

# MPS2222, MPS2222A

MPS2222A is a Preferred Device

## General Purpose Transistors

NPN Silicon



ON Semiconductor™

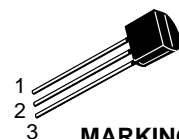
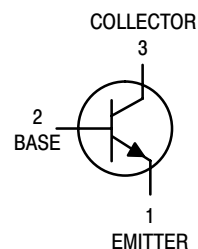
<http://onsemi.com>

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage MPS2222 MPS2222A	$V_{CE0}$	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 @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5 12	Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

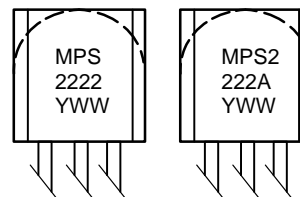
### THERMAL CHARACTERISTICS

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	$^\circ\text{C}/\text{W}$



TO-92  
CASE 29  
STYLE 1

### MARKING DIAGRAMS



Y = Year  
WW = Work Week

### 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.

# MPS2222, MPS2222A

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 0)	MPS2222 MPS2222A	V <sub>(BR)CEO</sub>	30 40	– –	V <sub>dc</sub>
Collector–Base Breakdown Voltage (I <sub>C</sub> = 10 μA <sub>dc</sub> , I <sub>E</sub> = 0)	MPS2222 MPS2222A	V <sub>(BR)CBO</sub>	60 75	– –	V <sub>dc</sub>
Emitter–Base Breakdown Voltage (I <sub>E</sub> = 10 μA <sub>dc</sub> , I <sub>C</sub> = 0)	MPS2222 MPS2222A	V <sub>(BR)EBO</sub>	5.0 6.0	– –	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 60 V <sub>dc</sub> , V <sub>EB(off)</sub> = 3.0 V <sub>dc</sub> )	MPS2222A	I <sub>CEX</sub>	–	10	nA <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 50 V <sub>dc</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = 60 V <sub>dc</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = 50 V <sub>dc</sub> , I <sub>E</sub> = 0, T <sub>A</sub> = 125°C) (V <sub>CB</sub> = 50 V <sub>dc</sub> , I <sub>E</sub> = 0, T <sub>A</sub> = 125°C)	MPS2222 MPS2222A MPS2222 MPS2222A	I <sub>CBO</sub>	– – – –	0.01 0.01 10 10	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>EB</sub> = 3.0 V <sub>dc</sub> , I <sub>C</sub> = 0)	MPS2222A	I <sub>EBO</sub>	–	100	nA <sub>dc</sub>
Base Cutoff Current (V <sub>CE</sub> = 60 V <sub>dc</sub> , V <sub>EB(off)</sub> = 3.0 V <sub>dc</sub> )	MPS2222A	I <sub>BL</sub>	–	20	nA <sub>dc</sub>
<b>ON CHARACTERISTICS</b>					
DC Current Gain (I <sub>C</sub> = 0.1 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> ) (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> ) (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> ) (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , T <sub>A</sub> = –55°C) (I <sub>C</sub> = 150 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> ) (Note 1.) (I <sub>C</sub> = 150 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (Note 1.) (I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> ) (Note 1.)	MPS2222A only     MPS2222 MPS2222A	h <sub>FE</sub>	35 50 75 35 100 50 30 40	– – – – 300 – – –	–
Collector–Emitter Saturation Voltage (Note 1.) (I <sub>C</sub> = 150 mA <sub>dc</sub> , I <sub>B</sub> = 15 mA <sub>dc</sub> )  (I <sub>C</sub> = 500 mA <sub>dc</sub> , I <sub>B</sub> = 50 mA <sub>dc</sub> )	MPS2222 MPS2222A  MPS2222 MPS2222A	V <sub>CE(sat)</sub>	– – – –	0.4 0.3 1.6 1.0	V <sub>dc</sub>
Base–Emitter Saturation Voltage (Note 1.) (I <sub>C</sub> = 150 mA <sub>dc</sub> , I <sub>B</sub> = 15 mA <sub>dc</sub> )  (I <sub>C</sub> = 500 mA <sub>dc</sub> , I <sub>B</sub> = 50 mA <sub>dc</sub> )	MPS2222 MPS2222A  MPS2222 MPS2222A	V <sub>BE(sat)</sub>	– 0.6 – –	1.3 1.2 2.6 2.0	V <sub>dc</sub>

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

# MPS2222, MPS2222A

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

Characteristic	Symbol	Min	Max	Unit
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain – Bandwidth Product (Note 2.) ( $I_C = 20\text{ mAdc}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	250 300	– –	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	–	8.0	pF
Input Capacitance ( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ibo}$	– –	30 25	pF
Input Impedance ( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ ) ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{ie}$	2.0 0.25	8.0 1.25	k $\Omega$
Voltage Feedback Ratio ( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ ) ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{re}$	– –	8.0 4.0	$\times 10^{-4}$
Small-Signal Current Gain ( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ ) ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	50 75	300 375	–
Output Admittance ( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ ) ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{oe}$	5.0 25	35 200	$\mu\text{mhos}$
Collector Base Time Constant ( $I_E = 20\text{ mAdc}$ , $V_{CB} = 20\text{ Vdc}$ , $f = 31.8\text{ MHz}$ )	$r_b' C_C$	–	150	ps
Noise Figure ( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )	NF	–	4.0	dB

## SWITCHING CHARACTERISTICS MPS2222A only

Delay Time	$(V_{CC} = 30\text{ Vdc}$ , $V_{BE(\text{off})} = -0.5\text{ Vdc}$ , $I_C = 150\text{ mAdc}$ , $I_{B1} = 15\text{ mAdc}$ ) (Figure 1)	$t_d$	–	10	ns
Rise Time		$t_r$	–	25	ns
Storage Time	$(V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mAdc}$ , $I_{B1} = I_{B2} = 15\text{ mAdc}$ ) (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

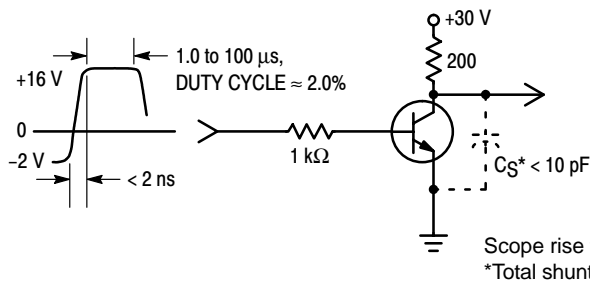


Figure 1. Turn-On Time

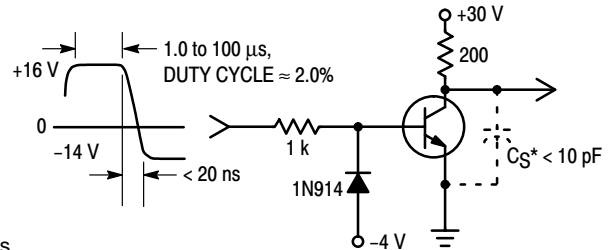


Figure 2. Turn-Off Time

# MPS2222, MPS2222A

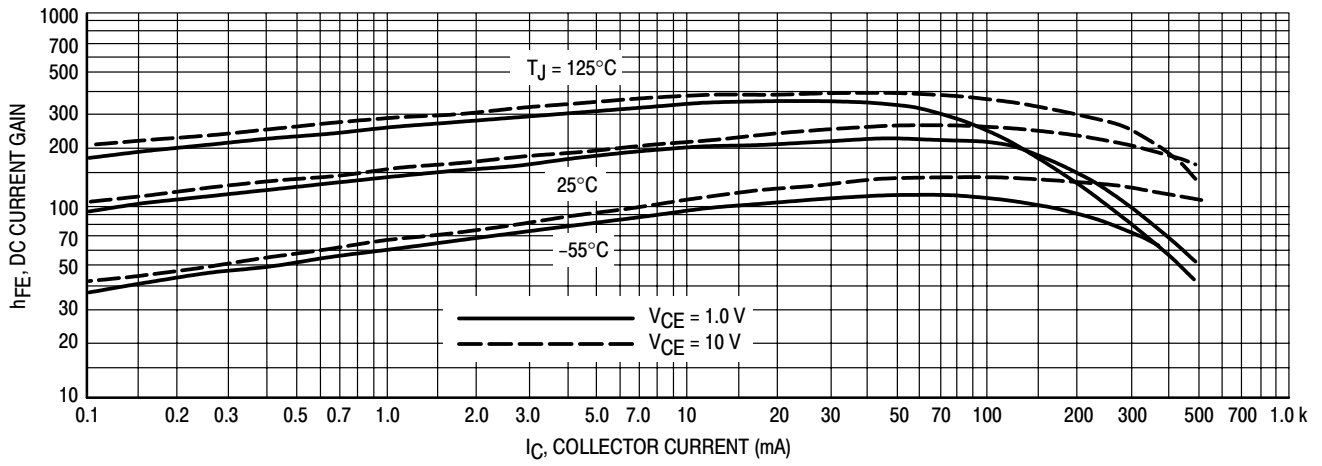


Figure 3. DC Current Gain

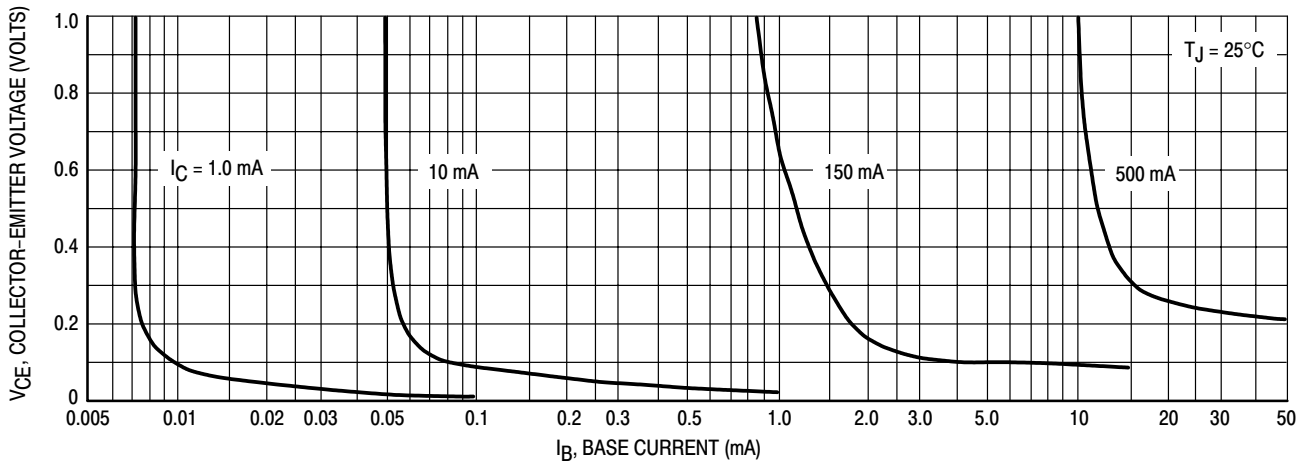


Figure 4. Collector Saturation Region

# MPS2222, MPS2222A

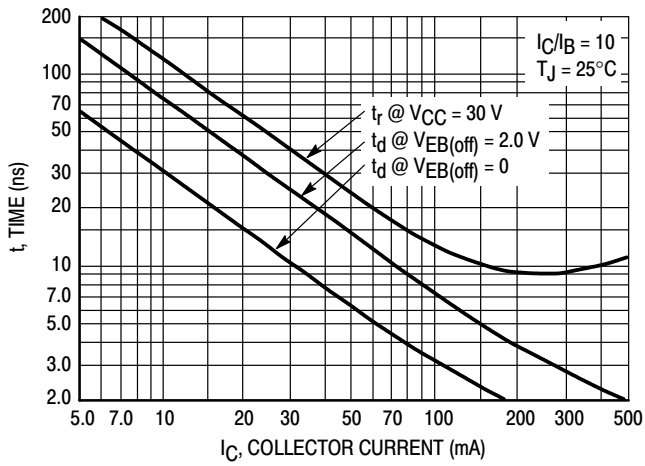


Figure 5. Turn-On Time

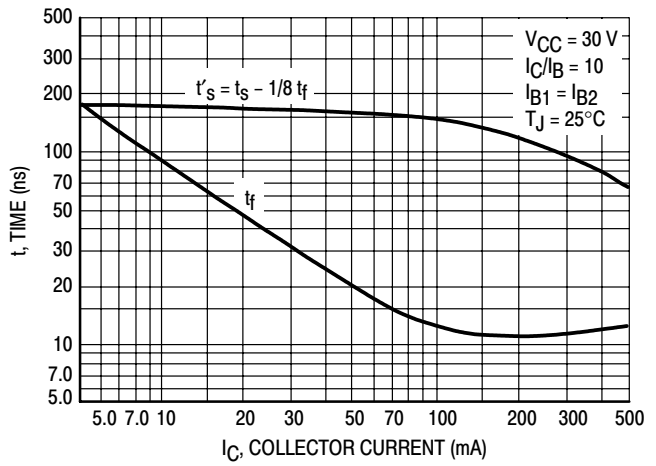


Figure 6. Turn-Off Time

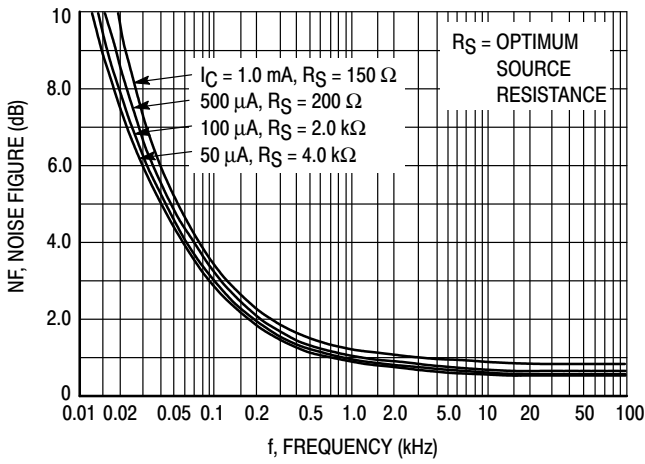


Figure 7. Frequency Effects

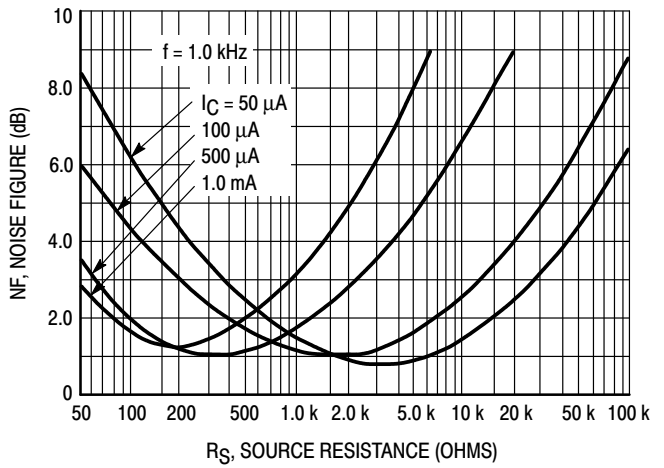


Figure 8. Source Resistance Effects

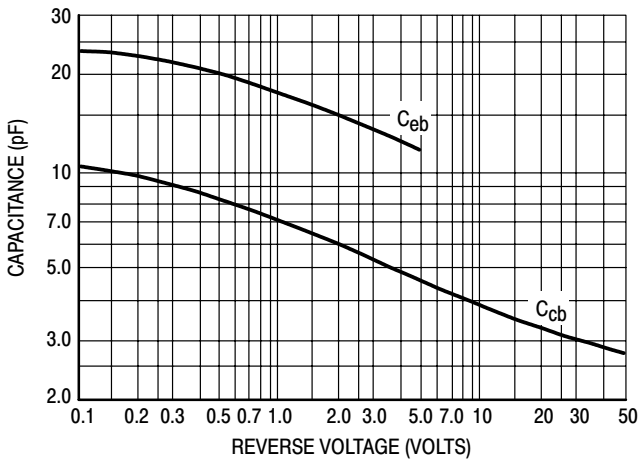


Figure 9. Capacitances

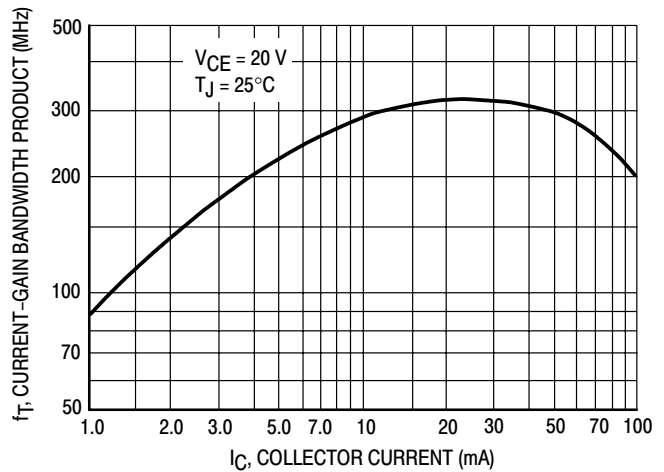


Figure 10. Current-Gain Bandwidth Product

# MPS2222, MPS2222A

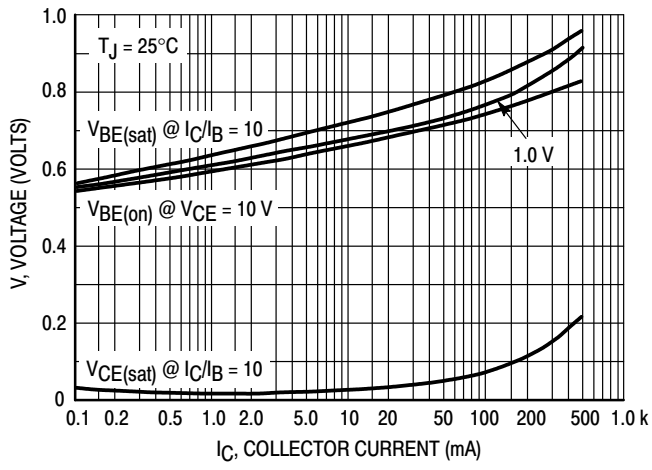


Figure 11. "On" Voltages

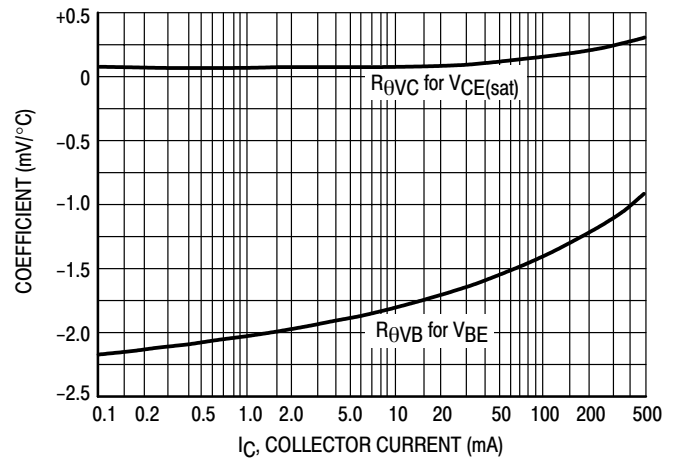
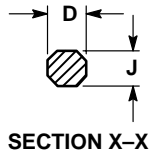
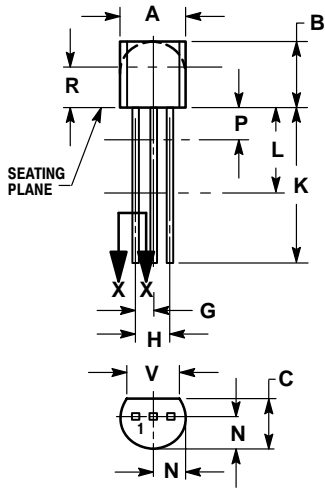


Figure 12. Temperature Coefficients

# MPS2222, MPS2222A

## PACKAGE DIMENSIONS

TO-92  
TO-226AA  
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.

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	0.021	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

# MPS2222, MPS2222A

**ON Semiconductor** and  are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

## PUBLICATION ORDERING INFORMATION

### Literature Fulfillment:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** ONlit@hibbertco.com

**N. American Technical Support:** 800-282-9855 Toll Free USA/Canada

**JAPAN:** ON Semiconductor, Japan Customer Focus Center  
4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031  
**Phone:** 81-3-5740-2700  
**Email:** r14525@onsemi.com

**ON Semiconductor Website:** <http://onsemi.com>

For additional information, please contact your local Sales Representative.



This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.