

# NTJD5121N, NVJD5121N

## MOSFET – Power, Dual, N-Channel With ESD Protection, SC-88 60 V, 295 mA



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

### Features

- Low  $R_{DS(on)}$
- Low Gate Threshold
- Low Input Capacitance
- ESD Protected Gate
- NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- This is a Pb-Free Device

### Applications

- Low Side Load Switch
- DC-DC Converters (Buck and Boost Circuits)

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

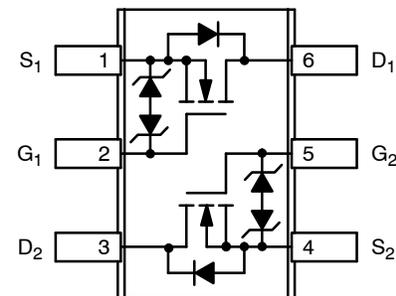
Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	60	V	
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	295	mA
		$T_A = 85^\circ\text{C}$	212	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	304	
		$T_A = 85^\circ\text{C}$	219	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	250	mW
		$t \leq 5$ s	266	
Pulsed Drain Current	$t_p = 10$ $\mu\text{s}$	$I_{DM}$	900	mA
Operating Junction and Storage Temperature	$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	210		mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260		$^\circ\text{C}$
Gate-Source ESD Rating (HBM)	$ESD_{HBM}$	2000		V
Gate-Source ESD Rating (MM)	$ESD_{MM}$	200		V

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 RATINGS

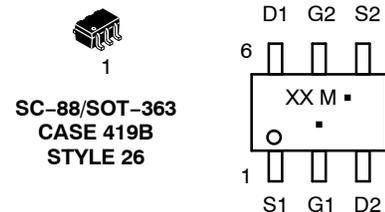
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ Max
60 V	1.6 $\Omega$ @ 10 V	295 mA
	2.5 $\Omega$ @ 4.5 V	

### SC-88 (SOT-363)



Top View

### MARKING DIAGRAM & PIN ASSIGNMENT



SC-88/SOT-363  
CASE 419B  
STYLE 26

XX = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

## NTJD5121N, NVJD5121N

Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State	$R_{\theta JA}$	467	°C/W
Junction-to-Ambient – $t \leq 5$ s	$R_{\theta JA}$	412	
Junction-to-Lead – Steady State	$R_{\theta JL}$	252	

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

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$		92		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		500	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 10$	$\mu\text{A}$

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0	1.7	2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.0		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$		1.0	1.6	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 200\text{ mA}$		1.2	2.5	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 200\text{ mA}$		80		S
Gate Resistance	$R_G$			536		$\Omega$

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 20\text{ V}$		26		pF
Output Capacitance	$C_{OSS}$			4.4		
Reverse Transfer Capacitance	$C_{RSS}$			2.5		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 25\text{ V}, I_D = 200\text{ mA}$		0.9		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.2		
Gate-to-Source Charge	$Q_{GS}$			0.3		
Gate-to-Drain Charge	$Q_{GD}$			0.28		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 25\text{ V}, I_D = 200\text{ mA}, R_G = 25\ \Omega$		22		ns
Rise Time	$t_r$			34		
Turn-Off Delay Time	$t_{d(off)}$			34		
Fall Time	$t_f$			32		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 200\text{ mA}$	$T_J = 25^\circ\text{C}$		0.8	1.2	V
			$T_J = 85^\circ\text{C}$		0.7		

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.

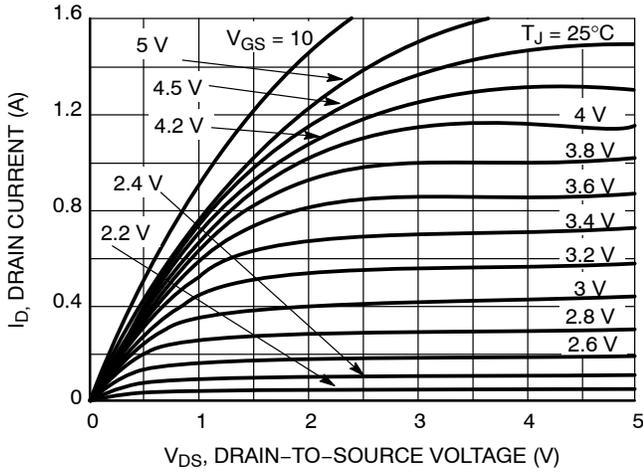
2. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

3. Switching characteristics are independent of operating junction temperatures.

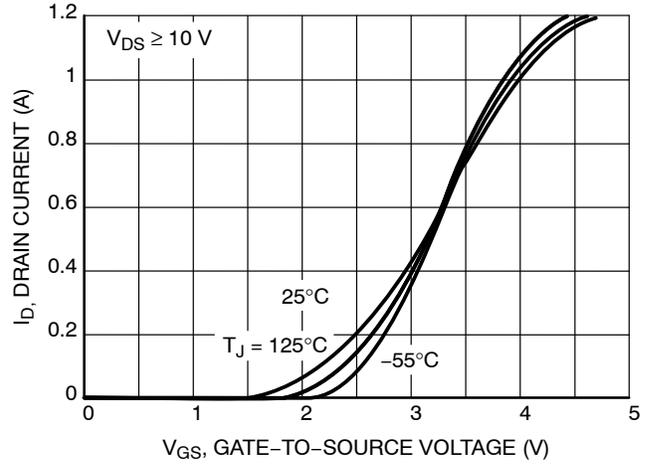
# NTJD5121N, NVJD5121N

## TYPICAL PERFORMANCE CURVES

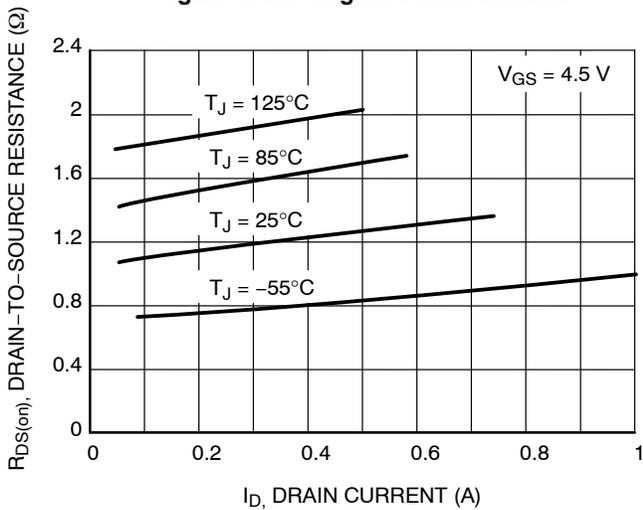
( $T_J = 25^\circ\text{C}$  unless otherwise noted)



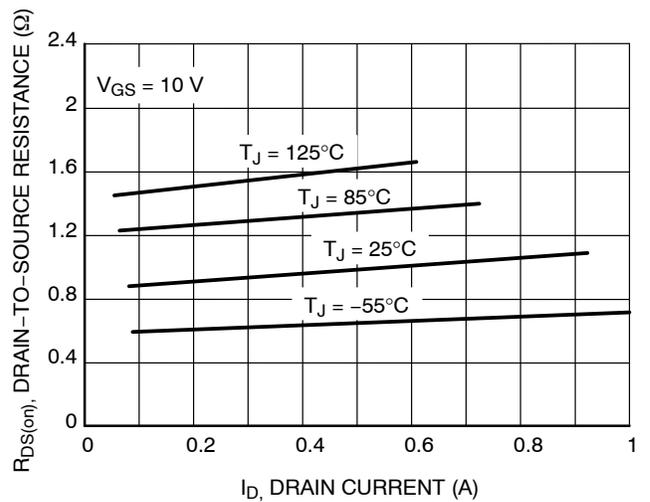
**Figure 1. On-Region Characteristics**



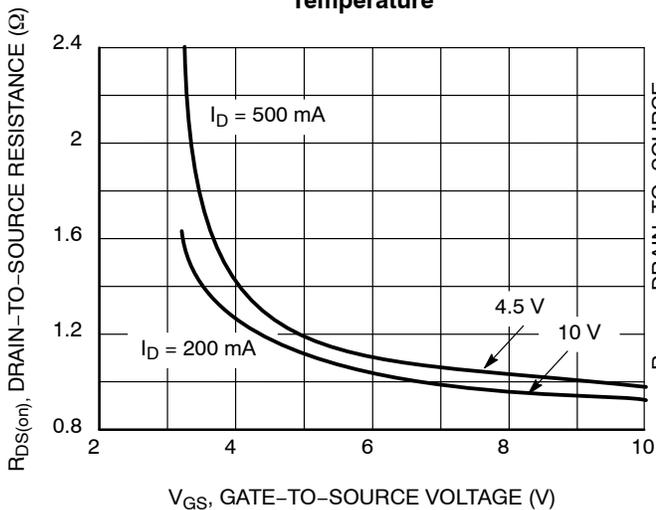
**Figure 2. Transfer Characteristics**



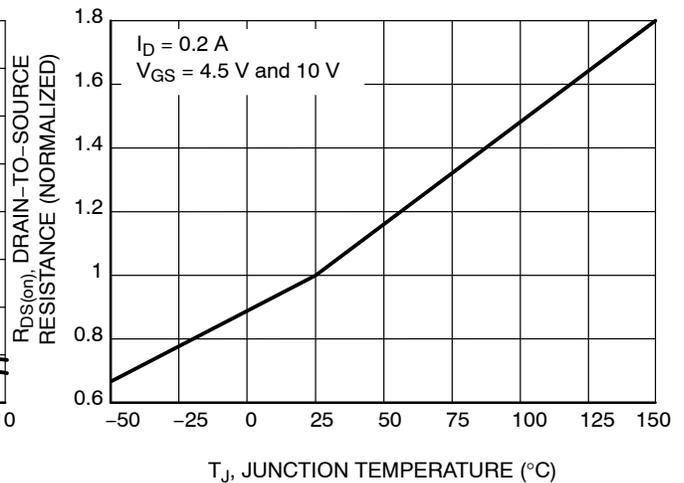
**Figure 3. On-Resistance vs. Drain Current and Temperature**



**Figure 4. On-Resistance vs. Drain Current and Temperature**



**Figure 5. On-Resistance versus Gate-to-Source Voltage**



**Figure 6. On-Resistance Variation with Temperature**

# NTJD5121N, NVJD5121N

## TYPICAL PERFORMANCE CURVES

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

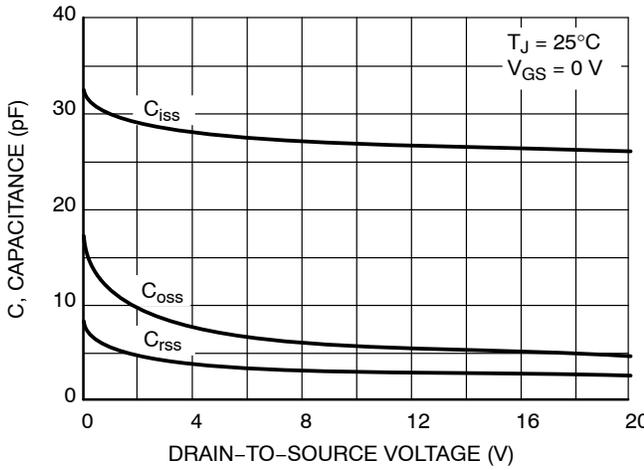


Figure 7. Capacitance Variation

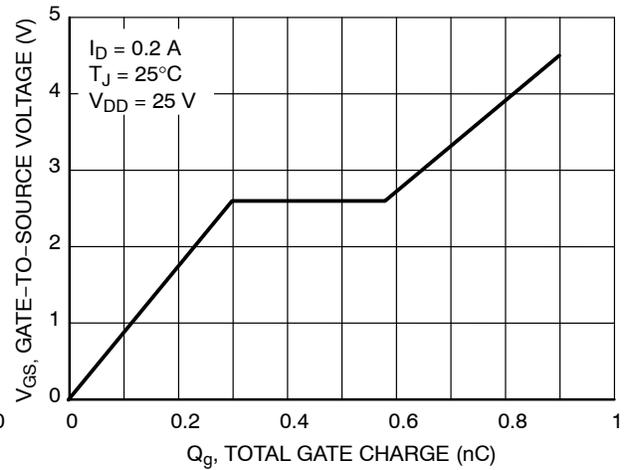


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

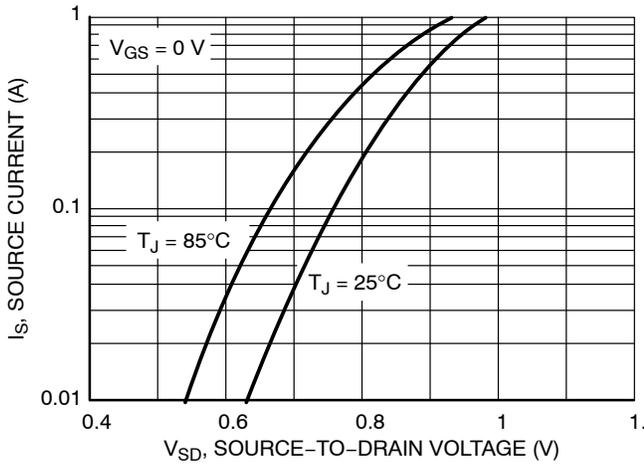


Figure 9. Diode Forward Voltage vs. Current

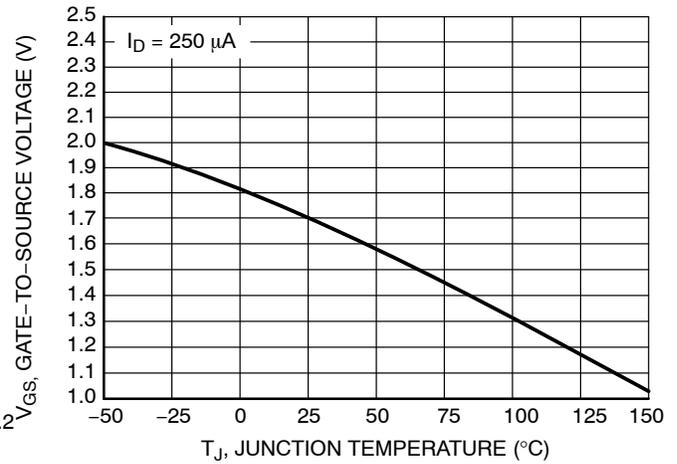


Figure 10. Threshold Voltage with Temperature

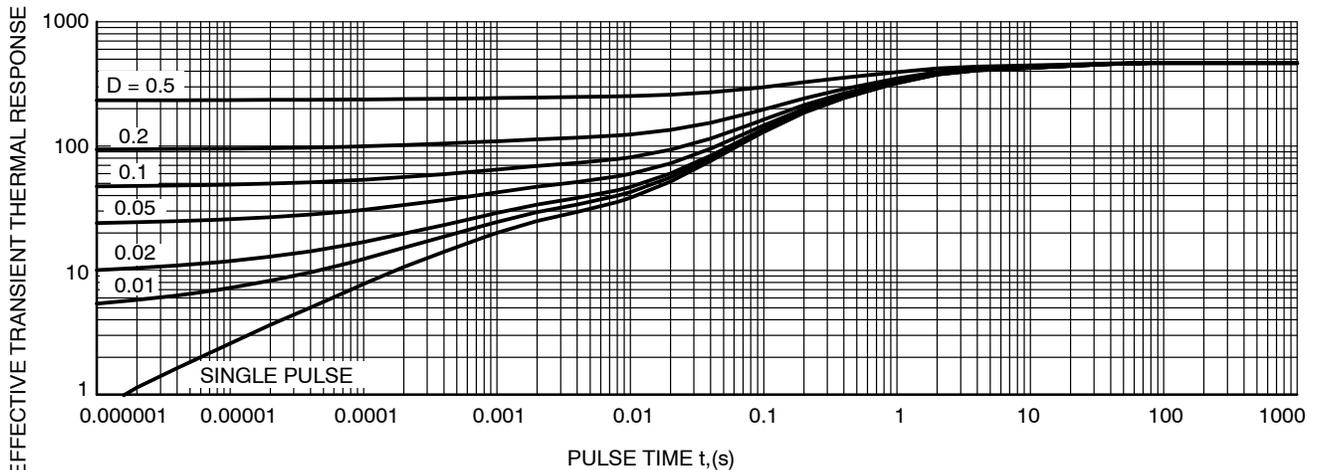


Figure 11. Thermal Response

# NTJD5121N, NVJD5121N

**Table 1. ORDERING INFORMATION**

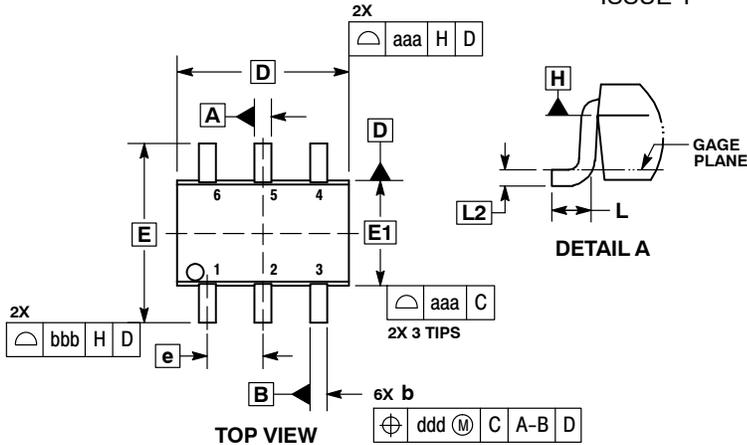
<b>Part Number</b>	<b>Marking (XX)</b>	<b>Package</b>	<b>Shipping<sup>†</sup></b>
NTJD5121NT1G	TF	SC-88 (Pb-Free)	3000 / Tape & Reel
NTJD5121NT2G	TF	SC-88 (Pb-Free)	3000 / Tape & Reel
NVJD5121NT1G	VTF	SC-88 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>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.

# NTJD5121N, NVJD5121N

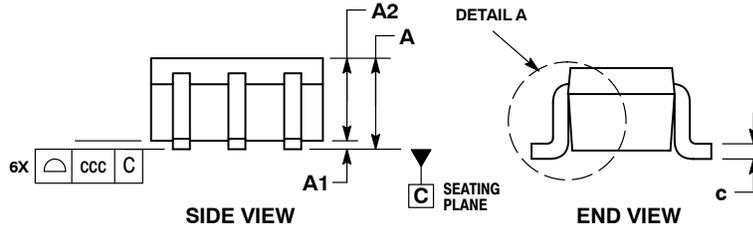
## PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363  
CASE 419B-02  
ISSUE Y



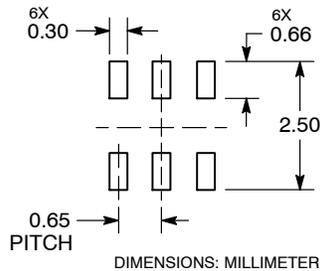
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
  4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
  5. DATUMS A AND B ARE DETERMINED AT DATUM H.
  6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
  7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.043
A1	0.00	---	0.10	0.000	---	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		



- STYLE 26:  
PIN 1. SOURCE 1  
2. GATE 1  
3. DRAIN 2  
4. SOURCE 2  
5. GATE 2  
6. DRAIN 1

### RECOMMENDED 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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