

PN2222ARLRAG Datasheet

www.digi-electronics.com



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	PN2222ARLRAG-DG
Manufacturer	onsemi
Manufacturer Product Number	PN2222ARLRAG
Description	TRANS NPN 40V 0.6A TO92
Detailed Description	Bipolar (BJT) Transistor NPN 40 V 600 mA 300MHz 6 25 mW Through Hole TO-92 (TO-226)



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.

Purchase and inquiry

Manufacturer Product Number:

PN2222ARLRAG

Series:

-

Transistor Type:

NPN

Voltage - Collector Emitter Breakdown (Max):

40 V

Current - Collector Cutoff (Max):

10nA (ICBO)

Power - Max:

625 mW

Operating Temperature:

-55°C ~ 150°C (TJ)

Package / Case:

TO-226-3, TO-92-3 Long Body (Formed Leads)

Base Product Number:

PN2222

Manufacturer:

onsemi

Product Status:

Obsolete

Current - Collector (Ic) (Max):

600 mA

Vce Saturation (Max) @ Ib, Ic:

1V @ 50mA, 500mA

DC Current Gain (hFE) (Min) @ Ic, Vce:

100 @ 150mA, 10V

Frequency - Transition:

300MHz

Mounting Type:

Through Hole

Supplier Device Package:

TO-92 (TO-226)

Environmental & Export classification

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

REACH Status:

REACH Unaffected

HTSUS:

8541.21.0075

PN2222, PN2222A

PN2222A is a Preferred Device

General Purpose Transistors

NPN Silicon

MAXIMUM RATINGS

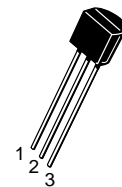
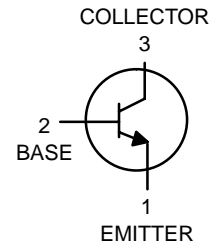
Rating	Symbol	Value	Unit
Collector-Emitter Voltage PN2222 PN2222A	V_{CEO}	30 40	Vdc
Collector-Base Voltage PN2222 PN2222A	V_{CBO}	60 75	Vdc
Emitter-Base Voltage PN2222 PN2222A	V_{EBO}	5.0 6.0	Vdc
Collector Current – Continuous	I_C	600	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°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

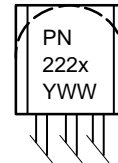
Characteristic	Symbol	Max	Unit
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$



ON Semiconductor™

<http://onsemi.com>TO-92
CASE 29
STYLE 1

MARKING DIAGRAM



PN222x= Device Code
 x = 2 or A
 Y = Year
 WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
PN2222	TO-92	5000 Units/Box
PN2222A	TO-92	5000 Units/Box
PN2222ARLRA	TO-92	2000/Tape & Reel
PN2222ARLRM	TO-92	2000/Ammo Pack
PN2222ARLRP	TO-92	2000/Ammo Pack

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

PN2222, PN2222A**ELECTRICAL CHARACTERISTICS** ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage ($I_C = 10\text{ mAdc}$, $I_B = 0$)	PN2222 PN2222A	$V_{(BR)CEO}$	30 40	– –	Vdc
Collector–Base Breakdown Voltage ($I_C = 10\ \mu\text{Adc}$, $I_E = 0$)	PN2222 PN2222A	$V_{(BR)CBO}$	60 75	– –	Vdc
Emitter–Base Breakdown Voltage ($I_E = 10\ \mu\text{Adc}$, $I_C = 0$)	PN2222 PN2222A	$V_{(BR)EBO}$	5.0 6.0	– –	Vdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 3.0\text{ Vdc}$)	PN2222A	I_{CEX}	–	10	nAdc
Collector Cutoff Current ($V_{CB} = 50\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 60\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 50\text{ Vdc}$, $I_E = 0$, $T_A = 125^\circ\text{C}$) ($V_{CB} = 50\text{ Vdc}$, $I_E = 0$, $T_A = 125^\circ\text{C}$)	PN2222 PN2222A PN2222 PN2222A	I_{CBO}	– – – –	0.01 0.01 10 10	μAdc
Emitter Cutoff Current ($V_{EB} = 3.0\text{ Vdc}$, $I_C = 0$)	PN2222A	I_{EBO}	–	100	nAdc
Base Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{EB(off)} = 3.0\text{ Vdc}$)	PN2222A	I_{BL}	–	20	nAdc
ON CHARACTERISTICS					
DC Current Gain ($I_C = 0.1\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) ($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $T_A = -55^\circ\text{C}$) ($I_C = 150\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) (Note 1.) ($I_C = 150\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) (Note 1.) ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$) (Note 1.)	PN2222A only PN2222 PN2222A	h_{FE}	35 50 75 35 100 50 30 40	– – – – 300 – – –	–
Collector–Emitter Saturation Voltage (Note 1.) ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$)	PN2222 PN2222A PN2222 PN2222A	$V_{CE(sat)}$	– – – –	0.4 0.3 1.6 1.0	Vdc
Base–Emitter Saturation Voltage (Note 1.) ($I_C = 150\text{ mAdc}$, $I_B = 15\text{ mAdc}$) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$)	PN2222 PN2222A PN2222 PN2222A	$V_{BE(sat)}$	– 0.6 – –	1.3 1.2 2.6 2.0	Vdc

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

PN2222, PN2222A**ELECTRICAL CHARACTERISTICS** ($T_A = 25^\circ\text{C}$ unless otherwise noted) (Continued)

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

SWITCHING CHARACTERISTICS PN2222A only

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

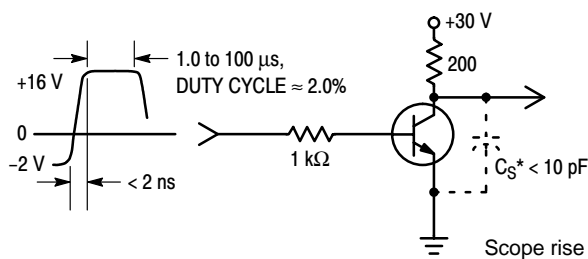
SWITCHING TIME EQUIVALENT TEST CIRCUITS

Figure 1. Turn-On Time

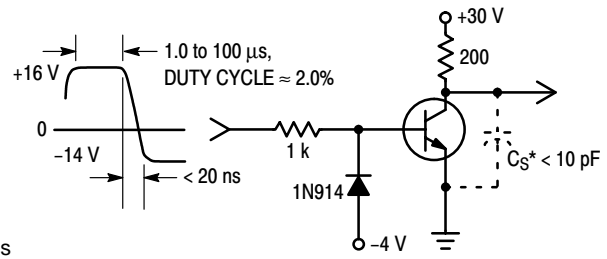


Figure 2. Turn-Off Time

PN2222, PN2222A

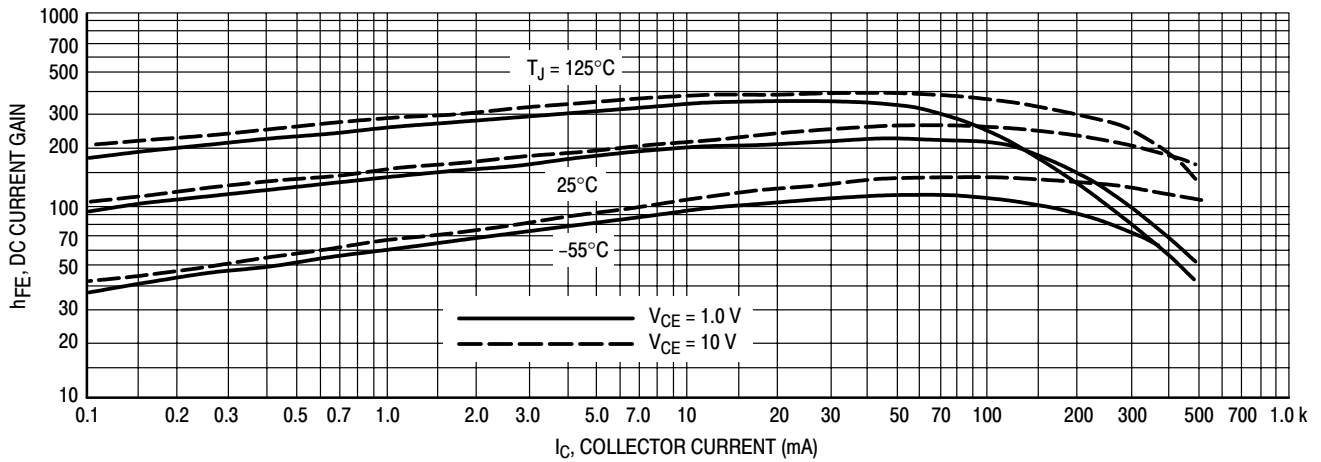


Figure 3. DC Current Gain

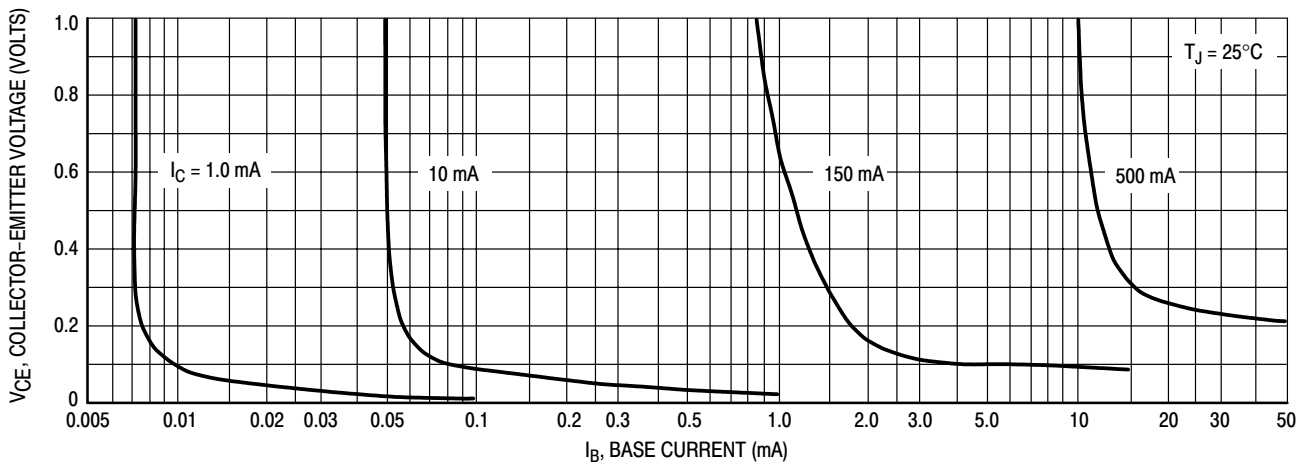


Figure 4. Collector Saturation Region

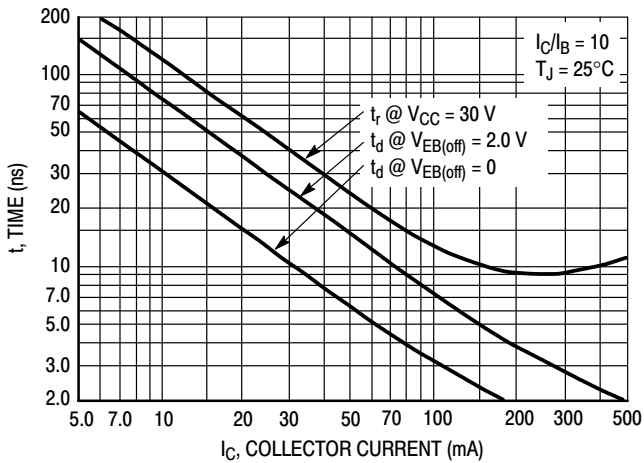


Figure 5. Turn-On Time

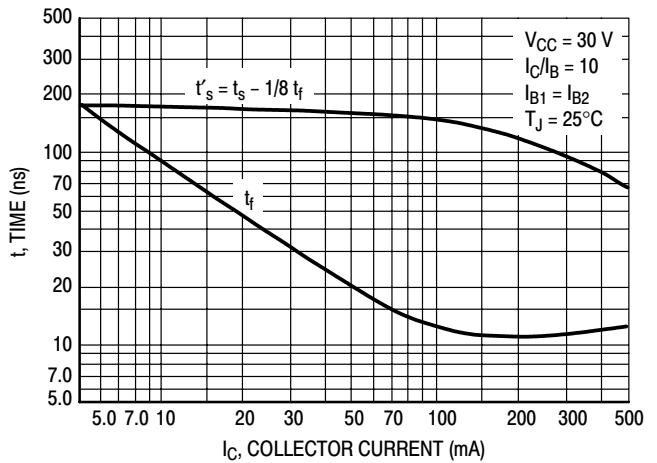


Figure 6. Turn-Off Time

PN2222, PN2222A

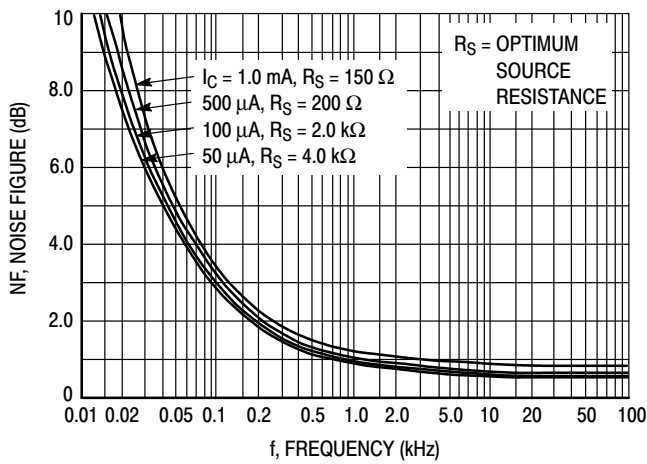


Figure 7. Frequency Effects

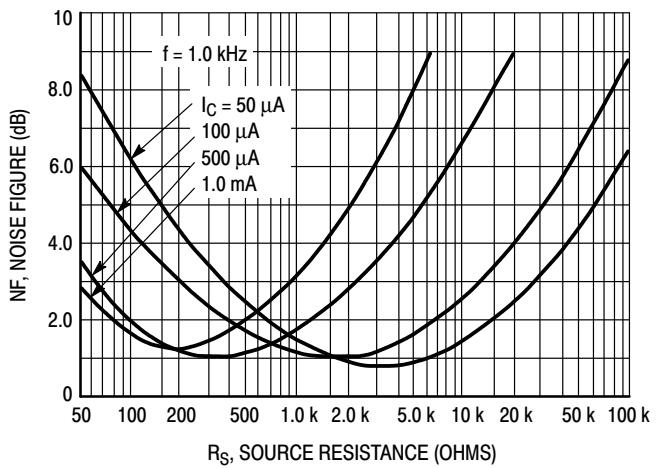


Figure 8. Source Resistance Effects

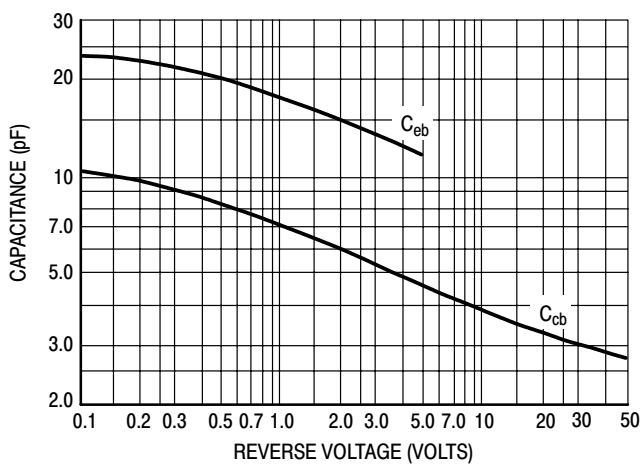


Figure 9. Capacitances

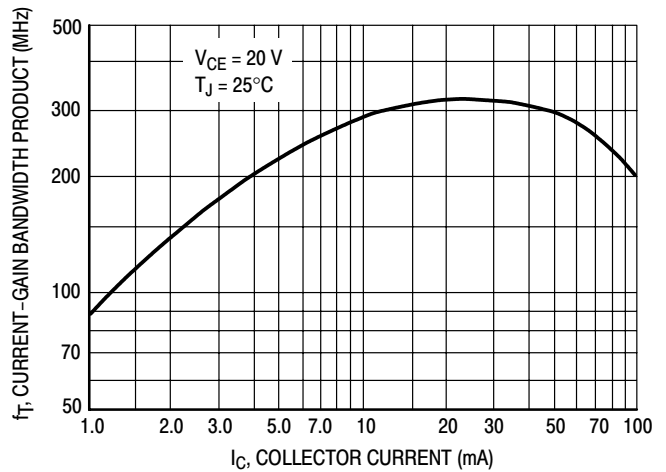


Figure 10. Current-Gain Bandwidth Product

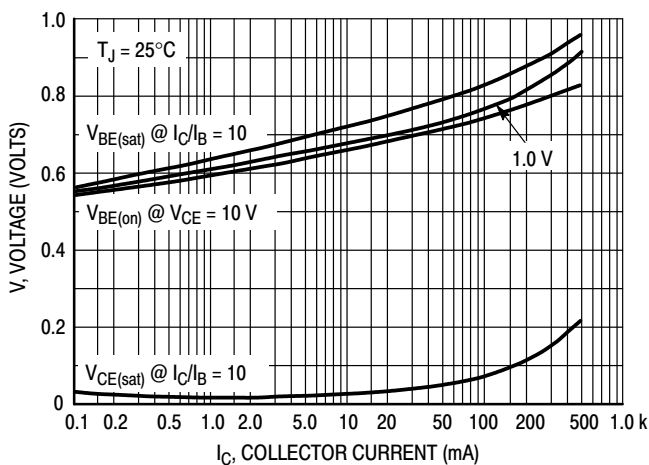


Figure 11. "On" Voltages

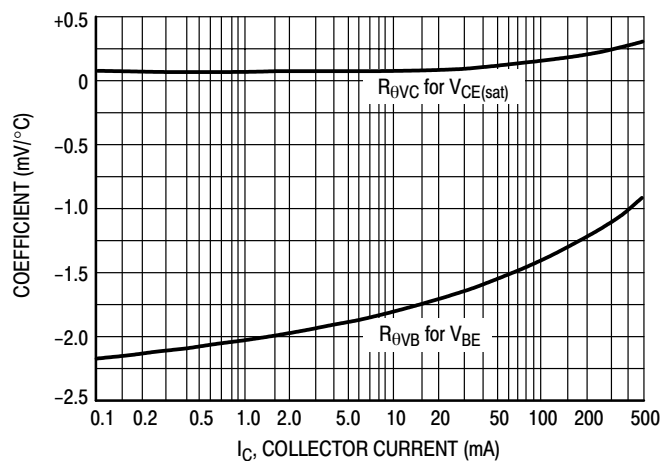
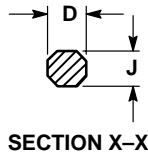
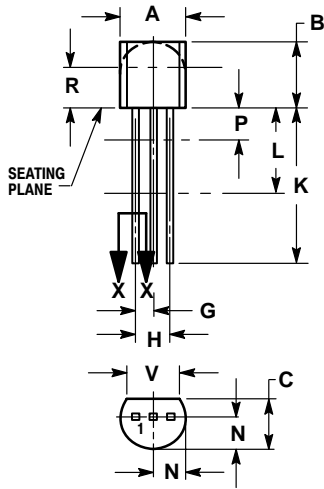


Figure 12. Temperature Coefficients

PN2222, PN2222A

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

PN2222, PN2222A

Notes

PN2222, PN2222A

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**NORTH AMERICA 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
Fax Response Line: 303-675-2167 or 800-344-3810 Toll Free USA/Canada

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

EUROPE: LDC for ON Semiconductor – European Support

German Phone: (+1) 303-308-7140 (Mon-Fri 2:30pm to 7:00pm CET)
Email: ONlit-german@hibbertco.com
French Phone: (+1) 303-308-7141 (Mon-Fri 2:00pm to 7:00pm CET)
Email: ONlit-french@hibbertco.com
English Phone: (+1) 303-308-7142 (Mon-Fri 12:00pm to 5:00pm GMT)
Email: ONlit@hibbertco.com

EUROPEAN TOLL-FREE ACCESS*: 00-800-4422-3781

*Available from Germany, France, Italy, UK, Ireland

CENTRAL/SOUTH AMERICA:

Spanish Phone: 303-308-7143 (Mon-Fri 8:00am to 5:00pm MST)
Email: ONlit-spanish@hibbertco.com
Toll-Free from Mexico: Dial 01-800-288-2872 for Access –
then Dial 866-297-9322

ASIA/PACIFIC: LDC for ON Semiconductor – Asia Support

Phone: 303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)
Toll Free from Hong Kong & Singapore:
001-800-4422-3781
Email: ONlit-asia@hibbertco.com

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.

OUR CERTIFICATE

DiGi provide top-quality products and perfect service for customer worldwide through standardization, technological innovation and continuous improvement. DiGi through third-party certification, we stricly control the quality of products and services. Welcome your RFQ to

Email: Info@DiGi-Electronics.com



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.