NTD5805N, NVD5805N

Power MOSFET

40 V, 51 A, Single N−Channel, DPAK

Features

- Low $R_{DS(on)}$
- High Current Capability
- Avalanche Energy Specified
- NVD 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

- LED Backlight Driver
- CCFL Backlight
- DC Motor Control
- Power Supply Secondary Side Synchronous Rectification

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	40	V
Gate−to−Source Voltage − Continuous			V_{GS}	±20	V
Gate−to−Source Voltage − Non−Repetitive (t_p < 10 μS)			V_{GS}	±30	V
Continuous Drain Current ($R_{\theta JC}$) (Note 1)	Steady State	T_C = 25°C	I_D	51	A
		T_C = 100°C		36	
Power Dissipation ($R_{\theta JC}$) (Note 1)		T_C = 25°C	P_D	47	W
Pulsed Drain Current	t_p = 10 μs		I_{DM}	85	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to 175	°C
Source Current (Body Diode)			I_S	30	A
Single Pulse Drain−to−Source Avalanche Energy (V_{DD} = 50 V, V_{GS} = 10 V, R_G = 25 Ω, $I_{L(pk)}$ = 40 A, L = 0.1 mH, V_{DS} = 40 V)			E_{AS}	80	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°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 (Drain)	$R_{\theta JC}$	3.2	°C/W
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	107	

1. Surface−mounted on FR4 board using the minimum recommended pad size.

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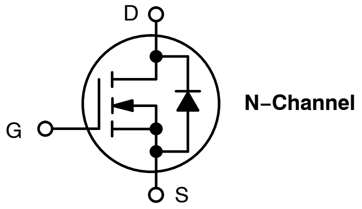
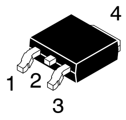
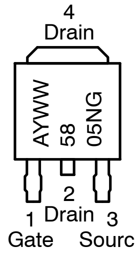
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	16 mΩ @ 5.0 V	51 A
	9.5 mΩ @ 10 V	





DPAK
CASE 369C
(Surface Mount)
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location*
Y = Year
WW = Work Week
5805N = Device Code
G = Pb−Free Package

* The Assembly Location Code (A) is front side optional. In cases where the Assembly Location is stamped in the package bottom (molding ejecter pin), the front side assembly code may be blank.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

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	$V_{(BR)DSS}/T_J$			40.8		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 = 150°C			100	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 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
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			7.04		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 15 A		7.6	9.5	mΩ
		V_{GS} = 5.0 V, I_D = 10 A		10.9	16	
Forward Transconductance	gFS	V_{DS} = 15 V, I_D = 15 A		8.54		S
CHARGES, CAPACITANCES AND GATE RESISTANCES						
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 25 V		1725		pF
Output Capacitance	C_{oss}			220		
Reverse Transfer Capacitance	C_{rss}			160		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 32 V, I_D = 30 A		33	80	nC
Threshold Gate Charge	$Q_{G(TH)}$			2.0		
Gate−to−Source Charge	Q_{GS}			7.2		
Gate−to−Drain Charge	Q_{GD}			9.8		
SWITCHING CHARACTERISTICS (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		10.2		ns
Rise Time	t_r			17.9		
Turn−Off Delay Time	$t_{d(off)}$			22.9		
Fall Time	t_f			4.5		
DRAIN−SOURCE DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 10 A; T_J = 25°C		0.83	1.2	V
		T_J = 150°C		0.65		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIs/dt = 100 A/μs, I_S = 30 A		24.8		ns
Charge Time	ta			14.6		
Discharge Time	tb			10.2		
Reverse Recovery Charge	Q_{RR}			15.5		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.

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CHARACTERISTICS

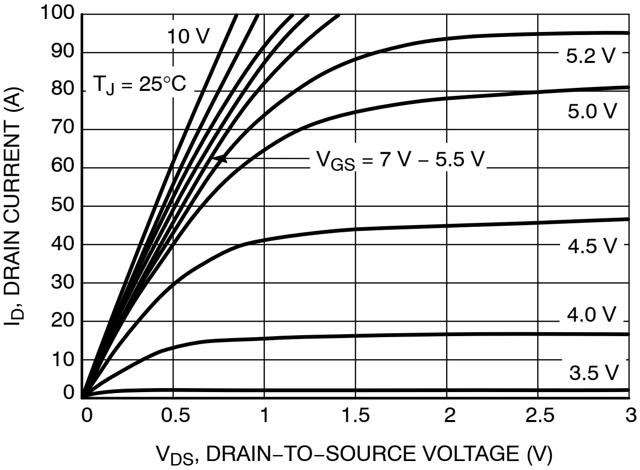


Figure 1. On−Region Characteristics

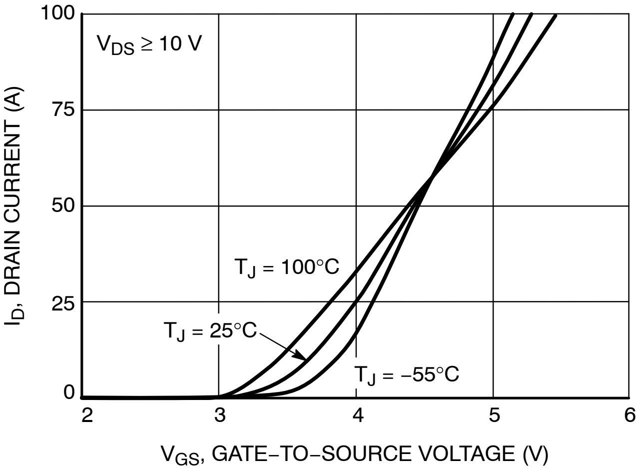


Figure 2. Transfer Characteristics

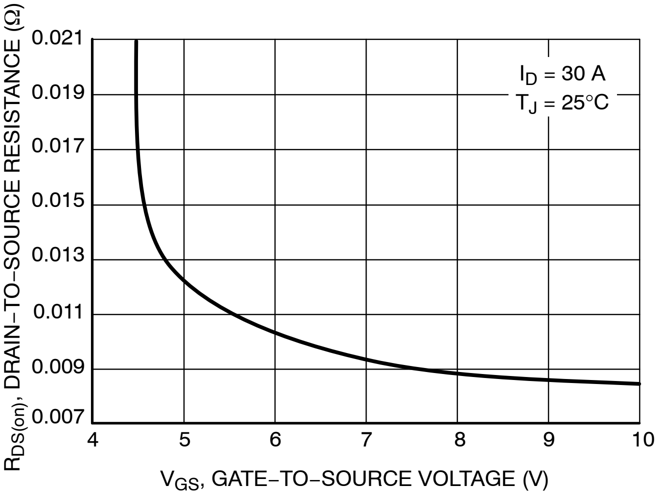


Figure 3. On−Resistance vs. Drain Current

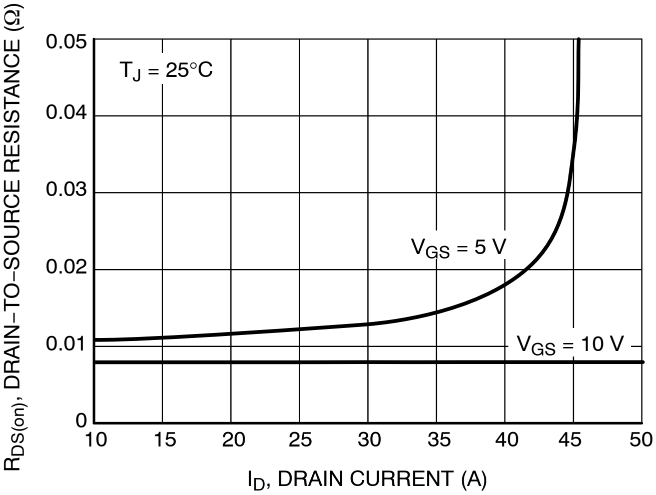


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

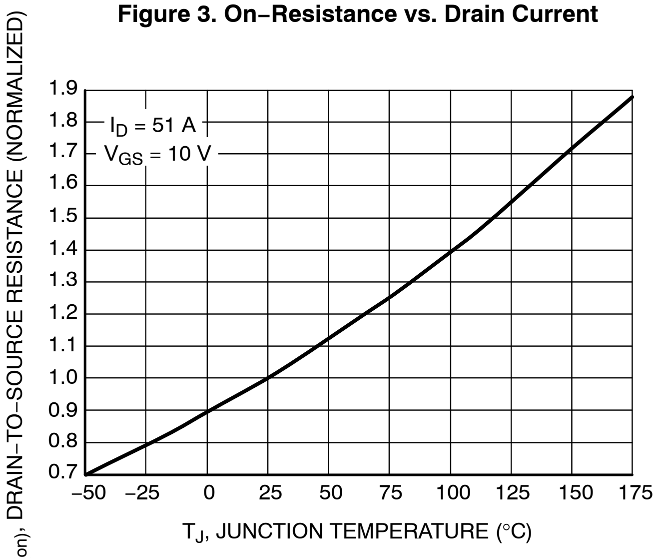


Figure 5. On−Resistance Variation with Temperature

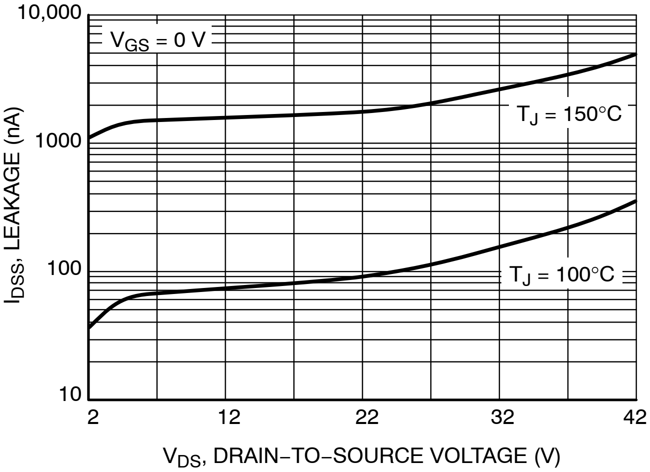


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

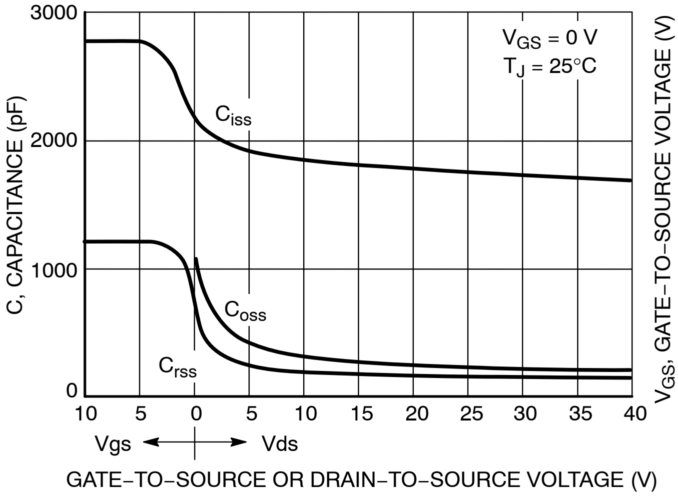


Figure 7. Capacitance Variation

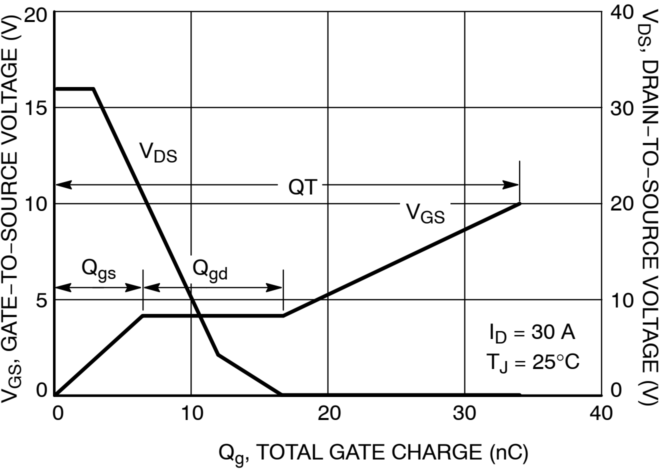


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

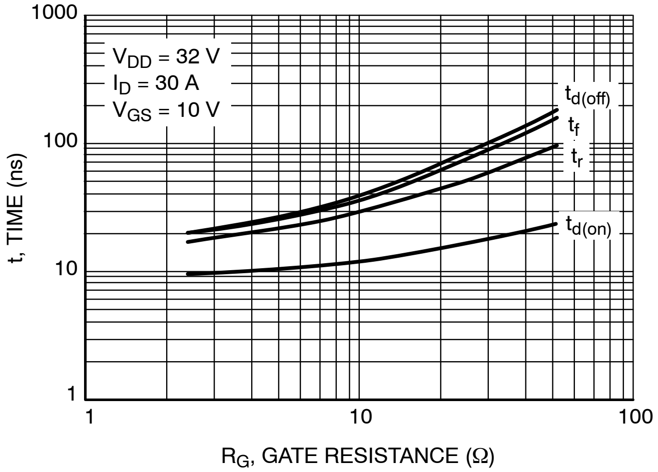


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

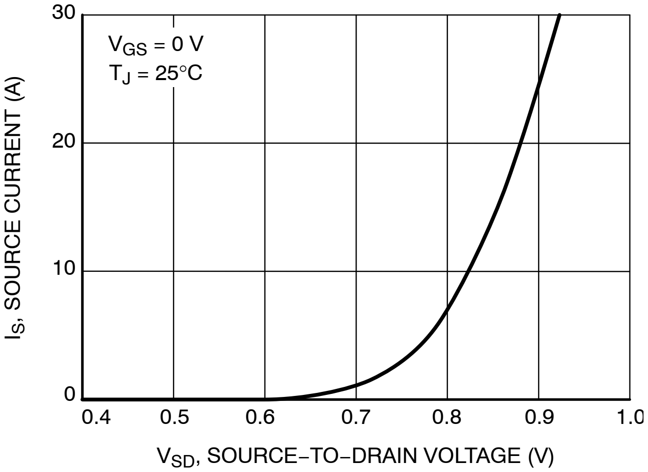


Figure 10. Diode Forward Voltage vs. Current

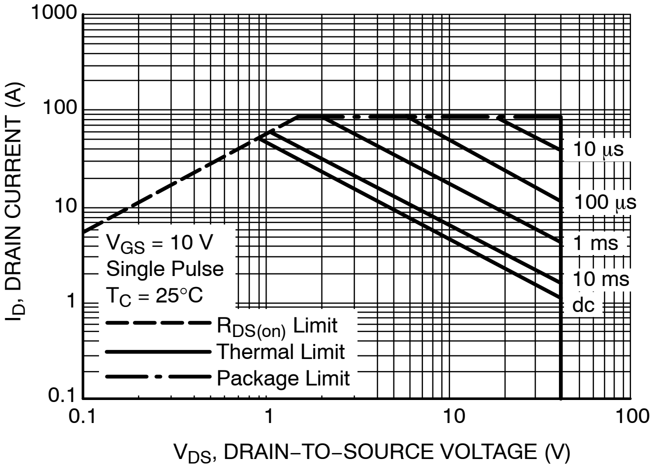


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL PERFORMANCE CHARACTERISTICS

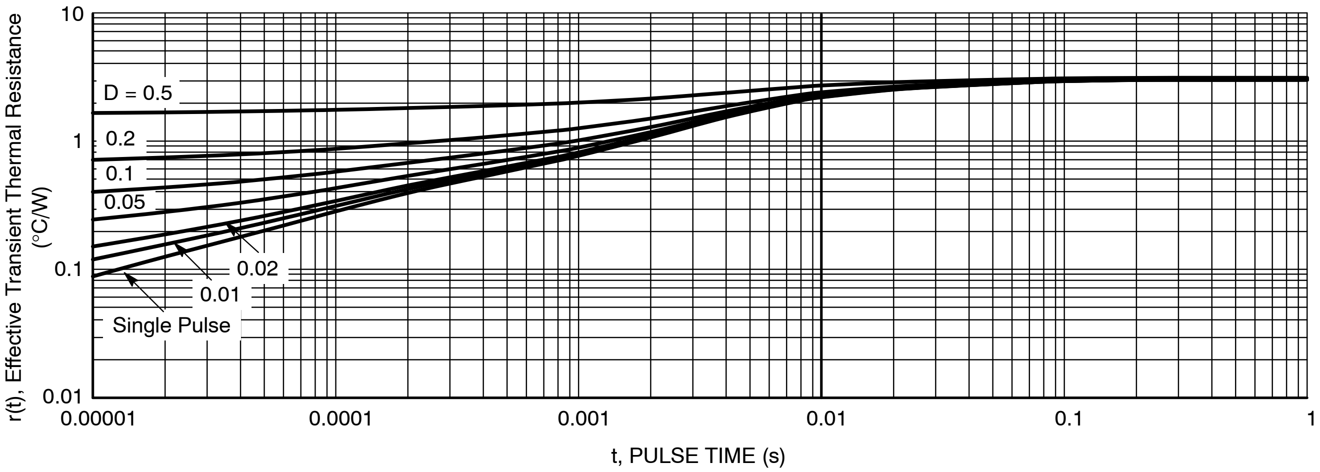


Figure 12. Thermal Response

ORDERING INFORMATION

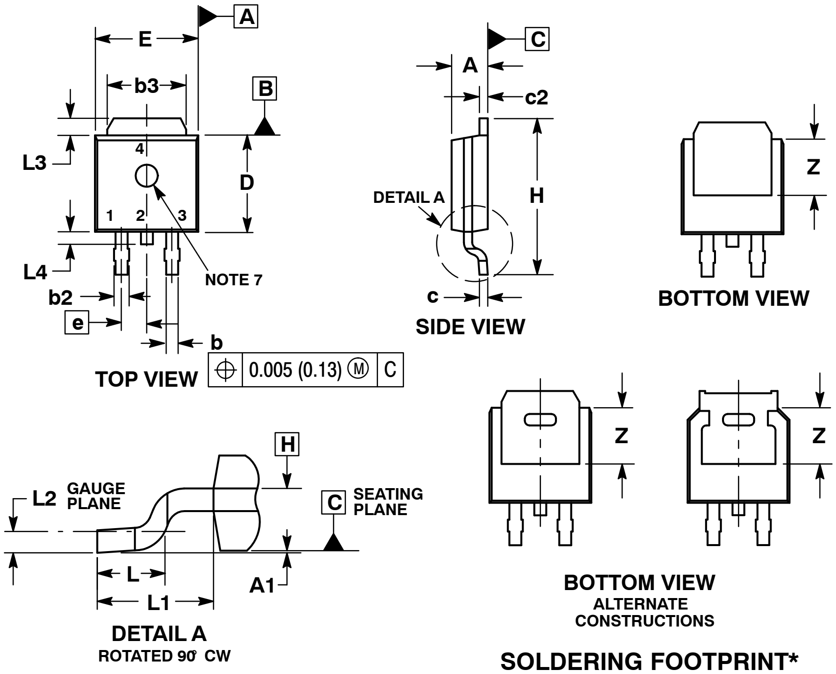
Order Number	Package	Shipping†
NTD5805NT4G	DPAK (Pb−Free)	2500 / Tape & Reel
NVD5805NT4G*	DPAK (Pb−Free)	2500 / Tape & Reel
NVD5805NT4G−VF01	DPAK (Pb−Free)	2500 / Tape & Reel

†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.

*NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE)
CASE 369C
ISSUE F

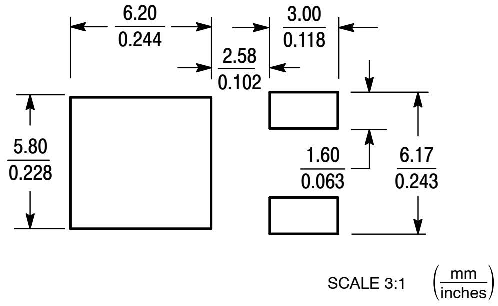


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES 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.
7. OPTIONAL MOLD FEATURE.

	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	0.028	0.045	0.72	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	0.114 REF		2.90 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	---

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

SOLDERING 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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