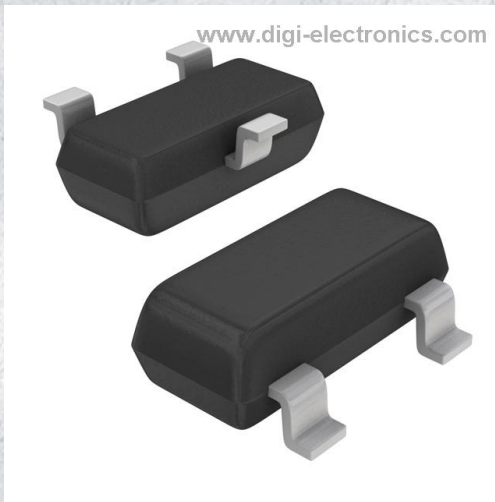


NTR4501NT1G Datasheet



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

DiGi Electronics Part Number	NTR4501NT1G-DG
Manufacturer	onsemi
Manufacturer Product Number	NTR4501NT1G
Description	MOSFET N-CH 20V 3.2A SOT23-3
Detailed Description	N-Channel 20 V 3.2A (Ta) 1.25W (Tj) Surface Mount SOT-23-3 (TO-236)



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:

NTR4501NT1G

Series:

-

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

20 V

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

1.8V, 4.5V

Vgs(th) (Max) @ Id:

1.2V @ 250 μ A

Vgs (Max):

\pm 12V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Supplier Device Package:

SOT-23-3 (TO-236)

Base Product Number:

NTR4501

Manufacturer:

onsemi

Product Status:

Active

Technology:

MOSFET (Metal Oxide)

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

3.2A (Ta)

Rds On (Max) @ Id, Vgs:

80mOhm @ 3.6A, 4.5V

Gate Charge (Qg) (Max) @ Vgs:

6 nC @ 4.5 V

Input Capacitance (Ciss) (Max) @ Vds:

200 pF @ 10 V

Power Dissipation (Max):

1.25W (Tj)

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:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

MOSFET - Power, Single N-Channel, SOT-23

20 V, 3.2 A

NTR4501N, NVR4501N

Features

- Leading Planar Technology for Low Gate Charge / Fast Switching
- 2.5 V Rated for Low Voltage Gate Drive
- SOT-23 Surface Mount for Small Footprint
- 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

- Load/Power Switch for Portables
- Load/Power Switch for Computing
- DC-DC Conversion

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		V_{DSS}	20	V	
Gate-to-Source Voltage		V_{GS}	± 12	V	
Continuous Drain Current (Note 1)	Steady State	I_D	$T_A = 25^\circ\text{C}$	3.2	A
			$T_A = 85^\circ\text{C}$	2.4	A
Steady State Power Dissipation (Note 1)	Steady State	P_D	1.25	W	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	10.0	A	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$	
Continuous Source Current (Body Diode)		I_S	1.6	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	$^\circ\text{C}$	

THERMAL RESISTANCE RATINGS

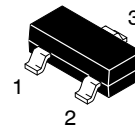
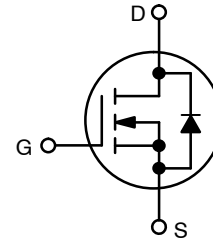
Parameter	Symbol	Max	Unit
Junction-to-Ambient (Note 1)	$R_{\theta JA}$	100	$^\circ\text{C}/\text{W}$
Junction-to-Ambient (Note 2)	$R_{\theta JA}$	300	

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.

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size.

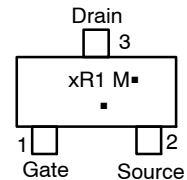
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D Max (Note 1)
20 V	70 m Ω @ 4.5 V	3.6 A
	88 m Ω @ 2.5 V	3.1 A

N-Channel



**SOT-23
CASE 318
STYLE 21**

MARKING DIAGRAM & PIN ASSIGNMENT



- TR1 = Device Code for NTR4501N
- VR1 = Device Code for NVR4501N
- M = Date Code*
- = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping [†]
NTR4501NT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
NVR4501NT1G	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 Specifications Brochure, BRD8011/D.

NTR4501N, NVR4501N**ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage (Note 3)	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	20	24.5		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			22		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$			1.5	μA
		$V_{DS} = 16\text{ V}, T_J = 85^\circ\text{C}$			10	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			± 100	nA

ON CHARACTERISTICS

Gate Threshold Voltage (Note 3)	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	0.65		1.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-2.3		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 3.6\text{ A}$		70	80	m Ω
		$V_{GS} = 2.5\text{ V}, I_D = 3.1\text{ A}$		88	105	
Forward Transconductance	g_{FS}	$V_{DS} = 5.0\text{ V}, I_D = 3.6\text{ A}$		9		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 10\text{ V}$		200		pF
Output Capacitance	C_{oss}			80		
Reverse Transfer Capacitance	C_{rss}			50		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.6\text{ A}$		2.4	6.0	nC
Gate-to-Source Gate Charge	Q_{GS}			0.5		
Gate-to-Drain Charge	Q_{GD}			0.6		

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.6\text{ A}, R_G = 6.0\ \Omega$		6.5	13	ns
Rise Time	t_r			12	24	
Turn-Off Delay Time	$t_{d(off)}$			12	24	
Fall Time	t_f			3	6	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_{SD} = 1.6\text{ A}$		0.8	1.2	V
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 1.6\text{ A}$		7.1		ns
Charge Time	t_a			5		
Discharge Time	t_b			1.9		
Reverse Recovery Charge	Q_{RR}			3.0		

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.

3. Pulse Test: Pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

NTR4501N, NVR4501N

TYPICAL CHARACTERISTICS

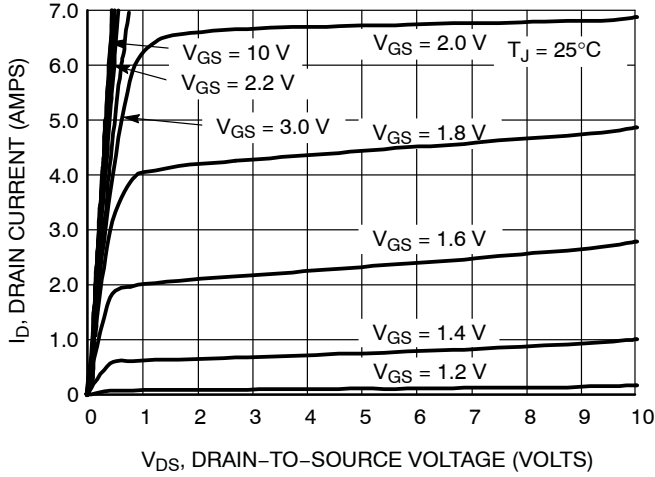


Figure 1. On-Region Characteristics

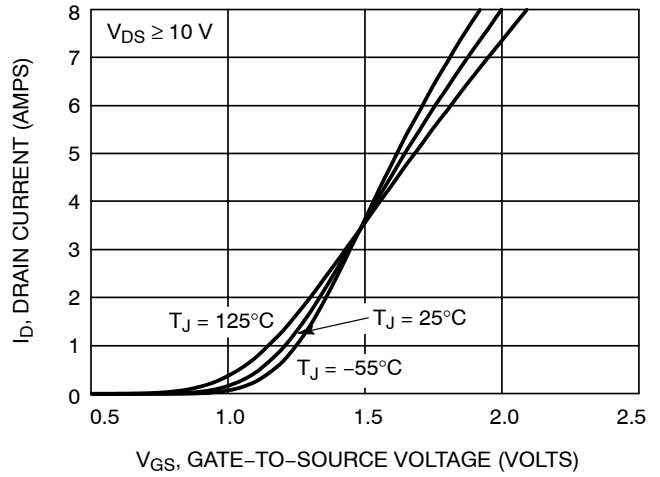


Figure 2. Transfer Characteristics

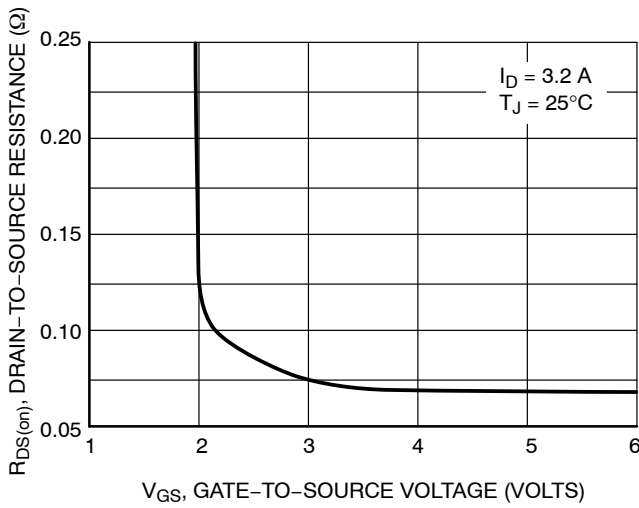


Figure 3. On-Resistance vs. Gate-to-Source Voltage

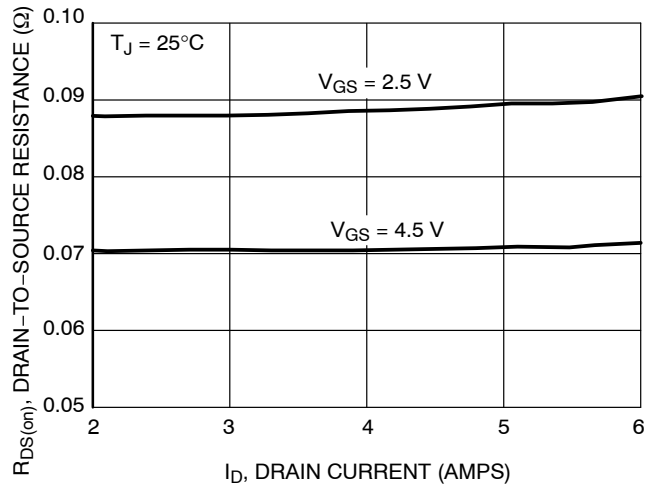


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

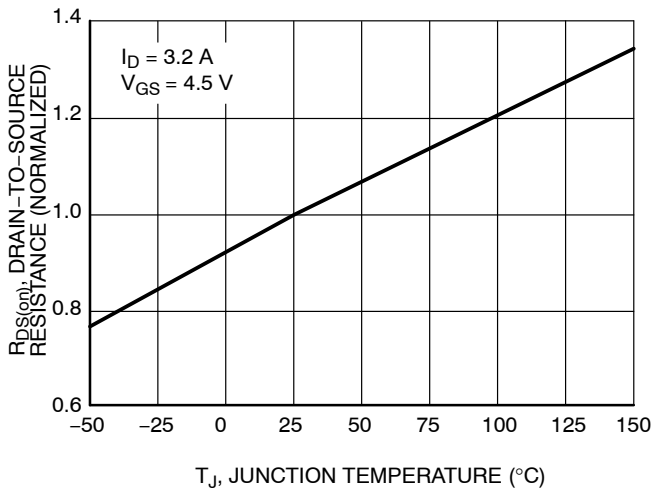


Figure 5. On-Resistance Variation with Temperature

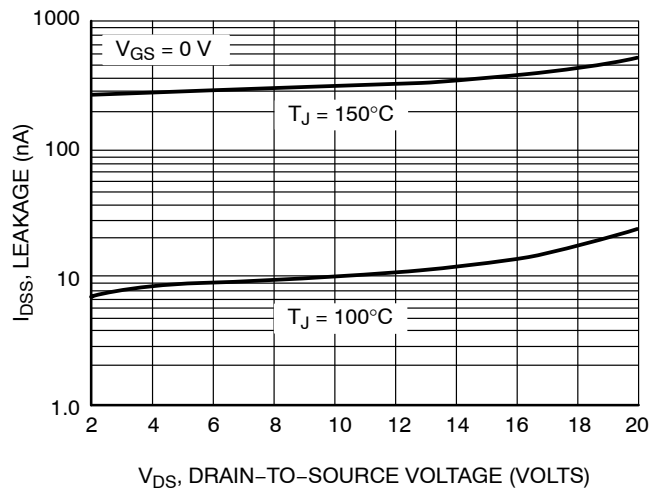


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTR4501N, NVR4501N

TYPICAL CHARACTERISTICS

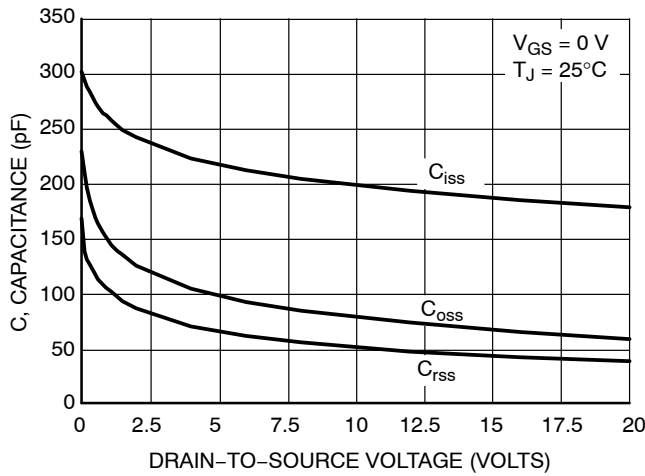


Figure 7. Capacitance Variation

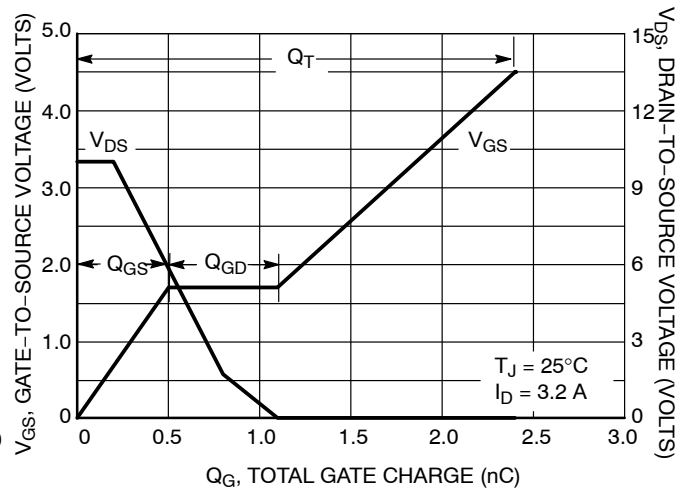


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

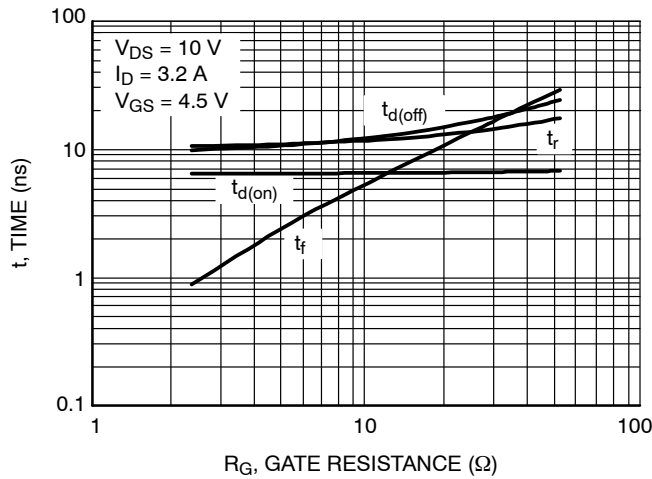


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

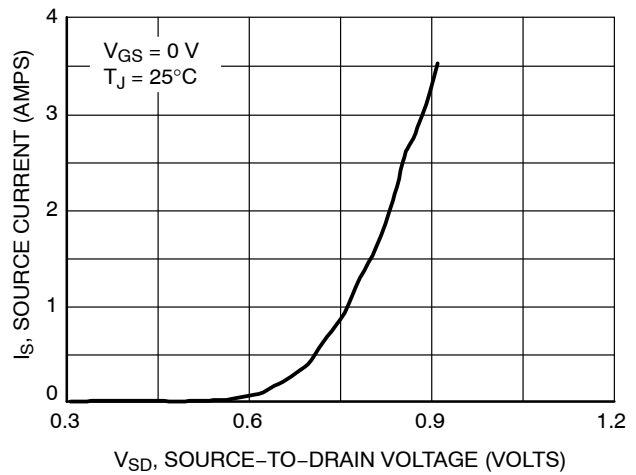


Figure 10. Diode Forward Voltage vs. Current

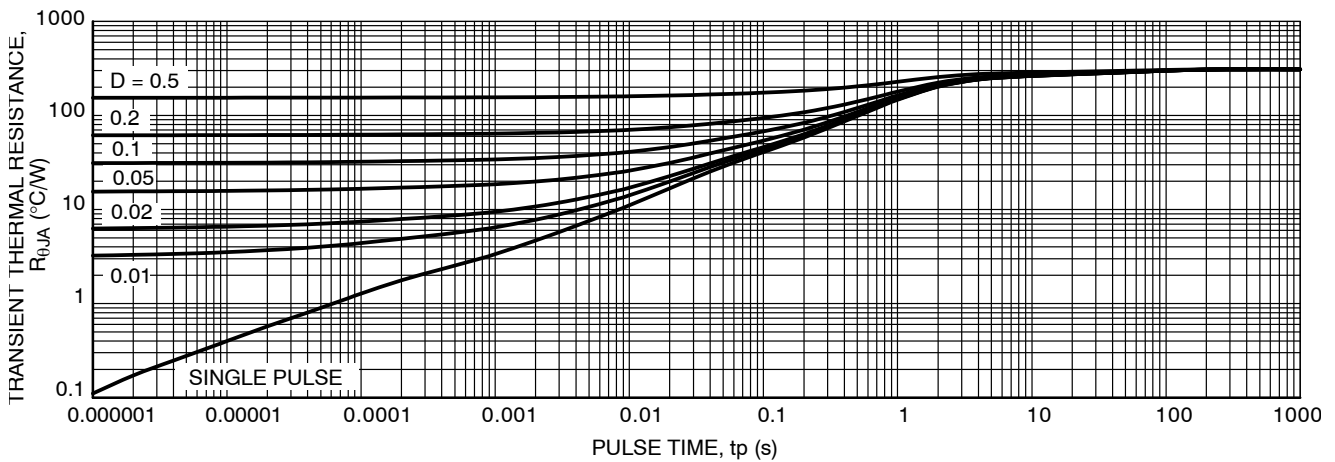


Figure 11. Thermal Response

NTR4501N, NVR4501N

TYPICAL CHARACTERISTICS

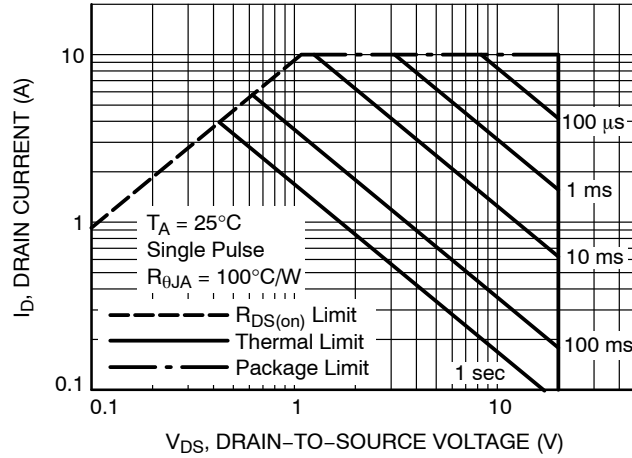
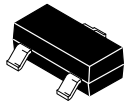


Figure 12. Safe Operating Area (SOA)



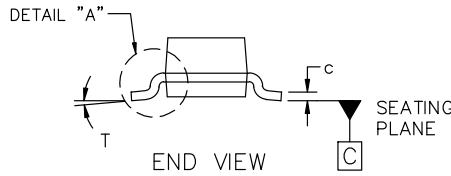
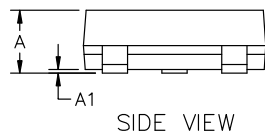
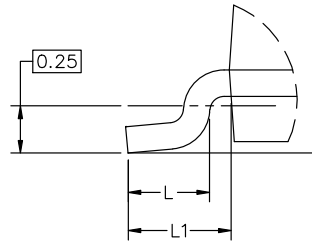
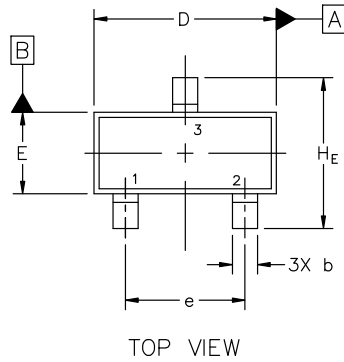
**MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS**



SCALE 4:1

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

DATE 14 AUG 2024

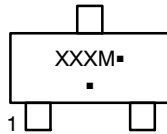


MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

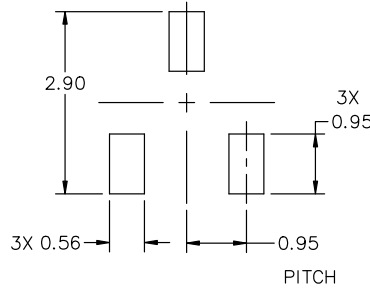
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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

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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

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