NTD5406N, STD5406N

Power MOSFET
40 V, 70 A, Single N−Channel, DPAK

Features
- Low $R_{DS(on)}$
- High Current Capability
- Low Gate Charge
- AEC Q101 Qualified − STD5406N
- These Devices are Pb−Free and are RoHS Compliant

Applications
- Electronic Brake Systems
- Electronic Power Steering
- Bridge Circuits

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	40	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current − $R_{\theta JC}$	Steady State	T_C = 25°C	I_D	70	A
		T_C = 125°C		40	
Power Dissipation − $R_{\theta JC}$	Steady State	T_C = 25°C	P_D	100	W
Continuous Drain Current − $R_{\theta JA}$ (Note 1)	Steady State	T_A = 25°C	I_D	12.2	A
		T_A = 125°C		7.0	
Power Dissipation − $R_{\theta JA}$ (Note 1)	Steady State	T_A = 25°C	P_D	3.0	W
Pulsed Drain Current	t_p = 10 μs		I_{DM}	150	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 175	°C
Source Current (Body Diode) Pulsed			I_S	63.5	A
Single Pulse Drain−to Source Avalanche Energy − (V_{DD} = 50 V, V_{GS} = 10 V, I_{PK} = 30 A, L = 1 mH, R_G = 25 Ω)			EAS	450	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL RESISTANCE RATINGS (Note 1)

Parameter	Symbol	Max	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	1.5	°C/W
Junction−to−Case (Note 1)	$R_{\theta JA}$	49	

1. Surface mounted on FR4 board using 1 sq in pad size, (Cu Area 1.127 sq in [2 oz] including traces).

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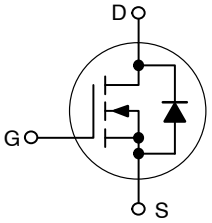
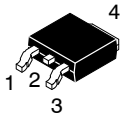
$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX (Note 1)
40 V	8.7 mΩ @ 10 V	70 A

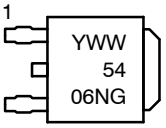
N−Channel





DPAK
CASE 369C
STYLE 2

MARKING DIAGRAM



Y = Year
WW = Work Week
5406N = Specific Device Code
G = Pb−Free Device

ORDERING INFORMATION

Device	Package	Shipping†
NTD5406NT4G	DPAK (Pb−Free)	2500 / Tape & Reel
STD5406NT4G	DPAK (Pb−Free)	2500 / 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.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		40			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				42		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 40 V	T_J = 25°C			1.0	μA
			T_J = 100°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±30 V				±100	nA
ON CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.5		3.5	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				−7.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A			8.7	10	mΩ
		V_{GS} = 5.0 V, I_D = 10 A			13.2	17	
Forward Transconductance	g_{FS}	V_{GS} = 10 V, I_D = 10 A			19		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 32 V			1375	2500	pF
Output Capacitance	C_{OSS}				370	700	
Reverse Transfer Capacitance	C_{RSS}				160	300	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 32 V, I_D = 30 A			45		nC
Threshold Gate Charge	$Q_{G(TH)}$				2.0		
Gate−to−Source Charge	Q_{GS}				5.4		
Gate−to−Drain Charge	Q_{GD}				20		
SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 3)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DD} = 32 V, I_D = 30 A, R_G = 2.5 Ω			7.2		ns
Rise Time	t_r				57		
Turn−Off Delay Time	$t_{d(OFF)}$				30		
Fall Time	t_f				67		
SWITCHING CHARACTERISTICS, V_{GS} = 5 V (Note 3)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 5.0 V, V_{DD} = 20 V, I_D = 30 A, R_G = 2.5 Ω			15		ns
Rise Time	t_r				147		
Turn−Off Delay Time	$t_{d(OFF)}$				20		
Fall Time	t_f				29		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 10 A	T_J = 25°C		0.82	1.1	V
			T_J = 125°C		0.67		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_{SD}/dt = 100 A/μs, I_S = 10 A			46		ns
Charge Time	t_a				24		
Discharge Time	t_b				22		
Reverse Recovery Charge	Q_{RR}				65		nC

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

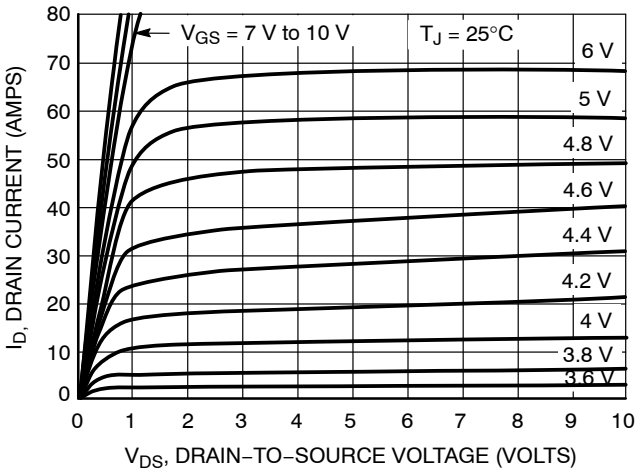


Figure 1. On−Region Characteristics

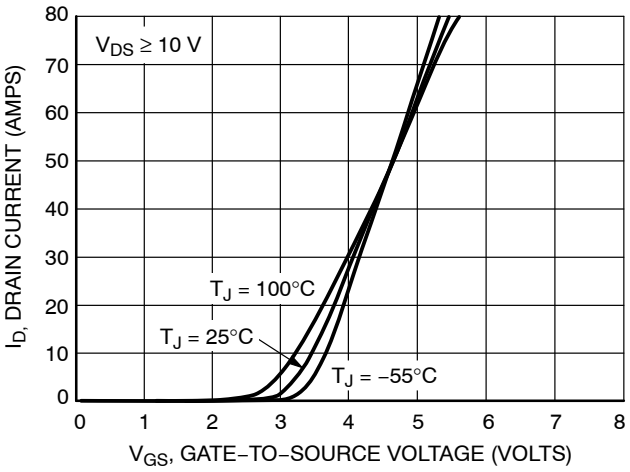


Figure 2. Transfer Characteristics

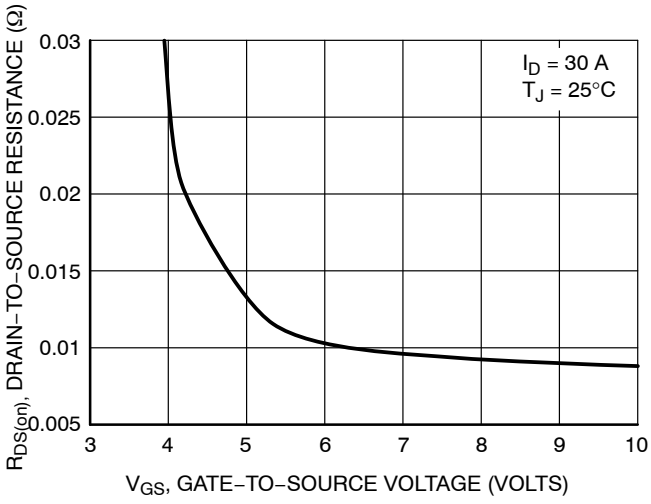


Figure 3. On−Resistance vs. Gate−to−Source Voltage

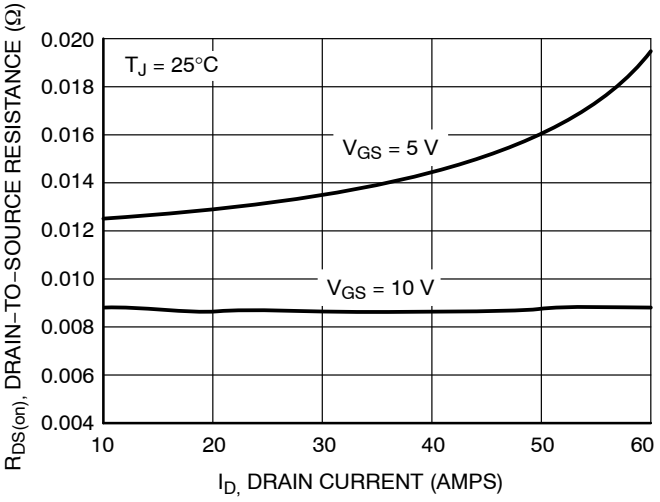


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

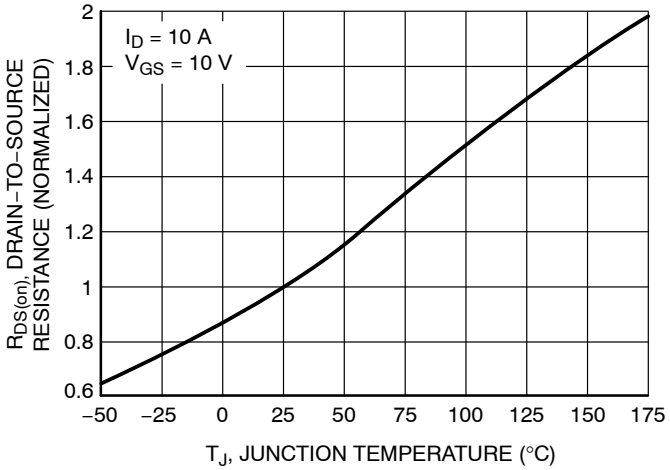


Figure 5. On−Resistance Variation with Temperature

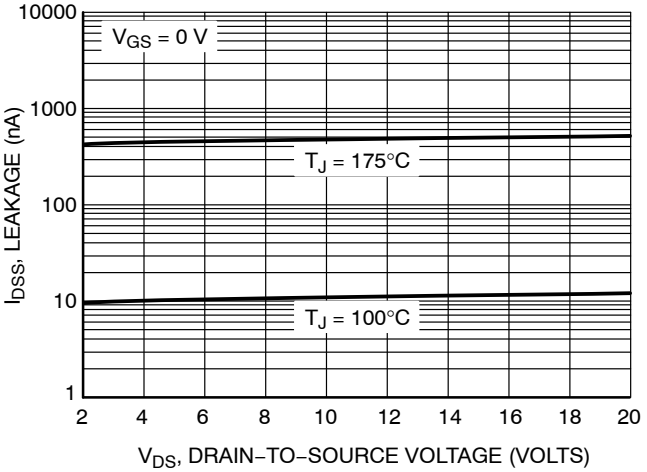


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

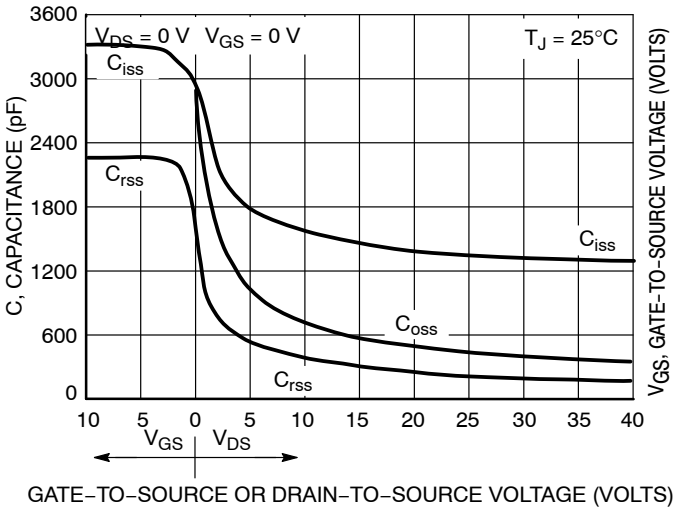


Figure 7. Capacitance Variation

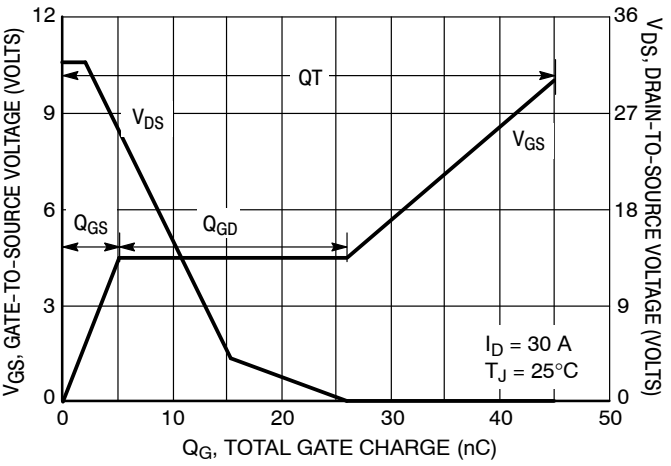


Figure 8. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge

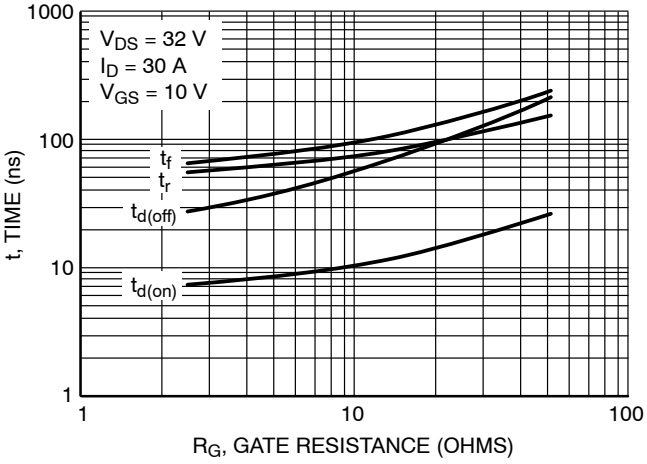


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

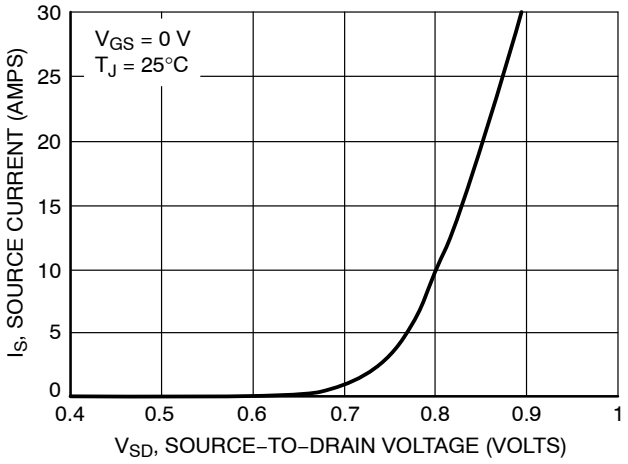


Figure 10. Diode Forward Voltage vs. Current

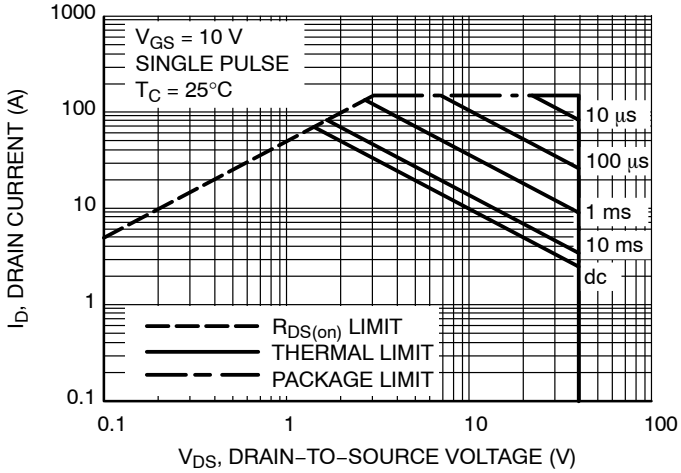


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL PERFORMANCE CURVES

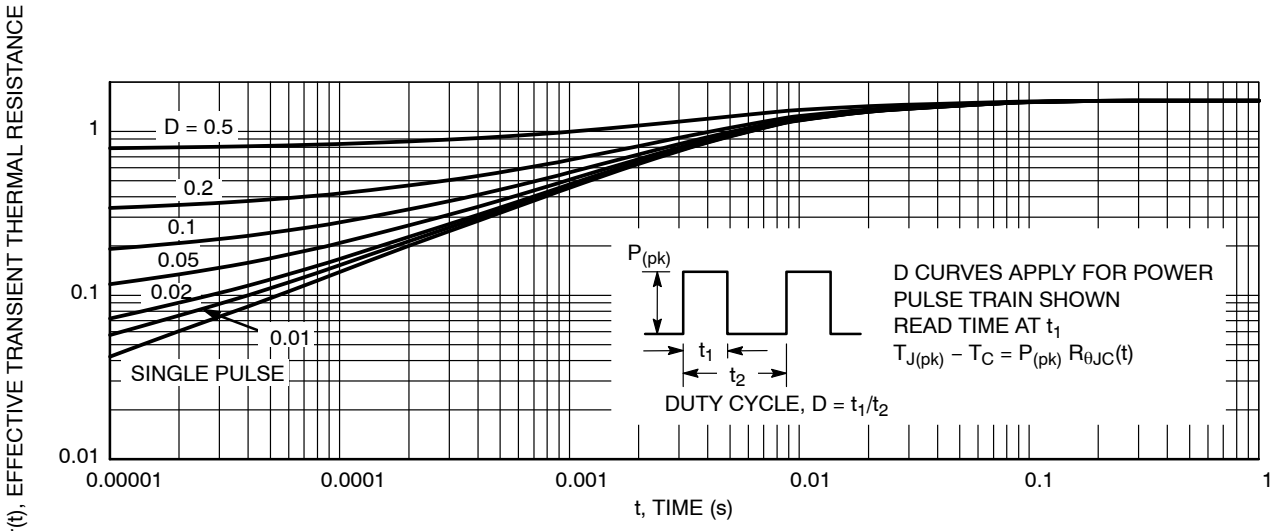
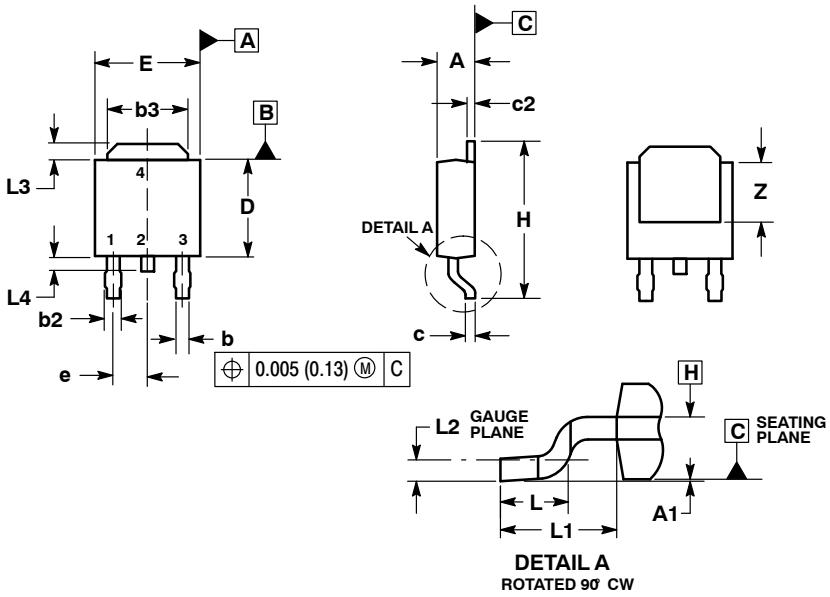


Figure 12. Thermal Response

PACKAGE DIMENSIONS

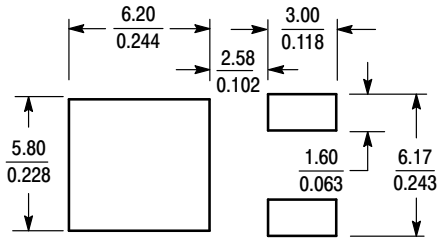
DPAK (SINGLE GAUGE)
CASE 369C−01
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108 REF		2.74 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	−−−	0.040	−−−	1.01
Z	0.155	−−−	3.93	−−−

SOLDERING FOOTPRINT*



SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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