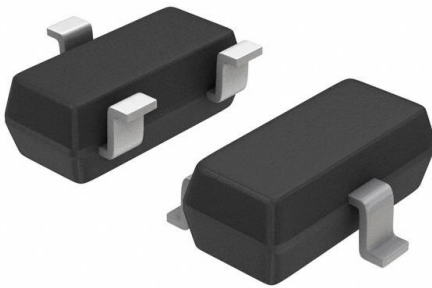


# NTR1P02T1G Datasheet

[www.digi-electronics.com](http://www.digi-electronics.com)



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

DiGi Electronics Part Number	NTR1P02T1G-DG
Manufacturer	<a href="#">onsemi</a>
Manufacturer Product Number	NTR1P02T1G
Description	MOSFET P-CH 20V 1A SOT23-3
Detailed Description	P-Channel 20 V 1A (Ta) 400mW (Ta) Surface Mount SOT-23-3 (TO-236)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

Manufacturer Product Number:

NTR1P02T1G

Series:

-

FET Type:

P-Channel

Drain to Source Voltage (Vdss):

20 V

Drive Voltage (Max Rds On, Min Rds On):

4.5V, 10V

Vgs(th) (Max) @ Id:

2.3V @ 250 $\mu$ A

Vgs (Max):

$\pm$ 20V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Supplier Device Package:

SOT-23-3 (TO-236)

Base Product Number:

NTR1P02

Manufacturer:

onsemi

Product Status:

Active

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

1A (Ta)

Rds On (Max) @ Id, Vgs:

180mOhm @ 1.5A, 10V

Gate Charge (Qg) (Max) @ Vgs:

2.5 nC @ 5 V

Input Capacitance (Ciss) (Max) @ Vds:

165 pF @ 5 V

Power Dissipation (Max):

400mW (Ta)

Mounting Type:

Surface Mount

Package / Case:

TO-236-3, SC-59, SOT-23-3

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.21.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

# NTR1P02, NVR1P02

## MOSFET – Power, P-Channel, SOT-23 -20 V, -1 A

### Features

- Ultra Low On-Resistance Provides Higher Efficiency and Extends Battery Life
  - $R_{DS(on)} = 0.180 \Omega$ ,  $V_{GS} = -10 \text{ V}$
  - $R_{DS(on)} = 0.280 \Omega$ ,  $V_{GS} = -4.5 \text{ V}$
- Power Management in Portable and Battery-Powered Products
- Miniature SOT-23 Surface Mount Package Saves Board Space
- Mounting Information for SOT-23 Package Provided
- NVR Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- DC-DC Converters
- Computers
- Printers
- PCMCIA Cards
- Cellular and Cordless Telephones

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	-20	V
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	V
Drain Current	$I_D$	-1.0	A
– Continuous @ $T_A = 25^\circ\text{C}$	$I_{DM}$	-2.67	
– Pulsed Drain Current ( $t_p \leq 1 \mu\text{s}$ )			
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	400	mW
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Thermal Resistance; Junction-to-Ambient	$R_{\theta JA}$	300	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, (1/8" from case for 10 s)	$T_L$	260	$^\circ\text{C}$

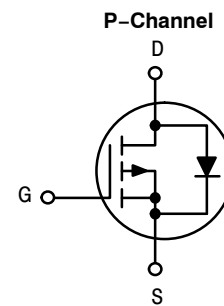
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



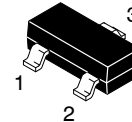
ON Semiconductor®

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

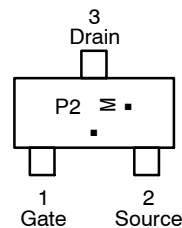
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
-20 V	148 m $\Omega$ @ -10 V	-1.0 A



### MARKING DIAGRAM/ PIN ASSIGNMENT



SOT-23  
CASE 318  
STYLE 21



P2 = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### ORDERING INFORMATION

Device	Package	Shipping†
NTR1P02T1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
NTR1P02T3G	SOT-23 (Pb-Free)	10000 / Tape & Reel
NVR1P02T1G	SOT-23 (Pb-Free)	3000 / Tape & Reel

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

**NTR1P02, NVR1P02****ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Breakdown Voltage ( $V_{GS} = 0\text{ V}$ , $I_D = -10\ \mu\text{A}$ ) (Positive Temperature Coefficient)	$V_{(BR)DSS}$	-20	32		V mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ( $V_{DS} = -20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ ) ( $V_{DS} = -20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150^\circ\text{C}$ )	$I_{DSS}$			-1.0 -10	$\mu\text{A}$
Gate-Body Leakage Current ( $V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSS}$			$\pm 100$	nA

**ON CHARACTERISTICS** (Note 1)

Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = -250\ \mu\text{A}$ ) (Negative Temperature Coefficient)	$V_{GS(th)}$	-1.1	-1.9 -4.0	-2.3	V mV/ $^\circ\text{C}$
Static Drain-to-Source On-State Resistance ( $V_{GS} = -10\text{ V}$ , $I_D = -1.5\text{ A}$ ) ( $V_{GS} = -4.5\text{ V}$ , $I_D = -0.75\text{ A}$ )	$R_{DS(on)}$		0.148 0.235	0.180 0.280	$\Omega$

**DYNAMIC CHARACTERISTICS**

Input Capacitance ( $V_{DS} = -5\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{iss}$		165		pF
Output Capacitance ( $V_{DS} = -5\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{oss}$		110		
Reverse Transfer Capacitance ( $V_{DS} = -5\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{rss}$		35		

**SWITCHING CHARACTERISTICS** (Note 2)

Turn-On Delay Time ( $V_{DD} = -15\text{ V}$ , $I_D = -1\text{ A}$ , $V_{GS} = -5\text{ V}$ , $R_G = 2.5\ \Omega$ )	$t_{d(on)}$		7.0		ns
Rise Time ( $V_{DD} = -15\text{ V}$ , $I_D = -1\text{ A}$ , $V_{GS} = -5\text{ V}$ , $R_G = 2.5\ \Omega$ )	$t_r$		9.0		
Turn-Off Delay Time ( $V_{DD} = -15\text{ V}$ , $I_D = -1\text{ A}$ , $V_{GS} = -5\text{ V}$ , $R_G = 2.5\ \Omega$ )	$t_{d(off)}$		9.0		
Fall Time ( $V_{DD} = -15\text{ V}$ , $I_D = -1\text{ A}$ , $V_{GS} = -5\text{ V}$ , $R_G = 2.5\ \Omega$ )	$t_f$		3.0		
Total Gate Charge ( $V_{DS} = -15\text{ V}$ , $V_{GS} = -5\text{ V}$ , $I_D = -0.8\text{ A}$ )	$Q_{tot}$		2.5		nC
Gate-Source Charge ( $V_{DS} = -15\text{ V}$ , $V_{GS} = -5\text{ V}$ , $I_D = -0.8\text{ A}$ )	$Q_{gs}$		0.75		
Gate-Drain Charge ( $V_{DS} = -15\text{ V}$ , $V_{GS} = -5\text{ V}$ , $I_D = -0.8\text{ A}$ )	$Q_{gd}$		1.0		

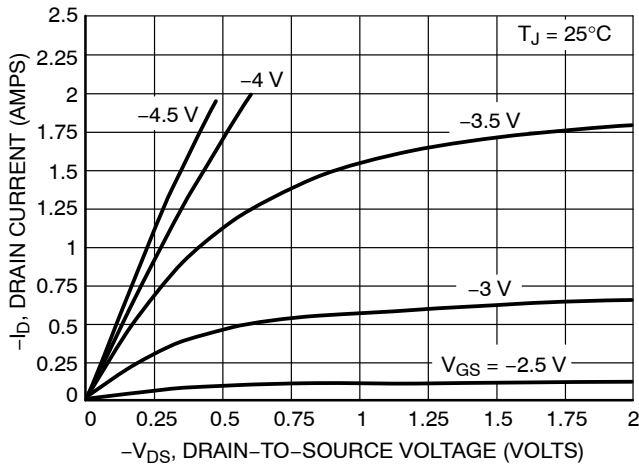
**BODY-DRAIN DIODE RATINGS** (Note 1)

Diode Forward On-Voltage (Note 2) ( $I_S = -0.6\text{ A}$ , $V_{GS} = 0\text{ V}$ ) ( $I_S = -0.6\text{ A}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150^\circ\text{C}$ )	$V_{SD}$		-0.8 -0.6	-1.0	V
Reverse Recovery Time ( $I_S = -1\text{ A}$ , $di_S/dt = 100\text{ A}/\mu\text{s}$ , $V_{GS} = 0\text{ V}$ )	$t_{rr}$		13.5		ns
	$t_a$		10.5		
	$t_b$		3.0		
Reverse Recovery Stored Charge ( $I_S = -1\text{ A}$ , $di_S/dt = 100\text{ A}/\mu\text{s}$ , $V_{GS} = 0\text{ V}$ )	$Q_{RR}$		0.008		$\mu\text{C}$

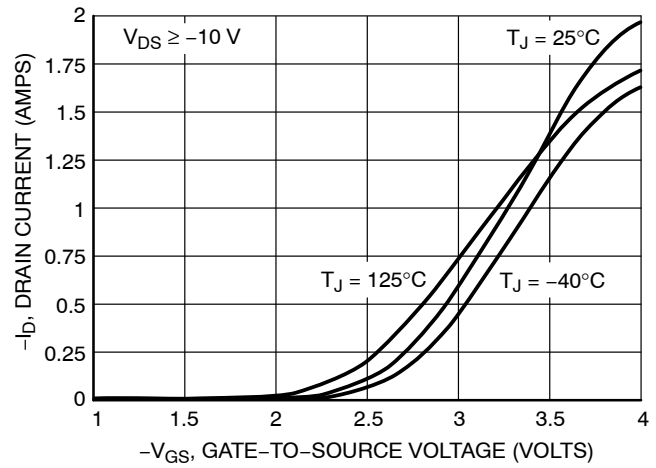
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
2. Switching characteristics are independent of operating junction temperature.

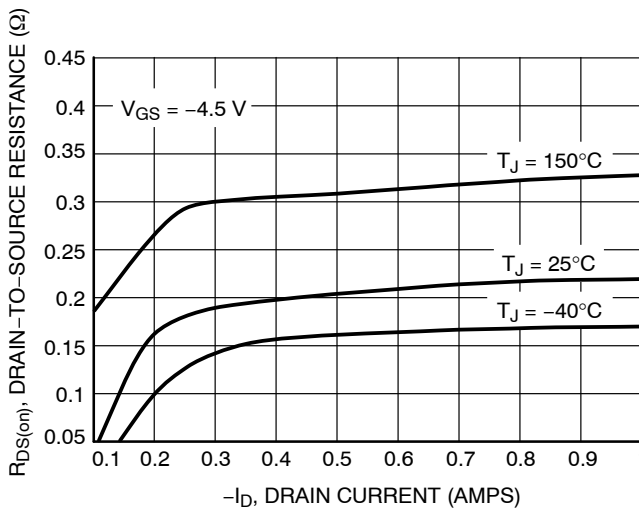
**NTR1P02, NVR1P02**



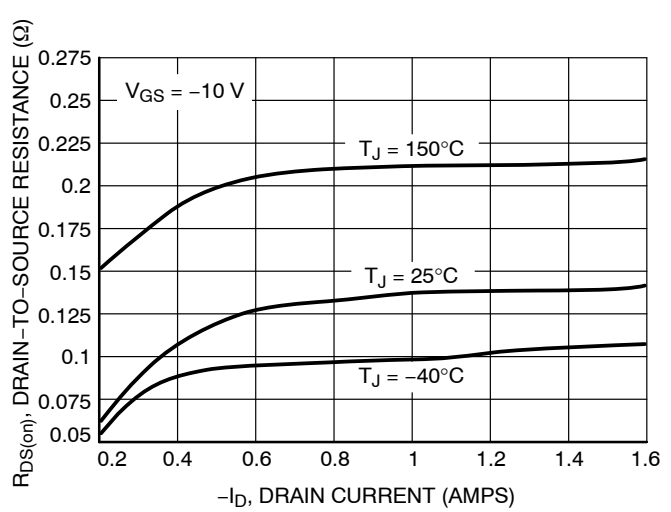
**Figure 1. On-Region Characteristics**



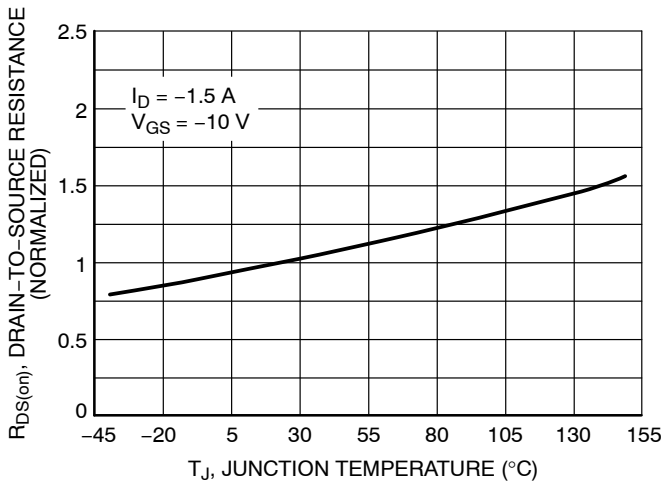
**Figure 2. Transfer Characteristics**



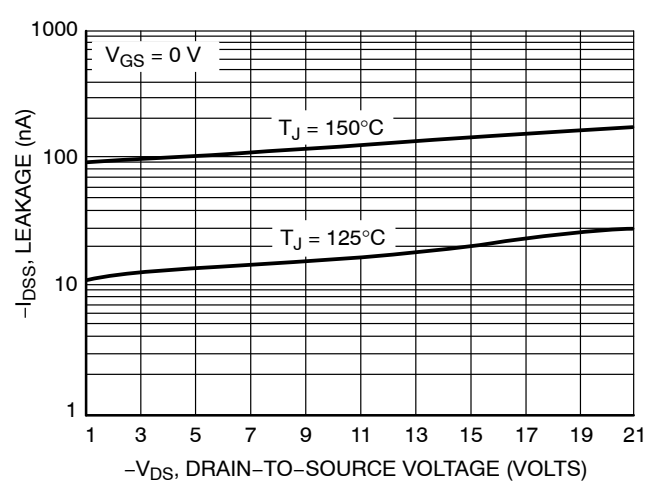
**Figure 3. On-Resistance versus Drain Current and Temperature**



**Figure 4. On-Resistance versus Drain Current and Temperature**

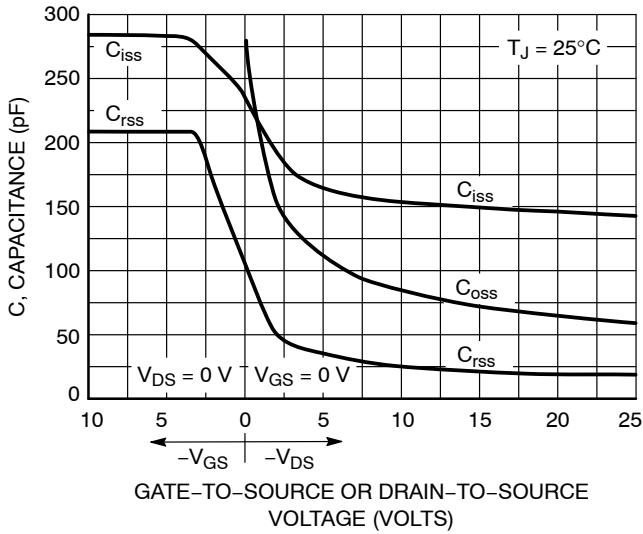


**Figure 5. On-Resistance Variation with Temperature**

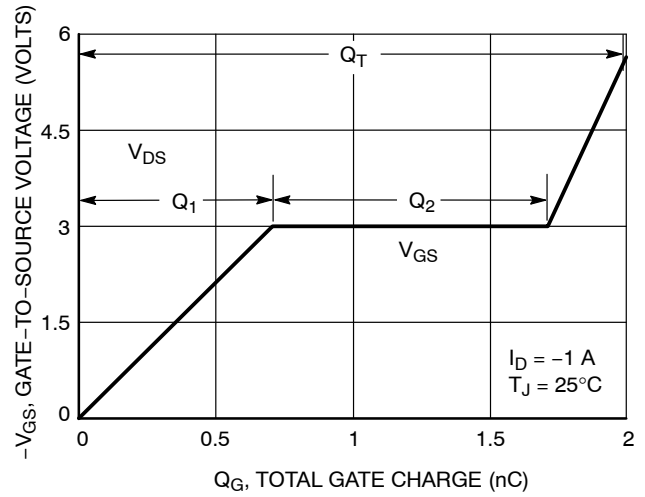


**Figure 6. Drain-to-Source Leakage Current versus Voltage**

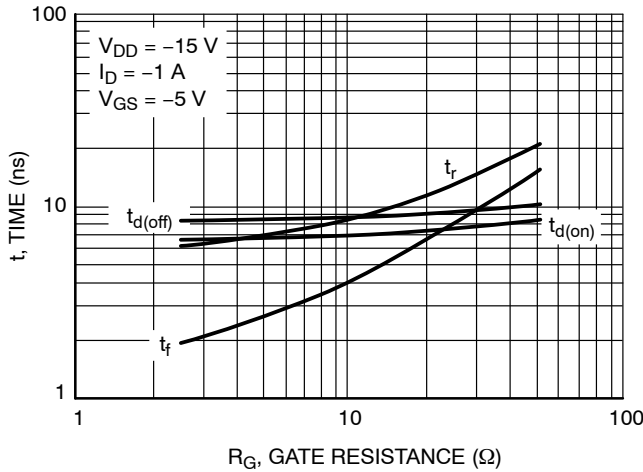
**NTR1P02, NVR1P02**



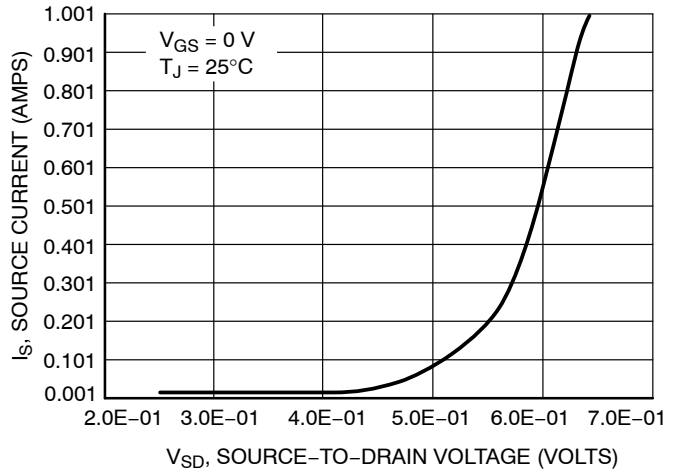
**Figure 7. Capacitance Variation**



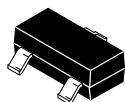
**Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge**



**Figure 9. Resistive Switching Time Variation versus Gate Resistance**



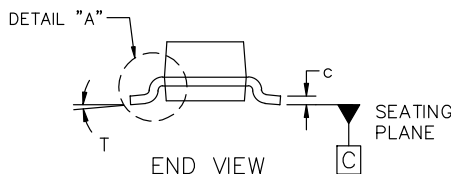
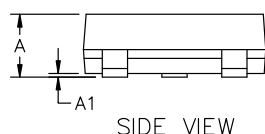
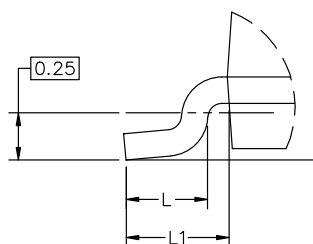
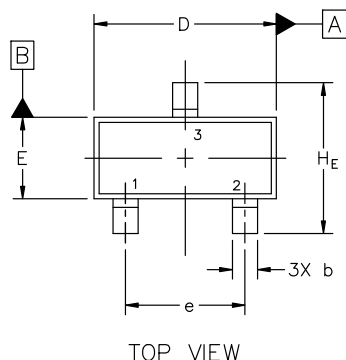
**Figure 10. Diode Forward Voltage versus Current**



SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

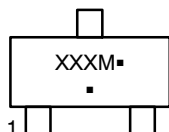


MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

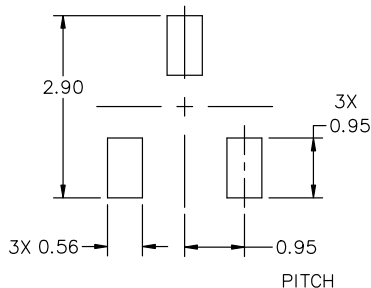
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**GENERIC MARKING DIAGRAM\***



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



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

**STYLES ON PAGE 2**

<b>DOCUMENT NUMBER:</b>	<b>98ASB42226B</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>SOT-23 (TO-236) 2.90x1.30x1.00 1.90P</b>	<b>PAGE 1 OF 2</b>

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi 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. onsemi does not convey any license under its patent rights nor the rights of others.

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

STYLE 1 THRU 5:  
 CANCELLED

STYLE 6:  
 PIN 1. BASE  
 2. EMITTER  
 3. COLLECTOR

STYLE 7:  
 PIN 1. EMITTER  
 2. BASE  
 3. COLLECTOR

STYLE 8:  
 PIN 1. ANODE  
 2. NO CONNECTION  
 3. CATHODE

STYLE 9:  
 PIN 1. ANODE  
 2. ANODE  
 3. CATHODE

STYLE 10:  
 PIN 1. DRAIN  
 2. SOURCE  
 3. GATE

STYLE 11:  
 PIN 1. ANODE  
 2. CATHODE  
 3. CATHODE-ANODE

STYLE 12:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. ANODE

STYLE 13:  
 PIN 1. SOURCE  
 2. DRAIN  
 3. GATE

STYLE 14:  
 PIN 1. CATHODE  
 2. GATE  
 3. ANODE

STYLE 15:  
 PIN 1. GATE  
 2. CATHODE  
 3. ANODE

STYLE 16:  
 PIN 1. ANODE  
 2. CATHODE  
 3. CATHODE

STYLE 17:  
 PIN 1. NO CONNECTION  
 2. ANODE  
 3. CATHODE

STYLE 18:  
 PIN 1. NO CONNECTION  
 2. CATHODE  
 3. ANODE

STYLE 19:  
 PIN 1. CATHODE  
 2. ANODE  
 3. CATHODE-ANODE

STYLE 20:  
 PIN 1. CATHODE  
 2. ANODE  
 3. GATE

STYLE 21:  
 PIN 1. GATE  
 2. SOURCE  
 3. DRAIN

STYLE 22:  
 PIN 1. RETURN  
 2. OUTPUT  
 3. INPUT

STYLE 23:  
 PIN 1. ANODE  
 2. ANODE  
 3. CATHODE

STYLE 24:  
 PIN 1. GATE  
 2. DRAIN  
 3. SOURCE

STYLE 25:  
 PIN 1. ANODE  
 2. CATHODE  
 3. GATE

STYLE 26:  
 PIN 1. CATHODE  
 2. ANODE  
 3. NO CONNECTION

STYLE 27:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. CATHODE

STYLE 28:  
 PIN 1. ANODE  
 2. ANODE  
 3. ANODE

<b>DOCUMENT NUMBER:</b>	<b>98ASB42226B</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>SOT-23 (TO-236) 2.90x1.30x1.00 1.90P</b>	<b>PAGE 2 OF 2</b>

**onsemi** and **ONSEMI** are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** 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. **onsemi** does not convey any license under its patent rights nor the rights of others.



**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

#### ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS:**

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

**ONLINE SUPPORT:** [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at [www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)

## 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](mailto:Info@DiGi-Electronics.com)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.