

NTR2101P

Small Signal MOSFET

–8.0 V, –3.7 A, Single P-Channel, SOT-23



Features

- Leading Trench Technology for Low $R_{DS(on)}$
- –1.8 V Rated for Low Voltage Gate Drive
- SOT-23 Surface Mount for Small Footprint (3 x 3 mm)
- This is a Pb-Free Device

Applications

- High Side Load Switch
- DC-DC Conversion
- Cell Phone, Notebook, PDAs, etc.

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

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	–8.0	V
Gate-to-Source Voltage		V_{GS}	± 8.0	V
Continuous Drain Current (Note 1)	$t \leq 5 \text{ s}$	I_D	–3.7	A
			–3.0	
Power Dissipation (Note 1)	$t \leq 5 \text{ s}$	P_D	0.96	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	–11	A
Operating Junction and Storage Temperature		T_J, T_{STG}	–55 to 150	°C
Source Current (Body Diode)		I_S	–1.2	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State	$R_{\theta JA}$	160	°C/W
Junction-to-Ambient – $t \leq 5 \text{ s}$	$R_{\theta JA}$	130	

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.

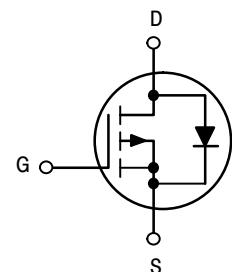
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

ON Semiconductor®

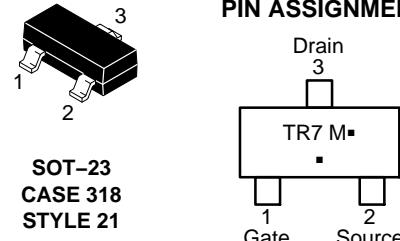
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$V_{(BR)DSS}$	$R_{DS(on)} \text{ Typ}$	$I_D \text{ Max}$
–8.0 V	39 mΩ @ –4.5 V	–3.7 A
	52 mΩ @ –2.5 V	
	79 mΩ @ –1.8 V	

P-Channel



MARKING DIAGRAM & PIN ASSIGNMENT



TR7 = Specific Device Code

M = Date Code*

▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping [†]
NTR2101PT1G	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.

NTR2101P

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}$, $I_D = -250 \mu\text{A}$	-8.0			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}/T_J}$			10		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}$, $V_{\text{DS}} = -6.4 \text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 125^\circ\text{C}$		-100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}$, $V_{\text{GS}} = \pm 8.0 \text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}$, $I_D = -250 \mu\text{A}$	-0.40		-1.0	V
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})/T_J}$			2.7		$\text{mV}/^\circ\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = -4.5 \text{ V}$, $I_D = -3.5 \text{ A}$		39	52	$\text{m}\Omega$
		$V_{\text{GS}} = -2.5 \text{ V}$, $I_D = -3.0 \text{ A}$		52	72	
		$V_{\text{GS}} = -1.8 \text{ V}$, $I_D = -2.0 \text{ A}$		79	120	
Forward Transconductance	g_{FS}	$V_{\text{GS}} = -5.0 \text{ V}$, $I_D = -3.5 \text{ A}$		9.0		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{\text{GS}} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$, $V_{\text{DS}} = -4.0 \text{ V}$		1173		pF
Output Capacitance	C_{OSS}			289		
Reverse Transfer Capacitance	C_{RSS}			218		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = -4.5 \text{ V}$, $V_{\text{DS}} = -4.0 \text{ V}$, $I_D = -3.5 \text{ A}$		12	15	nC
Gate-to-Source Charge	Q_{GS}			3.8		
Gate-to-Drain Charge	Q_{GD}			2.5		

SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{\text{d}(\text{on})}$	$V_{\text{GS}} = -4.5 \text{ V}$, $V_{\text{DD}} = -4.0 \text{ V}$, $I_D = -1.2 \text{ A}$, $R_G = 6.0 \Omega$		7.4	15	ns
Rise Time	t_r			15.75	25	
Turn-Off Delay Time	$t_{\text{d}(\text{off})}$			38	58	
Fall Time	t_f			31	51	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{\text{GS}} = 0 \text{ V}$, $I_S = -1.2 \text{ A}$	$T_J = 25^\circ\text{C}$		-0.73	-1.2	V
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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.

2. Pulse Test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

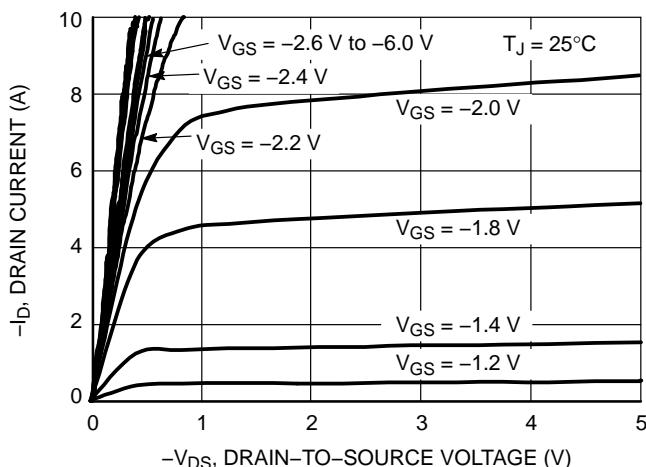


Figure 1. On-Region Characteristics

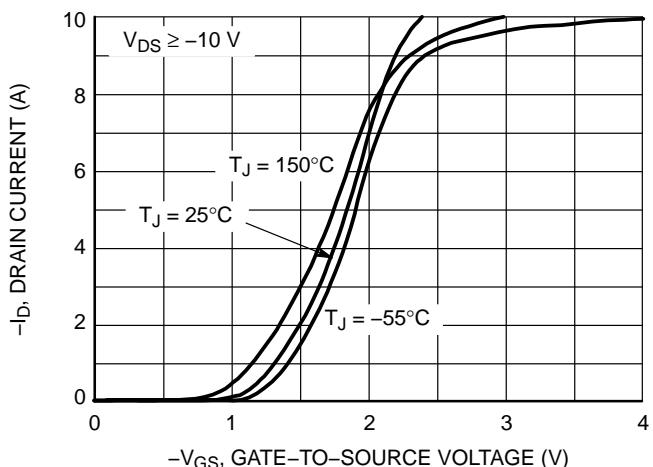


Figure 2. Transfer Characteristics

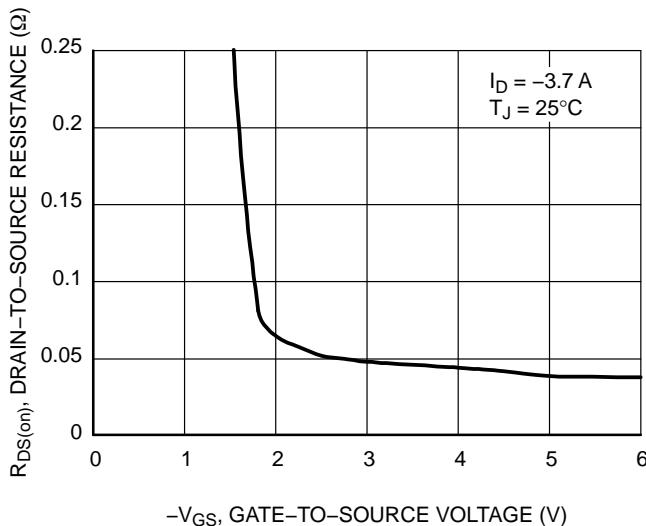


Figure 3. On-Resistance versus Gate-to-Source Voltage

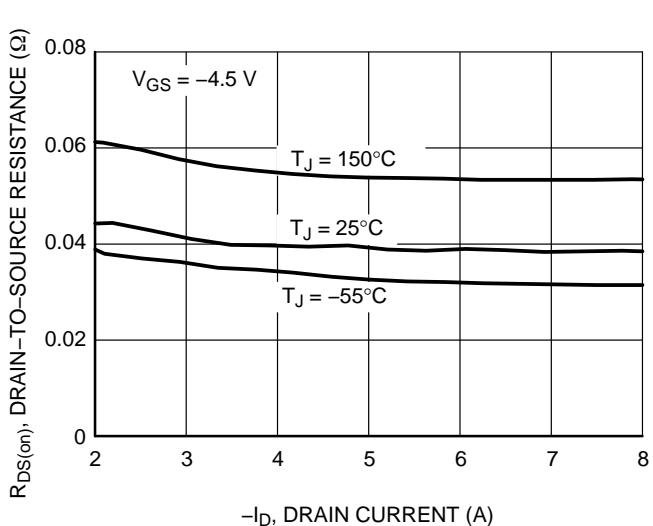


Figure 4. On-Resistance versus Drain Current and Gate Voltage

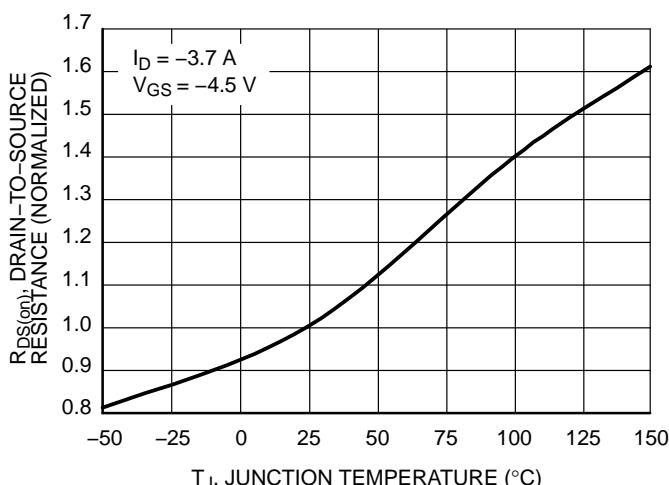


Figure 5. On-Resistance Variation with Temperature

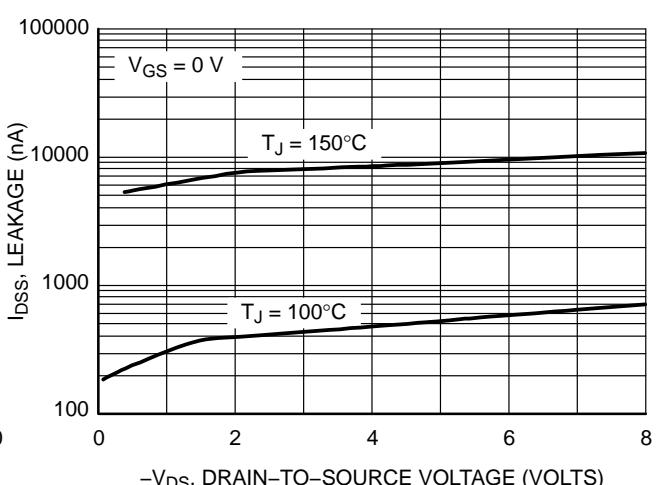
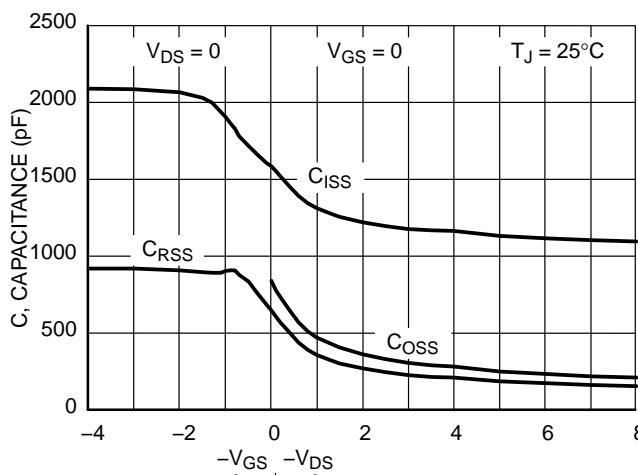


Figure 6. Drain-to-Source Leakage Current versus Voltage

TYPICAL CHARACTERISTICS



GATE-TO-SOURCE OR DRAIN-TO-SOURCE VOLTAGE (V)

Figure 7. Capacitance Variation

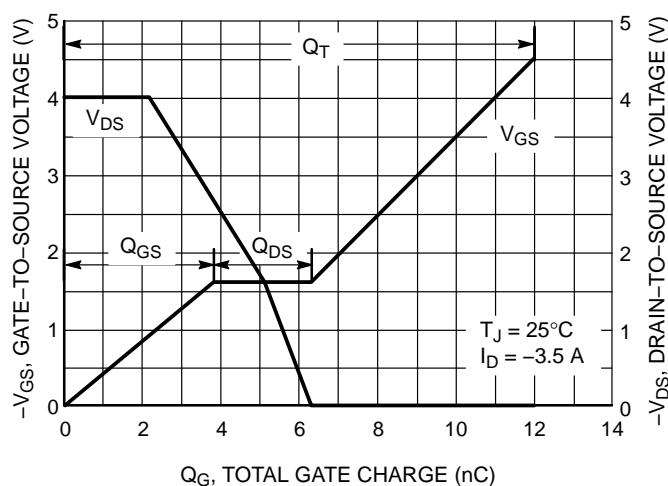


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

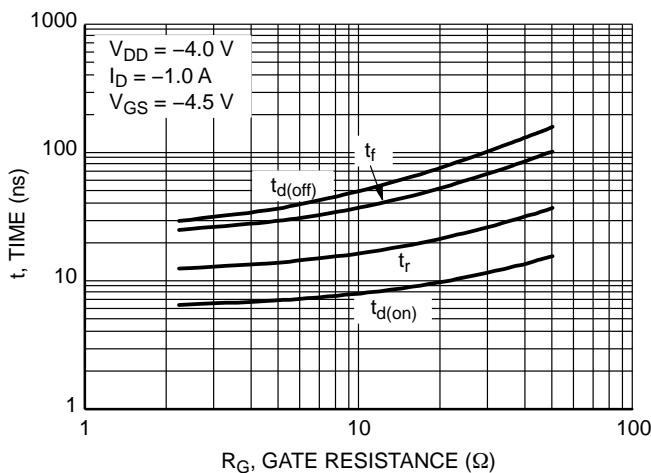


Figure 9. Resistive Switching Time Variation versus Gate Resistance

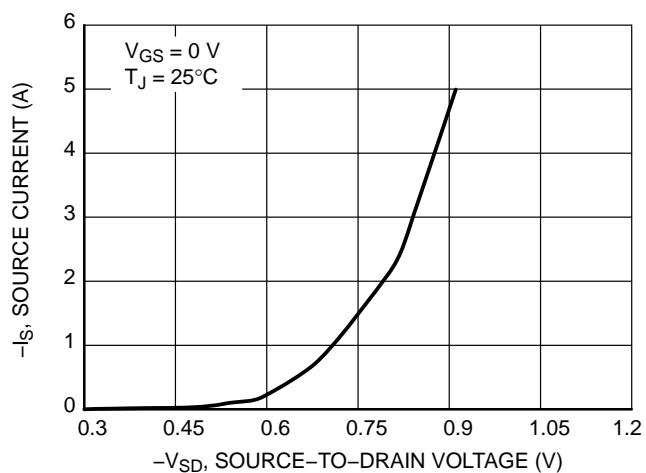


Figure 10. Diode Forward Voltage versus Current

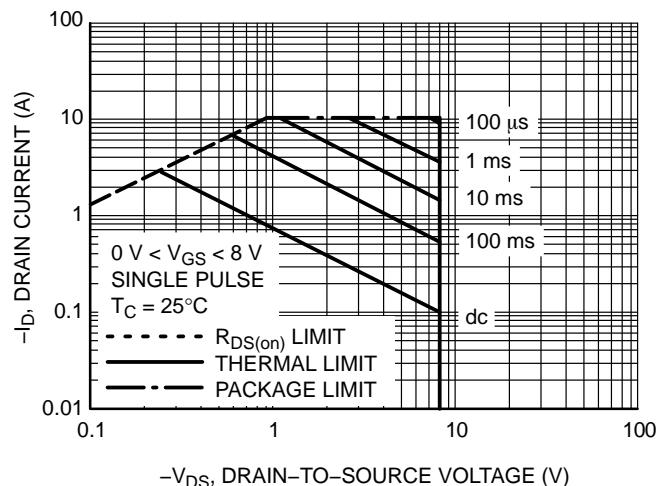


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS

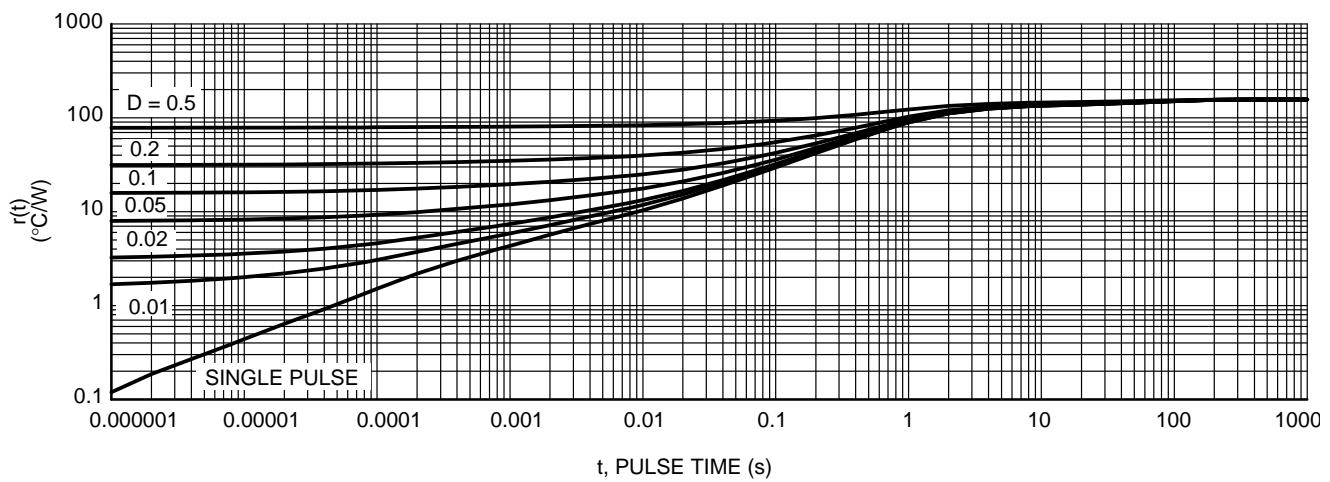
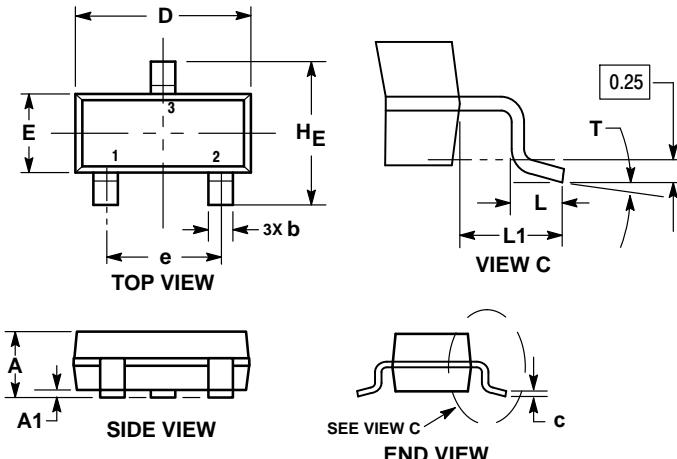


Figure 12. Thermal Response

PACKAGE DIMENSIONS

SOT-23 (TO-236)
CASE 318-08
ISSUE AR

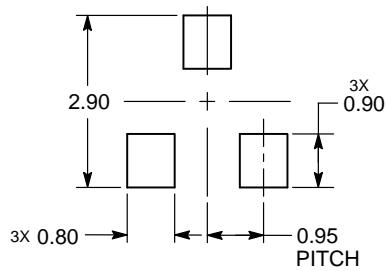
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: 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.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	—	10°	0°	—	10°

STYLE 21:

1. GATE
2. SOURCE
3. DRAIN

RECOMMENDED
SOLDERING FOOTPRINT*

DIMENSIONS: MILLIMETERS

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

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