE AL





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. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	INCHES		MILLIMETERS	
DIM	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	0.021	0.407	0.533
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

STYLE 14:
PIN 1. EMITTER
2. COLLECTOR
3. BASE

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