



# NTMFS4921N

## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3.25	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	58.3	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	144.1	
Junction-to-Ambient – $t \leq 10$ sec	$R_{\theta JA}$	22.3	

1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage (transient)	$V_{(BR)DSSst}$	$V_{GS} = 0\text{ V}, I_{D(aval)} = 13\text{ A}, T_{case} = 25^\circ\text{C}, t_{transient} = 100\text{ ns}$	34			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			25		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.45	1.8	2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$					mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V to } 11.5\text{ V}$	$I_D = 30\text{ A}$	5.3	6.95	m $\Omega$
			$I_D = 15\text{ A}$	5.2		
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$	8.6	10.8	
			$I_D = 15\text{ A}$	8.4		
Forward Transconductance	$g_{FS}$	$V_{DS} = 1.5\text{ V}, I_D = 30\text{ A}$		54		S

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 12\text{ V}$		1400		pF
Output Capacitance	$C_{OSS}$			282		
Reverse Transfer Capacitance	$C_{RSS}$			136		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		10.7	16	nC
Threshold Gate Charge	$Q_{G(TH)}$			1.4		
Gate-to-Source Charge	$Q_{GS}$			4.1		
Gate-to-Drain Charge	$Q_{GD}$			3.8		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		25		nC

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		13.3		ns
Rise Time	$t_r$			38		
Turn-Off Delay Time	$t_{d(OFF)}$			16.6		
Fall Time	$t_f$			3.8		

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

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>SWITCHING CHARACTERISTICS</b> (Note 4)						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 15\text{ A}, R_G = 3.0\ \Omega$		8.2		ns
Rise Time	$t_r$			20		
Turn-Off Delay Time	$t_{d(OFF)}$			23		
Fall Time	$t_f$			3.1		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.85	1.0	V
			$T_J = 125^\circ\text{C}$		0.74		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$		11		ns	
Charge Time	$t_a$			7.5			
Discharge Time	$t_b$			3.5			
Reverse Recovery Charge	$Q_{RR}$			2.0		nC	

## PACKAGE PARASITIC VALUES

Source Inductance	$L_S$	$T_A = 25^\circ\text{C}$		1.3		nH
Drain Inductance	$L_D$			0.005		
Gate Inductance	$L_G$			1.84		
Gate Resistance	$R_G$		0.5	1.1	2.0	

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

# NTMFS4921N

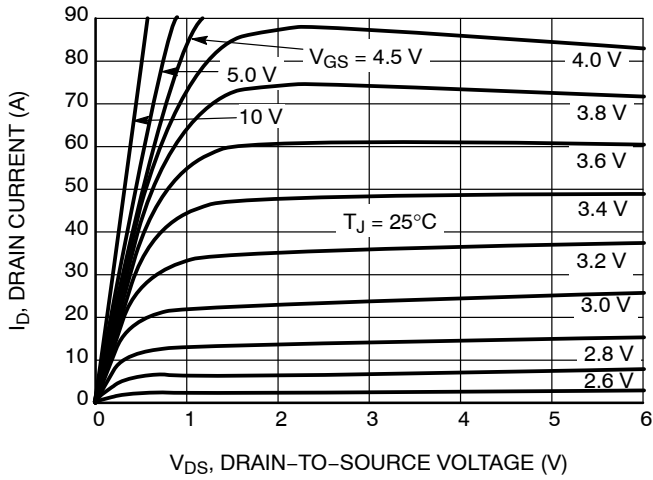


Figure 1. On-Region Characteristics

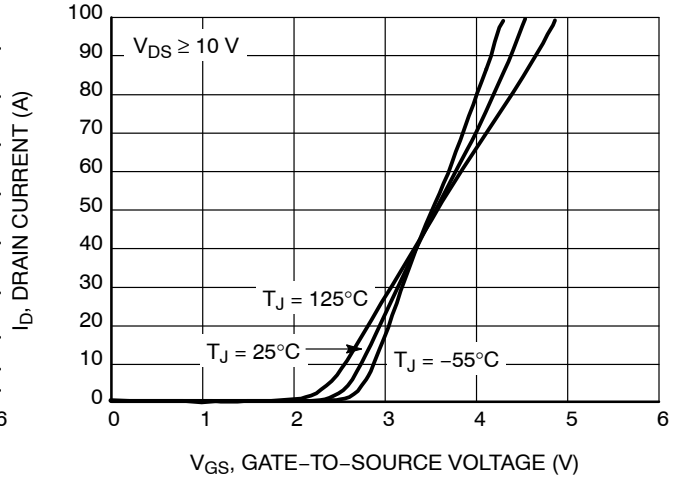


Figure 2. Transfer Characteristics

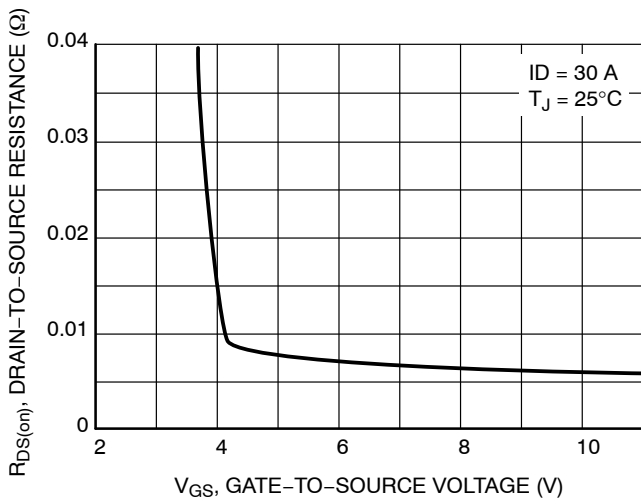


Figure 3. On-Resistance vs. Gate-to-Source Voltage

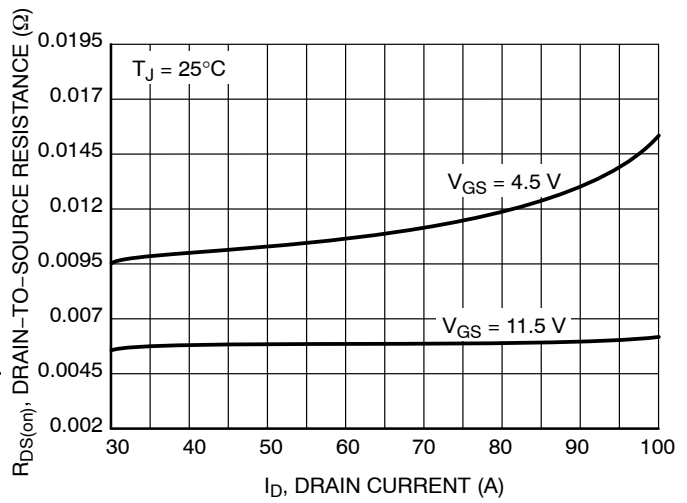


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

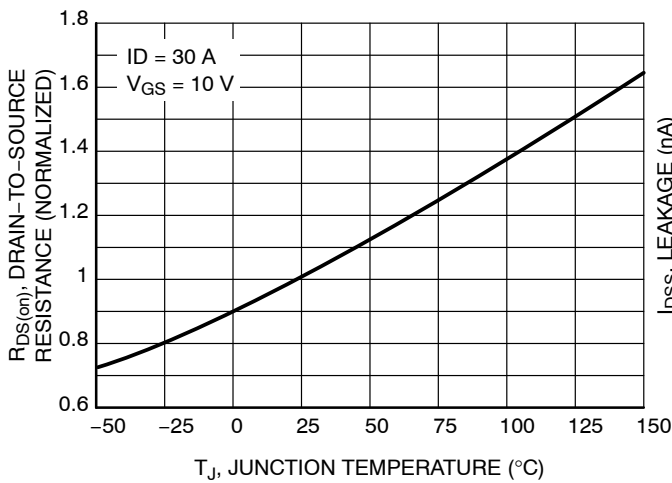


Figure 5. On-Resistance Variation with Temperature

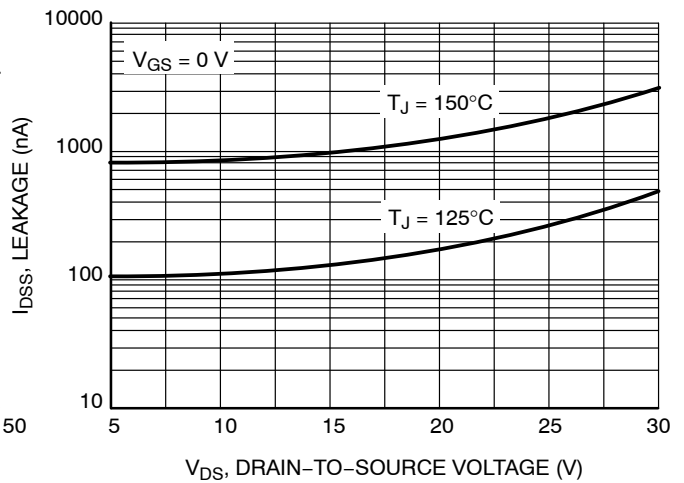
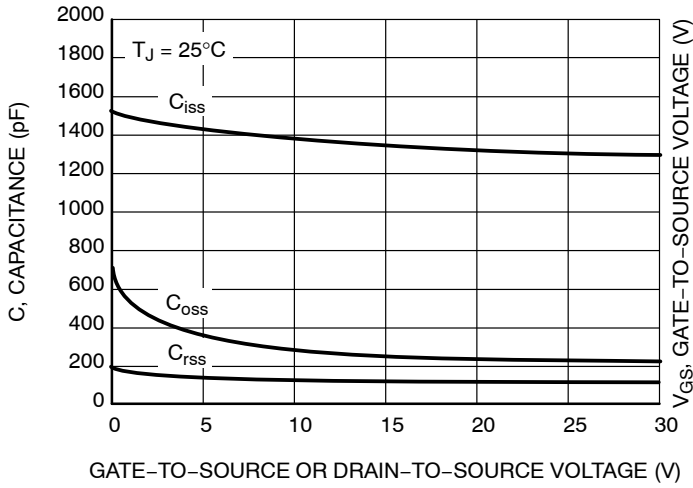
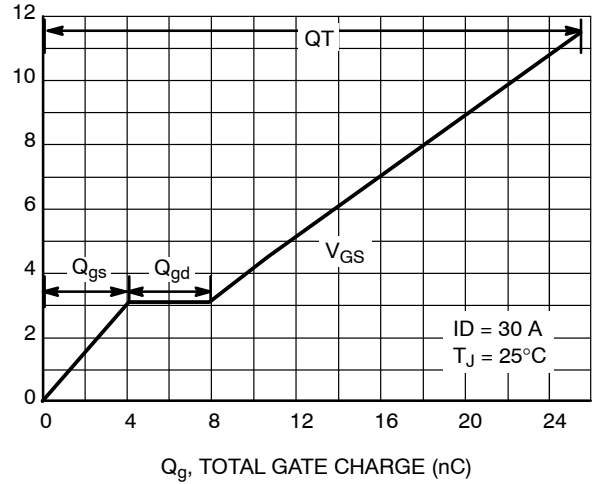


Figure 6. Drain-to-Source Leakage Current vs. Voltage

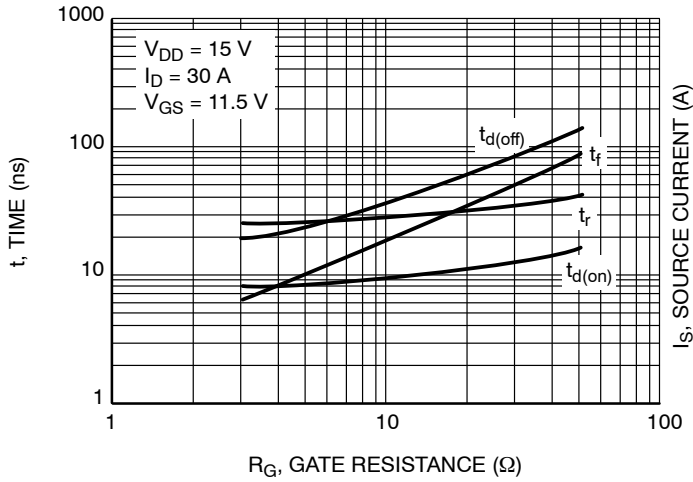
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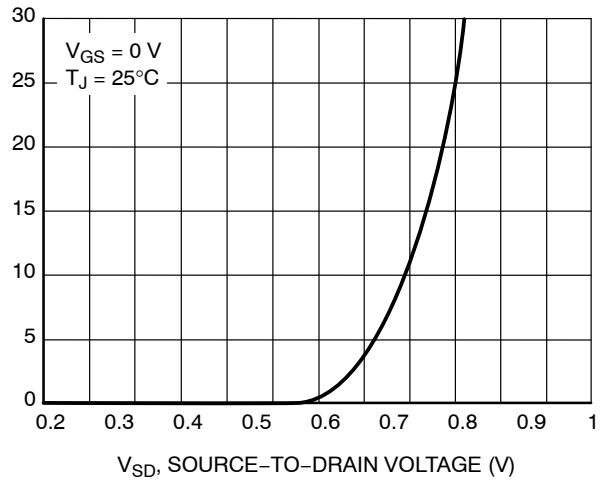
**Figure 7. Capacitance Variation**



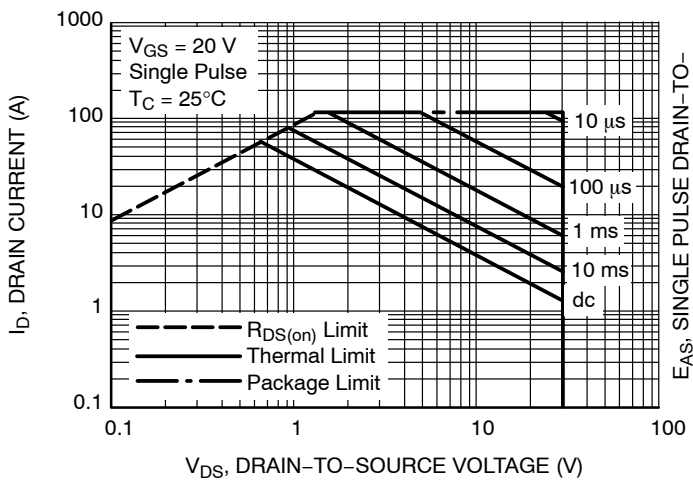
**Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge**



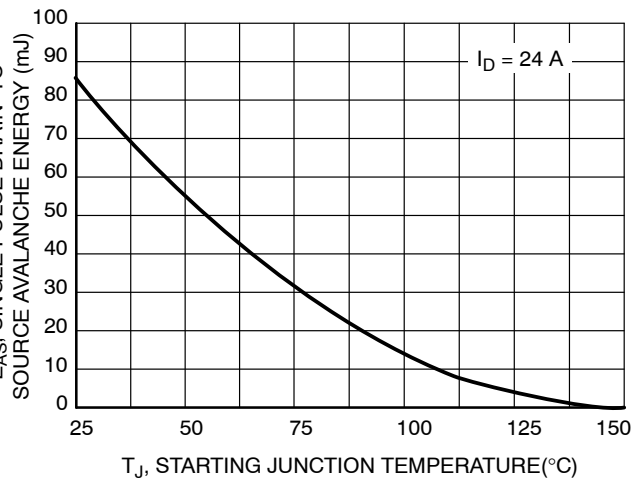
**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**



**Figure 10. Diode Forward Voltage vs. Current**



**Figure 11. Maximum Rated Forward Biased Safe Operating Area**



**Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature**

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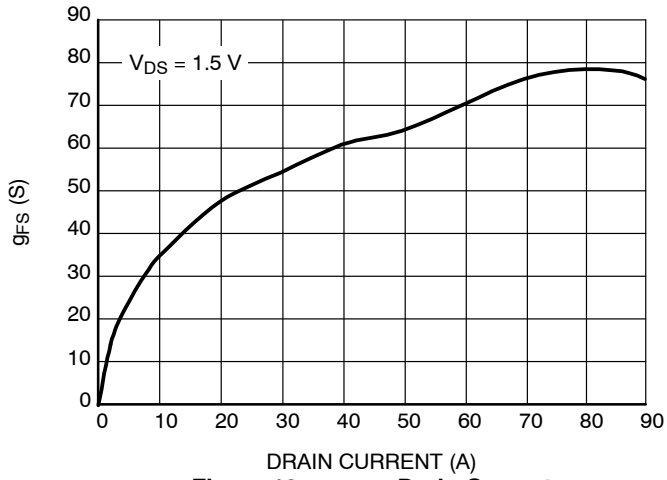


Figure 13.  $g_{FS}$  vs. Drain Current

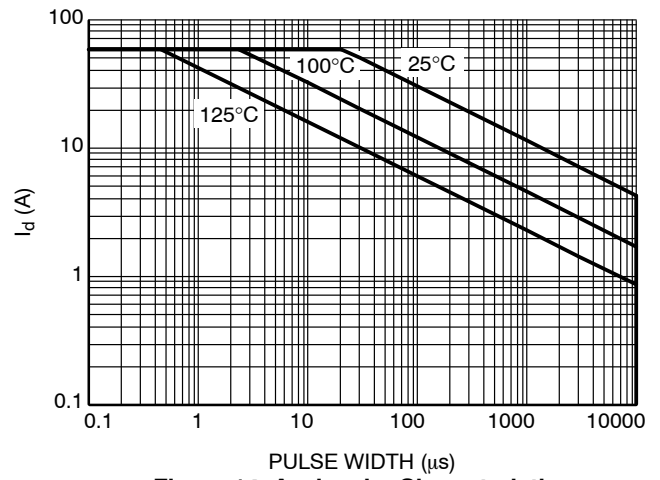
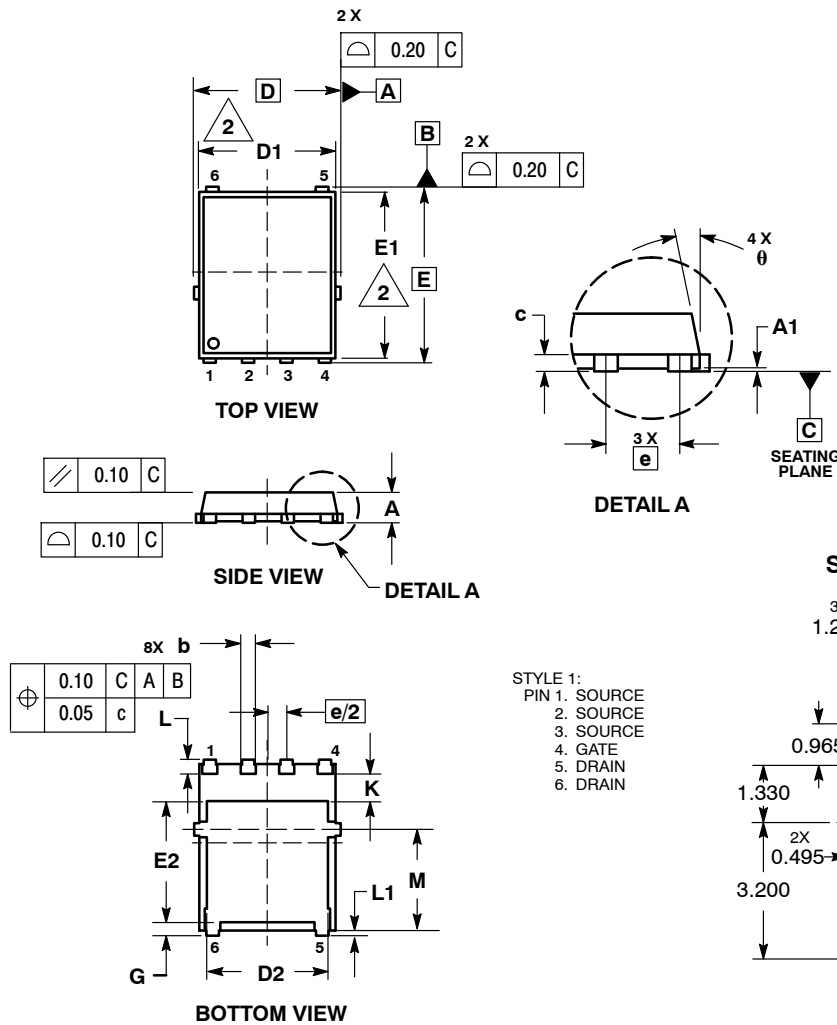


Figure 14. Avalanche Characteristics

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## PACKAGE DIMENSIONS

DFN6 5x6, 1.27P (S08 FL)  
CASE 488AA-01  
ISSUE C

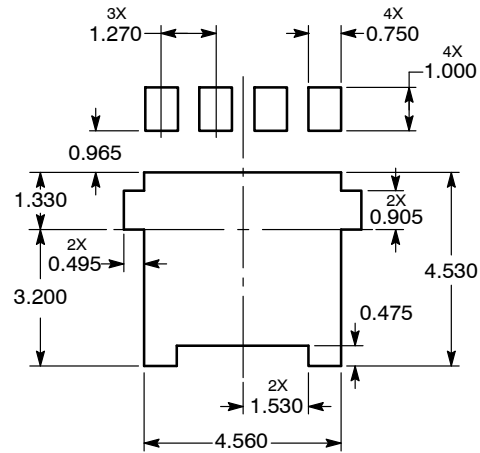


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.15 BSC		
D1	4.50	4.90	5.10
D2	3.50	---	4.22
E	6.15 BSC		
E1	5.50	5.80	6.10
E2	3.45	---	4.30
e	1.27 BSC		
G	0.51	0.61	0.71
K	0.51	---	---
L	0.51	0.61	0.71
L1	0.05	0.17	0.20
M	3.00	3.40	3.80
θ	0°	---	12°

**SOLDERING FOOTPRINT\***



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

\*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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