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MPS2222, MPS2222A

MPS2222A is a Preferred Device

General Purpose Transistors

NPN Silicon

ON Semiconductor®

http://onsemi.com

Features

- Pb−Free Packages are Available*

MAXIMUM RATINGS

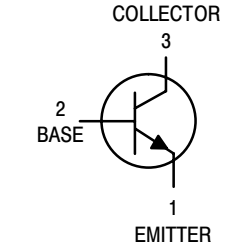
Rating	Symbol	Value	Unit
Collector−Emitter Voltage MPS2222 MPS2222A	V_{CEO}	 30 40	Vdc
Collector−Base Voltage MPS2222 MPS2222A	V_{CBO}	 60 75	Vdc
Emitter−Base Voltage MPS2222 MPS2222A	V_{EBO}	 5.0 6.0	Vdc
Collector Current − Continuous	I_C	600	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	 625 5.0	 mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	 1.5 12	 W mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150	°C

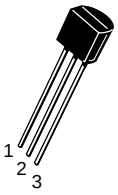
THERMAL CHARACTERISTICS

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

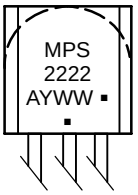




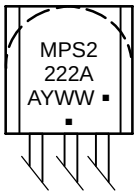
TO−92
CASE 29−11
STYLE 1

MARKING DIAGRAMS

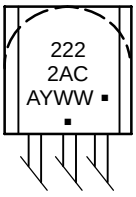
MPS2222



MPS2222A



MPS2222AC



A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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 MPS2222A	$V_{(BR)CEO}$	30 40	− −	Vdc
Collector−Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	MPS2222 MPS2222A	$V_{(BR)CBO}$	60 75	− −	Vdc
Emitter−Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	MPS2222 MPS2222A	$V_{(BR)EBO}$	5.0 6.0	− −	Vdc
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	
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain − Bandwidth Product (Note 2)		f_T			MHz
(I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	MPS2222		250	−	
	MPS2222A		300	−	
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)		C_{obo}	−	8.0	pF
Input Capacitance		C_{ibo}			pF
(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	MPS2222		−	30	
	MPS2222A		−	25	
Input Impedance		h_{ie}			kΩ
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		2.0	8.0	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		0.25	1.25	
Voltage Feedback Ratio		h_{re}			X 10^{-4}
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		−	8.0	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		−	4.0	
Small−Signal Current Gain		h_{fe}			−
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		50	300	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		75	375	
Output Admittance		h_{oe}			μmhos
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		5.0	35	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	MPS2222A		25	200	
Collector Base Time Constant		$rb'C_c$	−	150	ps
(I_E = 20 mAdc, V_{CB} = 20 Vdc, f = 31.8 MHz)	MPS2222A				
Noise Figure		NF	−	4.0	dB
(I_C = 100 μAdc, V_{CE} = 10 Vdc, R_S = 1.0 kΩ, f = 1.0 kHz)	MPS2222A				

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

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

Characteristic		Symbol	Min	Max	Unit
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

SWITCHING TIME EQUIVALENT TEST CIRCUITS

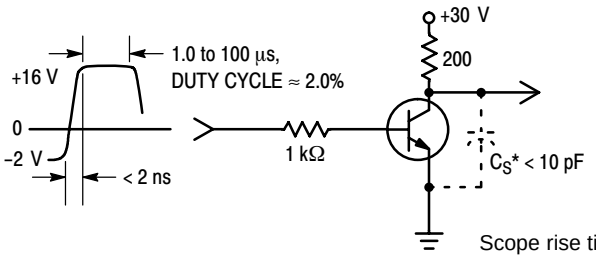
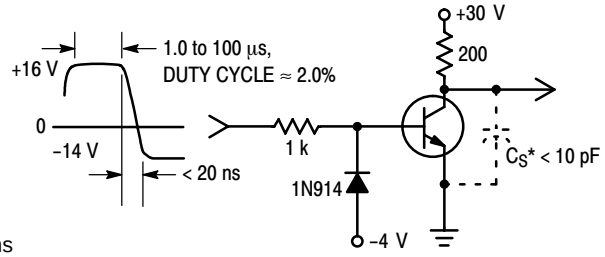


Figure 1. Turn−On Time



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

Figure 2. Turn−Off Time

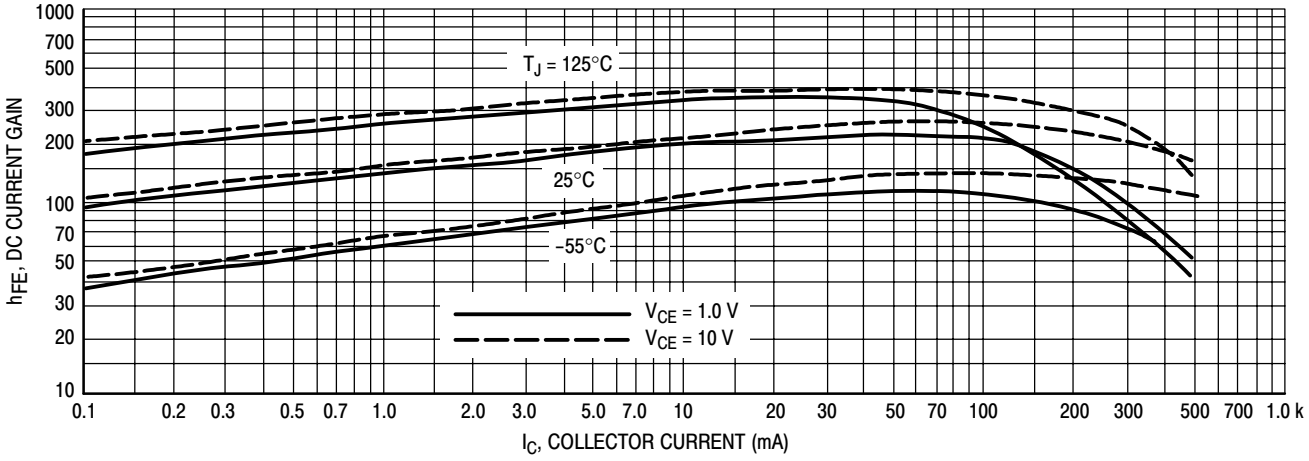


Figure 3. DC Current Gain

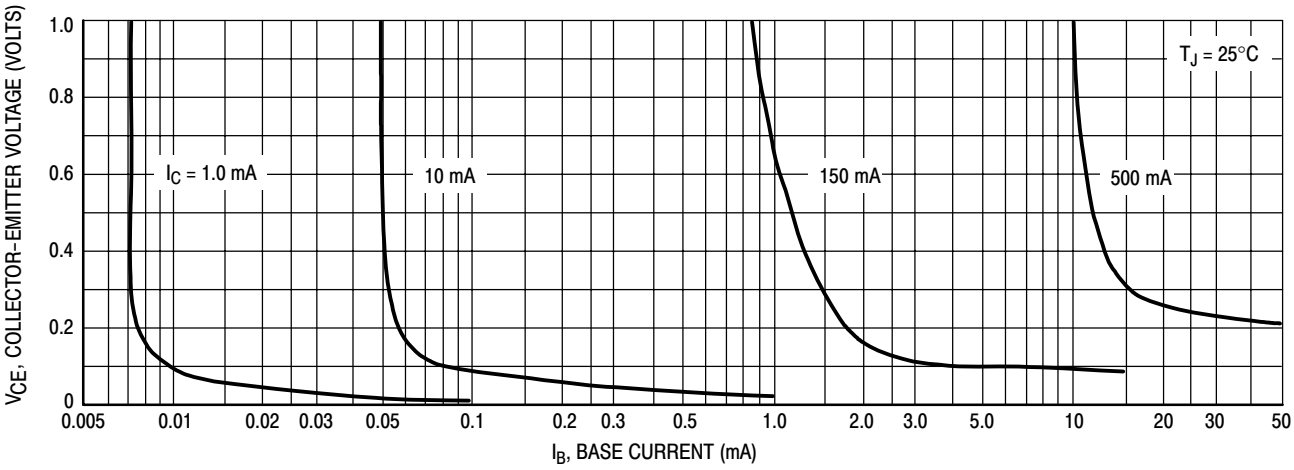


Figure 4. Collector Saturation Region

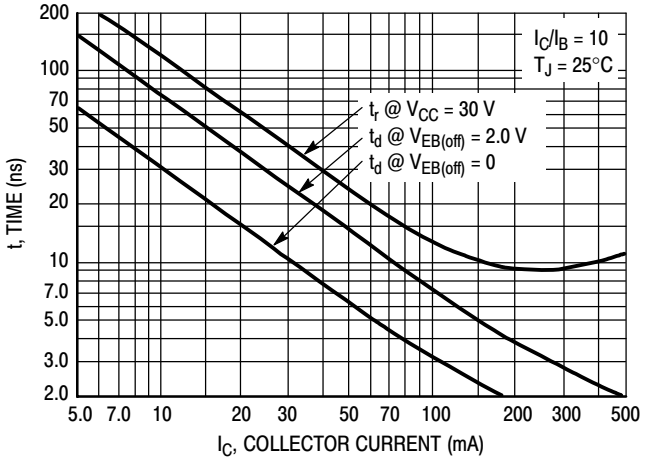


Figure 5. Turn−On Time

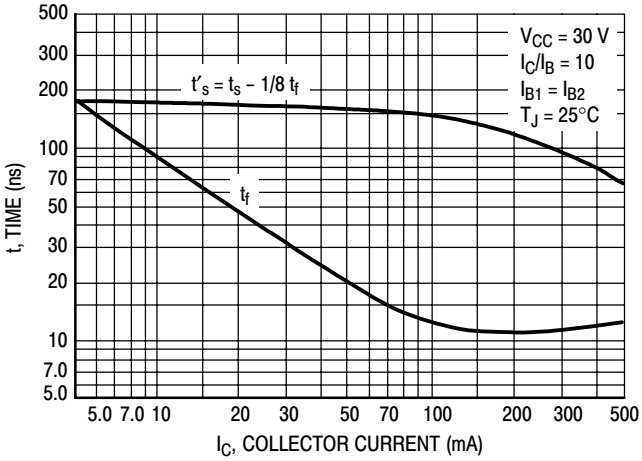


Figure 6. Turn−Off Time

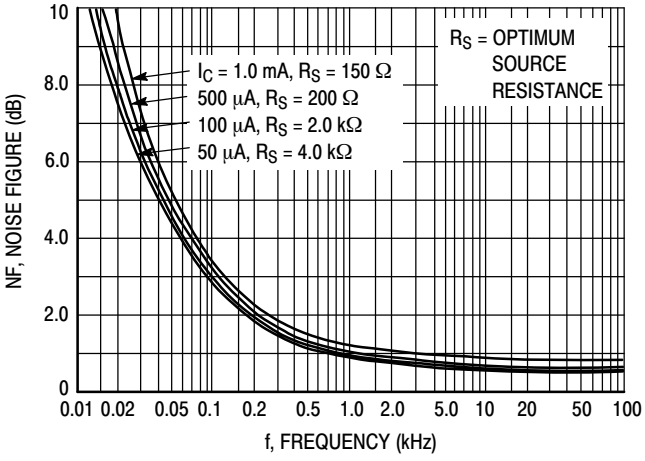


Figure 7. Frequency Effects

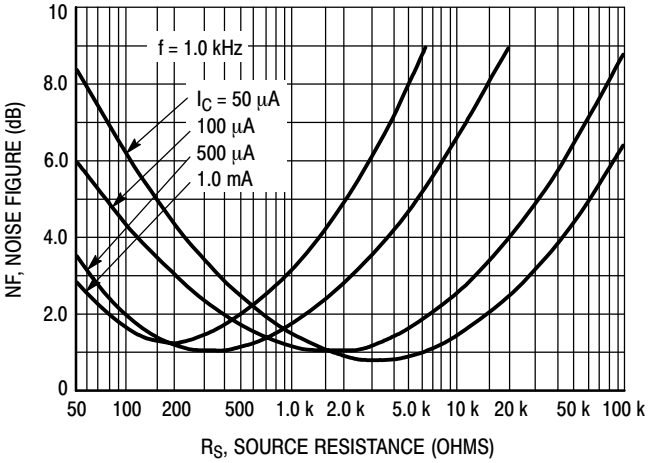


Figure 8. Source Resistance Effects

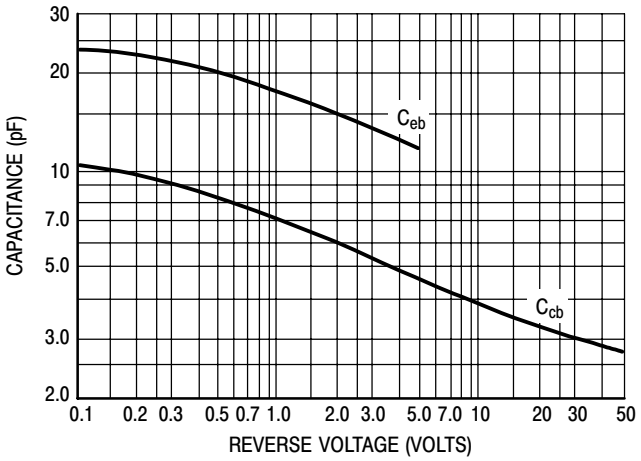


Figure 9. Capacitances

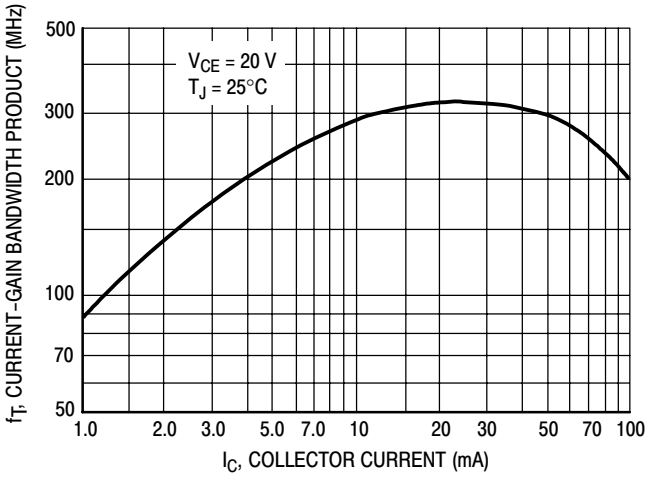


Figure 10. Current−Gain Bandwidth Product

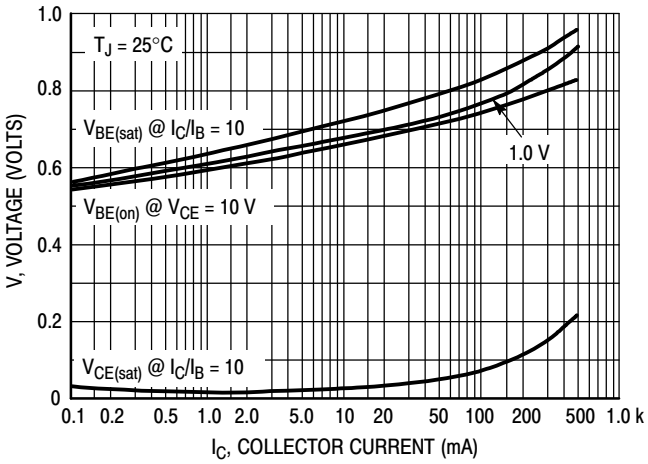


Figure 11. “On” Voltages

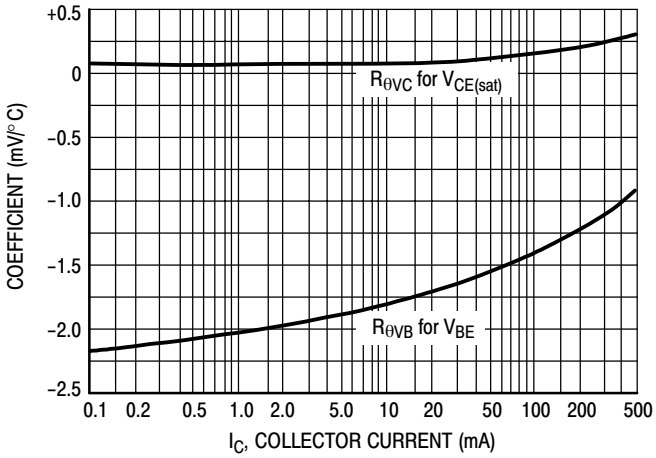


Figure 12. Temperature Coefficients

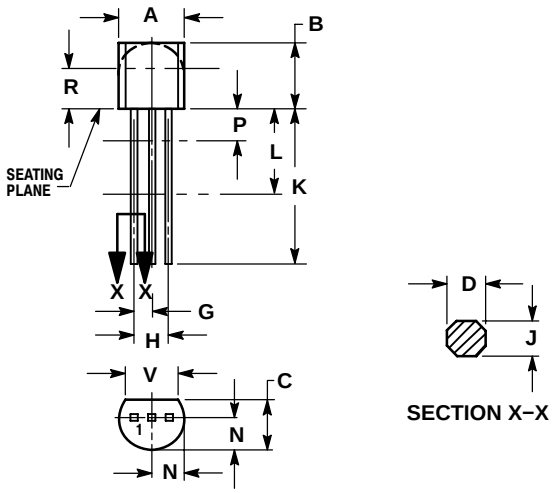
ORDERING INFORMATION

Device	Package	Shipping†
MPS2222	TO−92	5000 Units / Bulk
MPS2222G	TO−92 (Pb−Free)	5000 Units / Bulk
MPS2222RLRA	TO−92	2000 / Tape & Reel
MPS2222RLRAG	TO−92 (Pb−Free)	2000 / Tape & Reel
MPS2222RLRM	TO−92	2000 / Tape & Ammo Box
MPS2222RLRMG	TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MPS2222RLRP	TO−92	2000 / Tape & Ammo Box
MPS2222RLRPG	TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MPS2222A	TO−92	5000 Units / Bulk
MPS2222AG	TO−92 (Pb−Free)	5000 Units / Bulk
MPS2222ARL	TO−92	2000 / Tape & Reel
MPS2222ARLG	TO−92 (Pb−Free)	2000 / Tape & Reel
MPS2222ARLRA	TO−92	2000 / Tape & Reel
MPS2222ARLRAG	TO−92 (Pb−Free)	2000 / Tape & Reel
MPS2222ARLRM	TO−92	2000 / Tape & Reel
MPS2222ARLRMG	TO−92 (Pb−Free)	2000 / Tape & Reel
MPS2222ARLRP	TO−92	2000 / Tape & Ammo Box
MPS2222ARLRPG	TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MPS2222AZL1	TO−92	2000 / Tape & Ammo Box
MPS2222AZL1G	TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MPS2222ACRLRP	TO−92	2000 / Tape & Ammo Box
MPS2222ACRLRPG	TO−92 (Pb−Free)	2000 / Tape & Ammo Box

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

TO−92 (TO−226)
CASE 29−11
ISSUE AL



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

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LITERATURE FULFILLMENT:
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MPS2222/D