

MOSFET – Power, Single N-Channel, STD Gate, μ 8FL 40 V, 2.45 m Ω , 114 A

NVTFWS002N04XM

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (3.3 x 3.3 mm) for Compact Design
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Motor Drive
- Battery Protection
- Synchronous Rectification

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

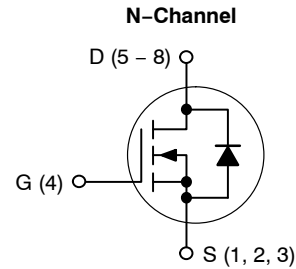
Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	40	V
Gate-to-Source Voltage			V_{GS}	± 20	V
Continuous Drain Current	Steady State	$T_C = 25^{\circ}\text{C}$	I_D	114	A
		$T_C = 100^{\circ}\text{C}$		81	
Power Dissipation		$T_C = 25^{\circ}\text{C}$	P_D	62	W
Pulsed Drain Current	$T_A = 25^{\circ}\text{C}, t_p = 10\text{ }\mu\text{s}$		I_D	650	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +175	$^{\circ}\text{C}$
Source Current (Body Diode)			I_S	87	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 6.3\text{ A}$)			E_{AS}	183	mJ
Lead Temperature for Soldering Purposes			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.

THERMAL RESISTANCE MAXIMUM RATINGS

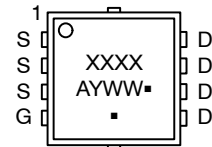
Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	2.43	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State	$R_{\theta JA}$	47	

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	2.45 m Ω @ 10 V	114 A



WDFNW8
(Full-Cut μ 8FL WF)
CASE 515AN

MARKING DIAGRAM



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
■ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

NVTFWS002N04XM

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 1 mA, T _J = 25°C	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	ΔV _{(BR)DSS} /ΔT _J	I _D = 1 mA, Referenced to 25°C		15		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 40 V, T _J = 25°C			1	μA
		V _{GS} = 0 V, V _{DS} = 40 V, T _J = 125°C			20	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V			100	nA

ON CHARACTERISTICS (Note 1)

Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 11 A, T _J = 25°C		2.1	2.45	mΩ
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 50 μA, T _J = 25°C	2.5		3.5	V
Gate Threshold Voltage Temperature Coefficient	ΔV _{GS(TH)} /ΔT _J	V _{GS} = V _{DS} , I _D = 50 μA		-7.3		mV/°C
Forward Transconductance	g _{FS}	V _{DS} = 5 V, I _D = 11 A		59		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C _{iss}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 25 V		1364		pF
Output Capacitance	C _{oss}			880		
Reverse Transfer Capacitance	C _{rss}			18		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 32 V, I _D = 11 A		22		nC
Threshold Gate Charge	Q _{G(TH)}			4.0		
Gate-to-Source Charge	Q _{GS}			6.0		
Gate-to-Drain Charge	Q _{GD}			4.2		
Gate Resistance	R _G	f = 1 MHz		0.8		Ω

SWITCHING CHARACTERISTICS (Note 2)

Turn-On Delay Time	t _{d(on)}	Resistive Load, V _{GS} = 10 V, V _{DS} = 32 V, I _D = 11 A, R _G = 0 Ω		6		ns
Rise Time	t _r			10		
Turn-Off Delay Time	t _{d(off)}			10		
Fall Time	t _f			12		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 11 A, T _J = 25°C		0.78	1.2	V
		V _{GS} = 0 V, I _S = 11 A, T _J = 125°C		0.62		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 11 A, V _{DS} = 32 V		38		ns
Charge Time	t _a			13		
Discharge Time	t _b			25		
Reverse Recovery Charge	Q _{RR}			25		nC

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 ≤ 300 μs, Duty Cycle ≤ 2%.
2. Switching characteristics are independent of operating junction temperatures.



TYPICAL CHARACTERISTICS

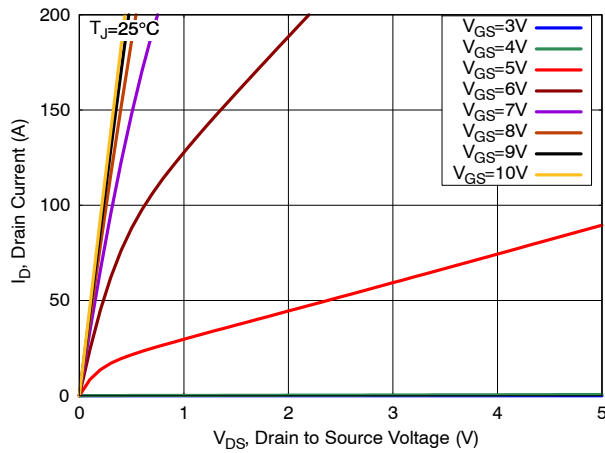


Figure 1. On-Region Characteristics

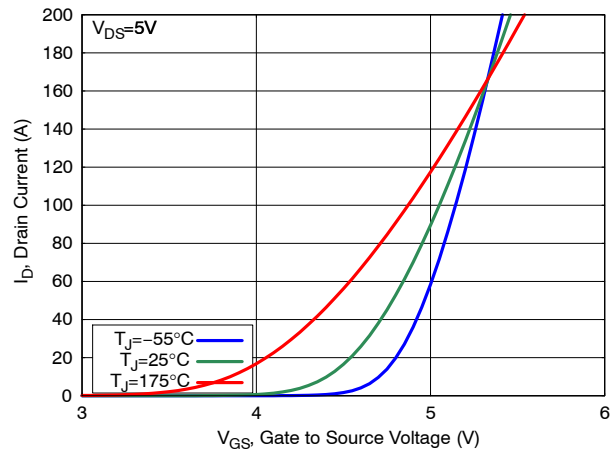


Figure 2. Transfer Characteristics

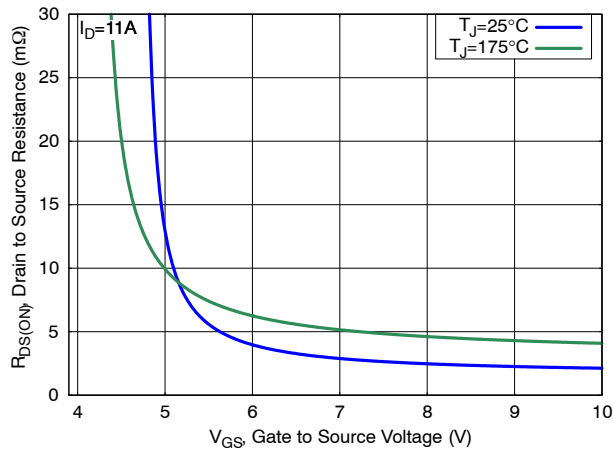


Figure 3. On-Resistance vs. Gate Voltage

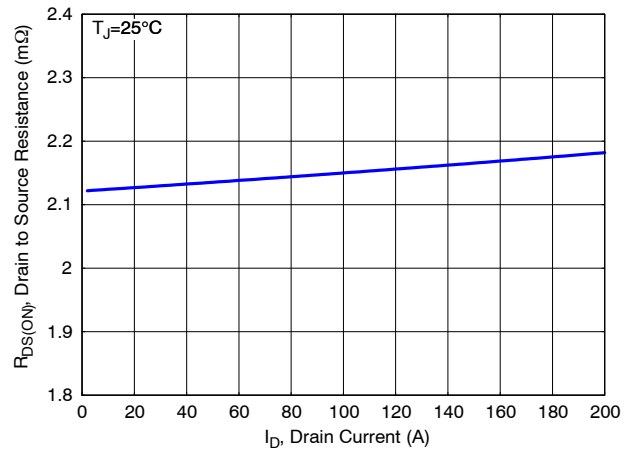


Figure 4. On-Resistance vs. Drain Current

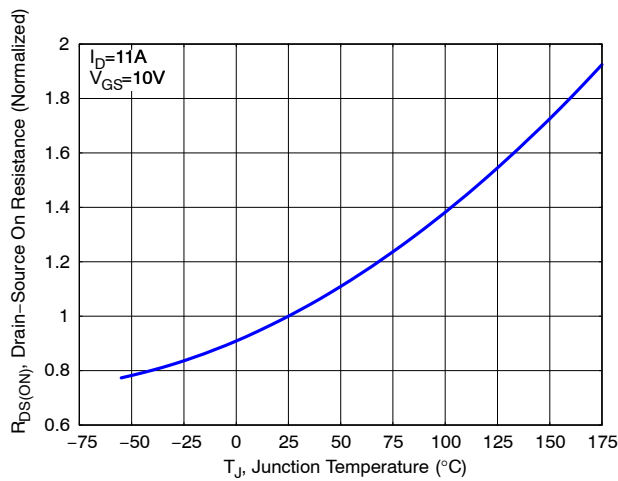


Figure 5. Normalized On-Resistance vs. Junction Temperature

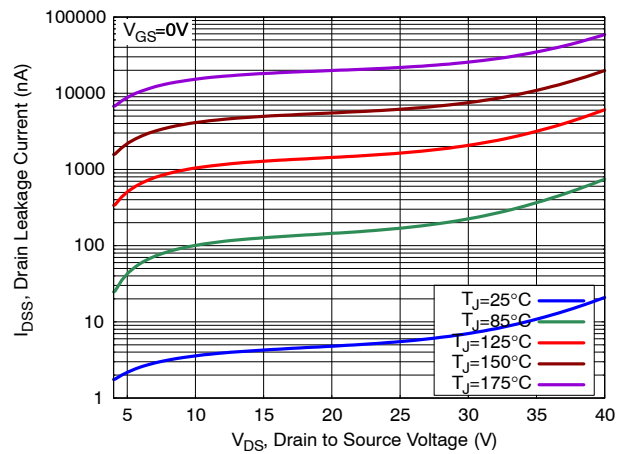


Figure 6. Drain Leakage Current vs. Drain Voltage

TYPICAL CHARACTERISTICS

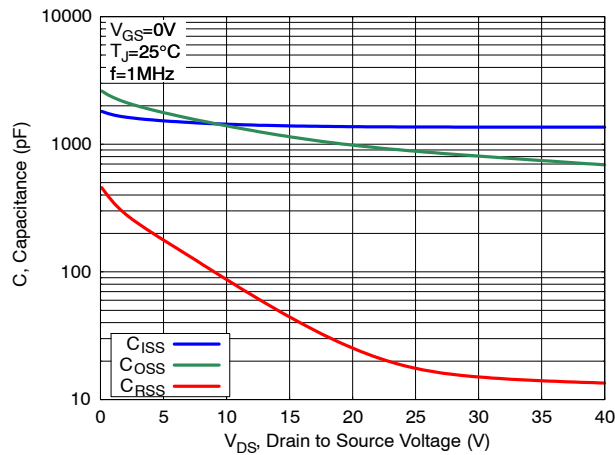


Figure 7. Capacitance Characteristics

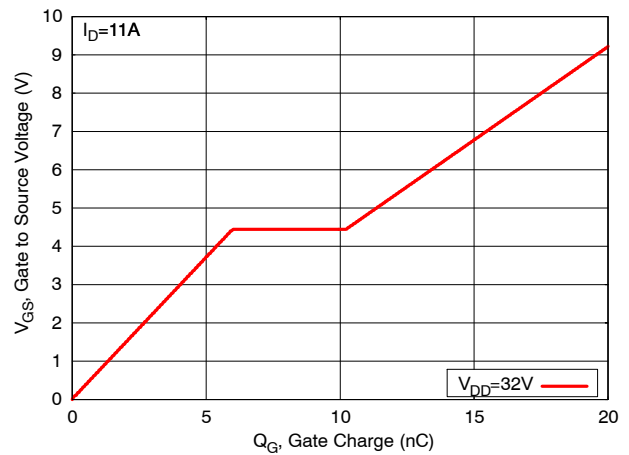


Figure 8. Gate Charge Characteristics

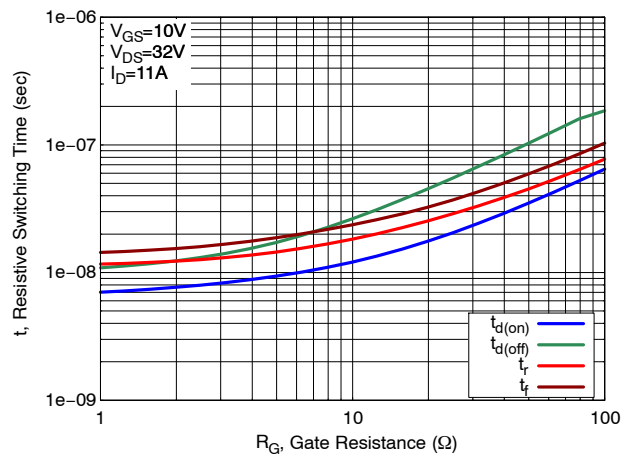


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

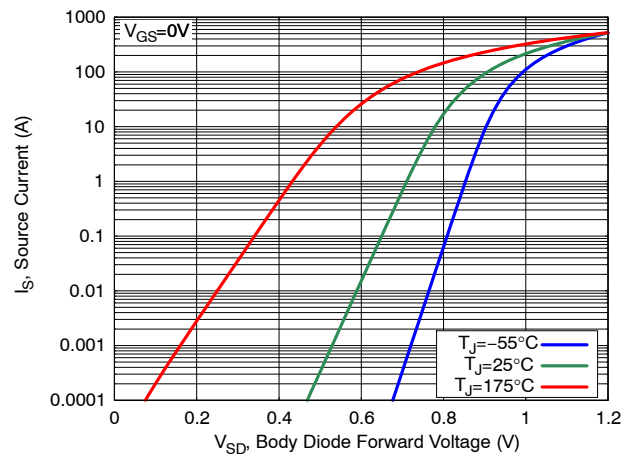


Figure 10. Diode Forward Characteristics

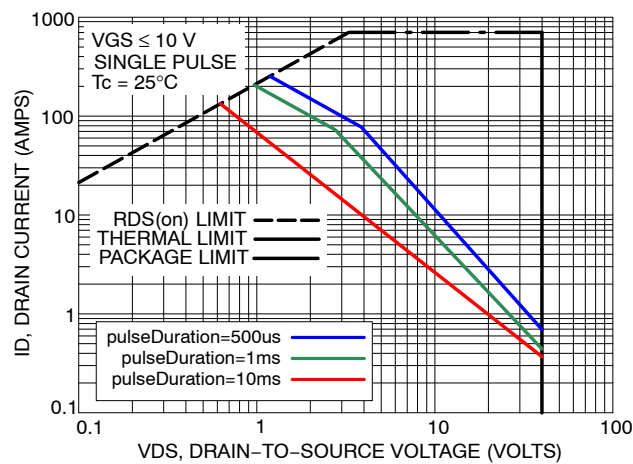


Figure 11. Maximum Rated Forward Biased Safe Operating Area

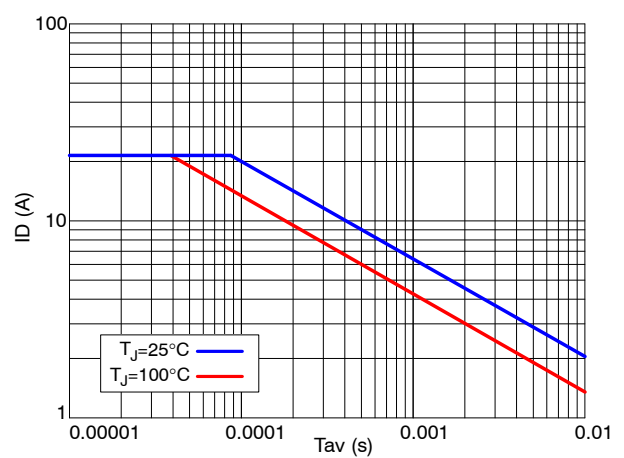


Figure 12. UIS

TYPICAL CHARACTERISTICS

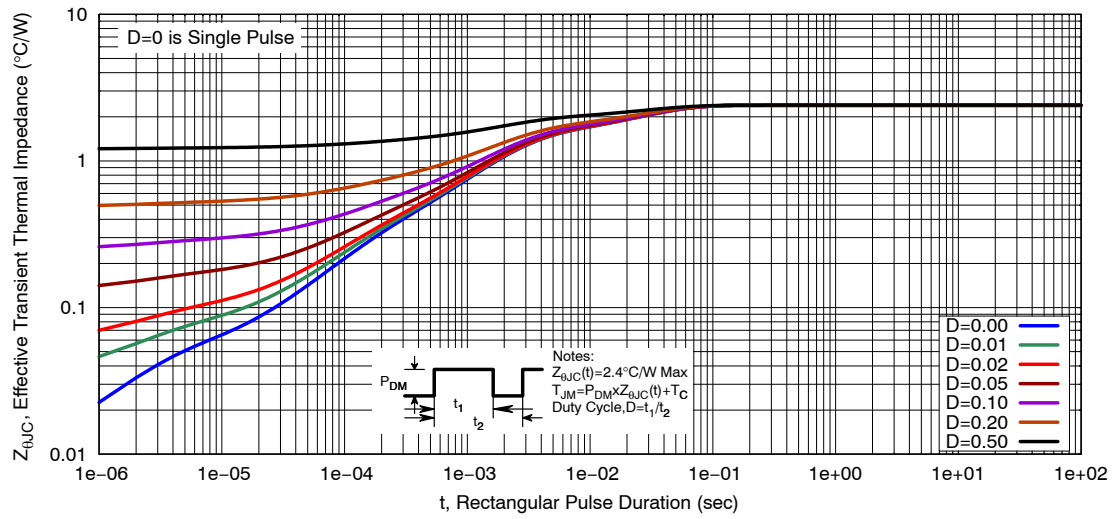


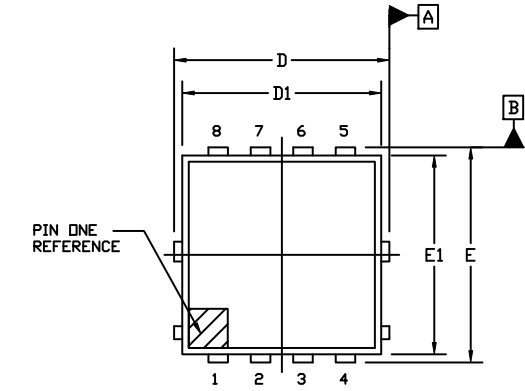
Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

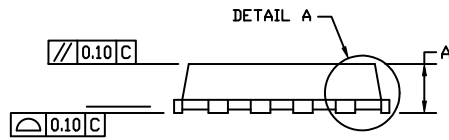
Device	Marking	Package	Shipping [†]
NVTFWS002N04XMTAG	002W	WDFN8 (Pb-Free)	1500 / Tape & Reel

[†]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.

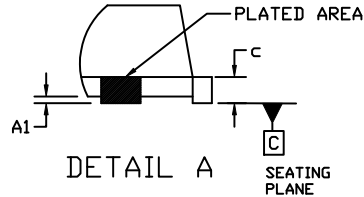
PACKAGE DIMENSIONS

WDFNW8 3.3x3.3, 0.65P (Full-Cut μ 8FL WF)
CASE 515AN
ISSUE O

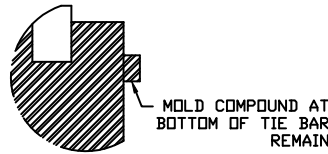
TOP VIEW



SIDE VIEW



DETAIL A

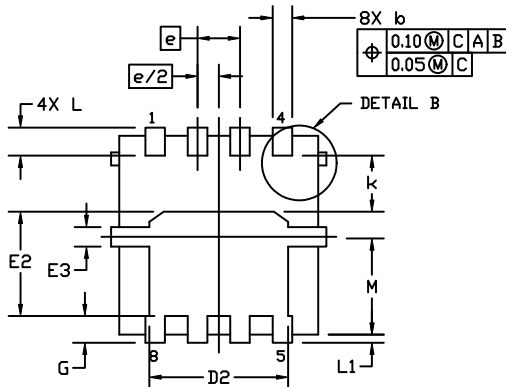


DETAIL B

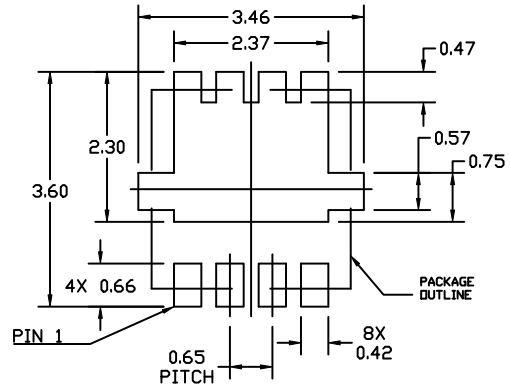
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	----	0.05
b	0.23	0.30	0.40
c	0.15	0.20	0.25
D	3.05	3.30	3.55
D1	2.95	3.05	3.15
D2	1.98	2.11	2.24
E	3.05	3.30	3.55
E1	2.95	3.05	3.15
E2	1.47	1.60	1.73
E3	0.23	0.30	0.40
e	0.65 BSC		
G	0.30	0.41	0.51
K	0.65	0.80	0.95
L	0.30	0.43	0.59
L1	0.06	0.13	0.20
M	1.40	1.50	1.60



BOTTOM VIEW

RECOMMENDED
MOUNTING FOOTPRINT

- * 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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