NTMFS4941N

MOSFET – Power, Single, N-Channel, SO-8 FL
30 V, 47 A

Features
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications
- CPU Power Delivery
- DC−DC Converters

ON Semiconductor®

http://onsemi.com

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
30 V	6.2 mΩ @ 10 V	47 A
	9.0 mΩ @ 4.5 V	

D (5,6)

G (4)

S (1,2,3)

N−CHANNEL MOSFET

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	30	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	T_A = 25°C	I_D	15	A
		T_A = 100°C		9.4	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	2.56	W
Continuous Drain Current $R_{\theta JA} \le$ 10 s (Note 1)		T_A = 25°C	I_D	25	A
		T_A = 100°C		16	
Power Dissipation $R_{\theta JA} \le$ 10 s (Note 1)		T_A = 25°C	P_D	7.2	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	I_D	9.0	A
		T_A = 100°C		5.7	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	0.91	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	47	A
		T_C =100°C		30	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	25.5	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	140	A
Current Limited by Package	T_A = 25°C		I_{Dmax}	100	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)			I_S	23	A
Drain to Source DV/DT			dV/d_t	7.5	V/ns

MARKING DIAGRAM

SO−8 FLAT LEAD CASE 488AA STYLE 1
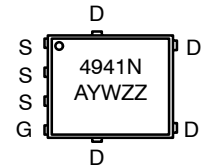
4941N
AYWZZ

A	= Assembly Location
Y	= Year
W	= Work Week
ZZ	= Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping[†]
NTMFS4941NT1G	SO−8 FL (Pb−Free)	1500 / Tape & Reel
NTMFS4941NT3G	SO−8 FL (Pb−Free)	5000 / 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.

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

Parameter	Symbol	Value	Unit
Single Pulse Drain–to–Source Avalanche Energy T_J = 25°C, V_{DD} = 50 V, V_{GS} = 10 V, I_L = 29 A_{pk}, L = 0.1 mH, R_G = 25 Ω	E_{AS}	42	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.
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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	4.9	°C/W
Junction−to−Ambient − Steady State (Note 3)	$R_{\theta JA}$	48.8	
Junction−to−Ambient − Steady State (Note 4)	$R_{\theta JA}$	137	
Junction−to−Ambient − (t ≤ 10 s) (Note 3)	$R_{\theta JA}$	17.5	

3. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
4. Surface−mounted on FR4 board using the minimum recommended pad size.

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

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		30			V
Drain−to−Source Breakdown Voltage (transient)	$V_{(BR)DSSt}$	VGS = 0 V, $I_{D(aval)}$ = 12 A, T_{case} = 25°C, $t_{transient}$ = 100 ns		34			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25°C			1.0	μA
			T_J = 125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.2	1.67	2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				4.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 30 A		4.7	6.2	mΩ
			I_D = 15 A		4.7		
		V_{GS} = 4.5 V	I_D = 30 A		7.1	9.0	
			I_D = 15 A		7.1		
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 15 A			32		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			1650		pF
Output Capacitance	C_{OSS}				570		
Reverse Transfer Capacitance	C_{RSS}				17		
Capacitance Ratio	C_{RSS}/C_{ISS}	V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz			0.010	0.021	

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

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ELECTRICAL CHARACTERISTICS ($T_J = 25°C$ unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
CHARGES, CAPACITANCES & GATE RESISTANCE							
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5$ V, $V_{DS} = 15$ V; $I_D = 30$ A			11.3		nC
Threshold Gate Charge	$Q_{G(TH)}$				2.9		
Gate−to−Source Charge	Q_{GS}				5.7		
Gate−to−Drain Charge	Q_{GD}				1.64		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10$ V, $V_{DS} = 15$ V; $I_D = 30$ A			25.5		nC
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5$ V, $V_{DS} = 15$ V, $I_D = 15$ A, $R_G = 3.0$ Ω			11.6		ns
Rise Time	t_r				22		
Turn−Off Delay Time	$t_{d(OFF)}$				20		
Fall Time	t_f				2.7		
Turn−On Delay Time	$t_{d(ON)}$	$V_{GS} = 10$ V, $V_{DS} = 15$ V, $I_D = 15$ A, $R_G = 3.0$ Ω			9.0		ns
Rise Time	t_r				21.8		
Turn−Off Delay Time	$t_{d(OFF)}$				23.8		
Fall Time	t_f				2.8		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	$V_{GS} = 0$ V, $I_S = 30$ A	$T_J = 25°C$		0.91	1.1	V
			$T_J = 125°C$		0.81		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0$ V, dIS/dt = 100 A/μs, $I_S = 30$ A			32		ns
Charge Time	t_a				16.6		
Discharge Time	t_b				15.4		
Reverse Recovery Charge	Q_{RR}				25		nC
PACKAGE PARASITIC VALUES							
Source Inductance	L_S	$T_A = 25°C$			0.93		nH
Drain Inductance	L_D				0.005		nH
Gate Inductance	L_G				1.84		nH
Gate Resistance	R_G				1.1	2.0	Ω

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

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TYPICAL CHARACTERISTICS
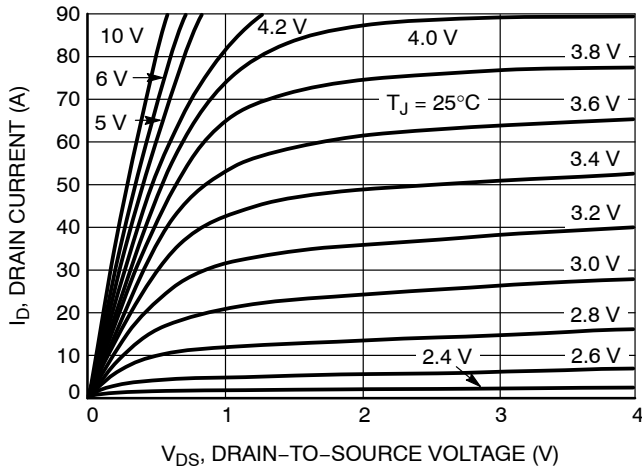
Figure 1. On−Region Characteristics
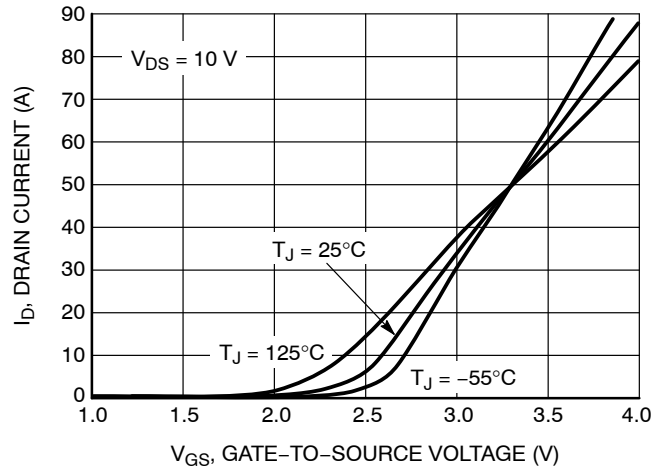
Figure 2. Transfer Characteristics
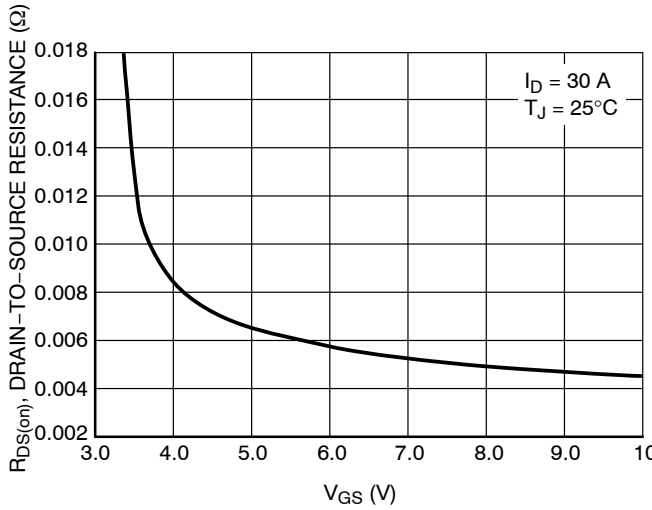
Figure 3. On−Resistance vs. V_{GS}
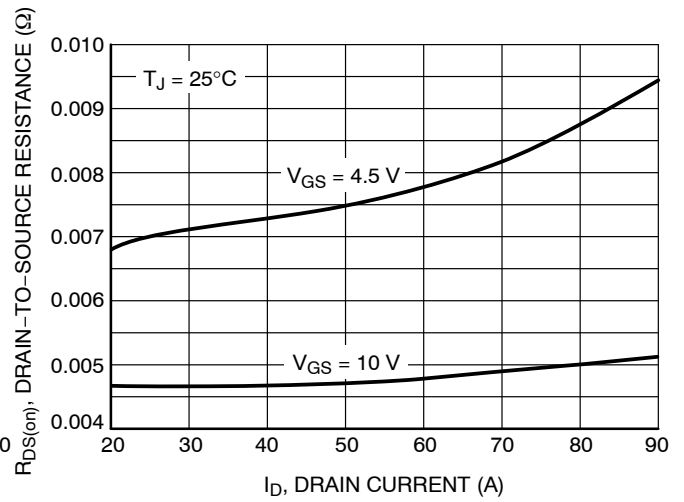
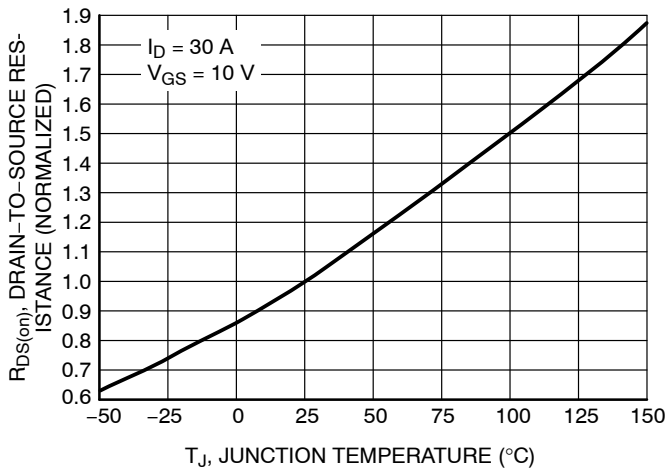
Figure 4. On−Resistance vs. Drain Current and Gate Voltage
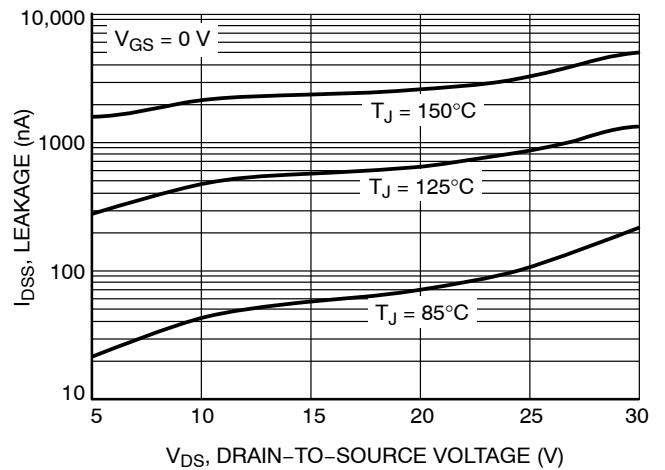

Figure 5. On−Resistance Variation with Temperature

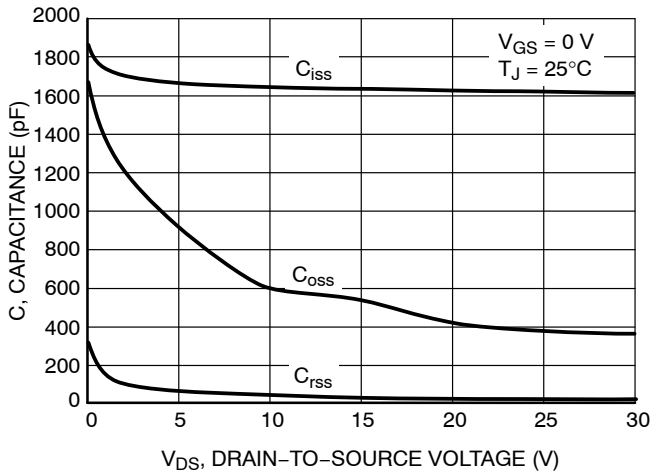Figure 6. Drain−to−Source Leakage Current vs. Voltage

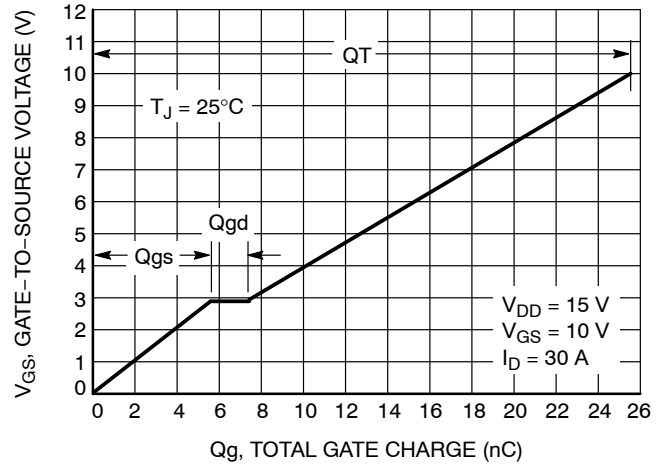# NTMFS4941N

TYPICAL CHARACTERISTICS

Figure 7. Capacitance Variation

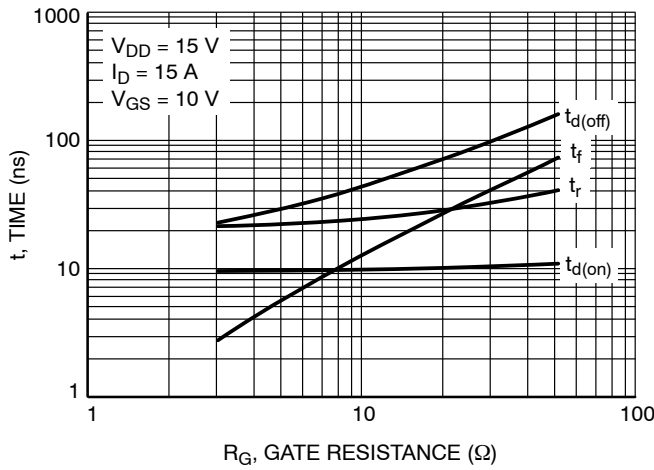**Figure 8. Gate–to–Source and Drain–to–Source Voltage vs. Total Charge**

Figure 9. Resistive Switching Time Variation vs. Gate Resistance
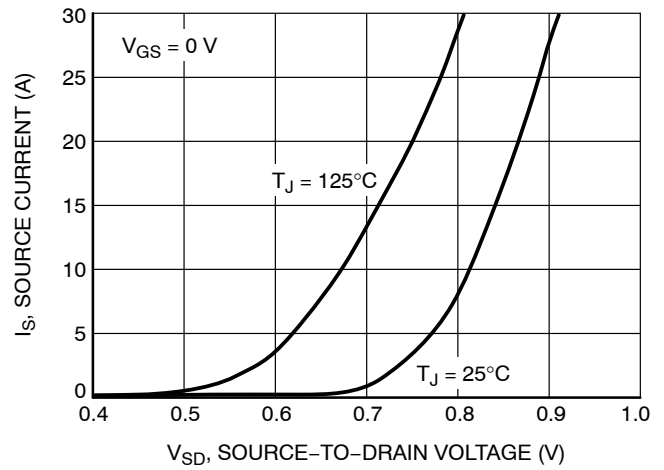
Figure 10. Diode Forward Voltage vs. Current
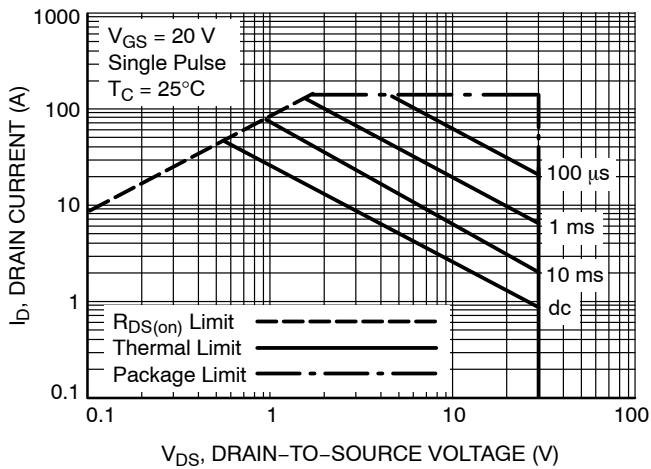
Figure 11. Maximum Rated Forward Biased Safe Operating Area
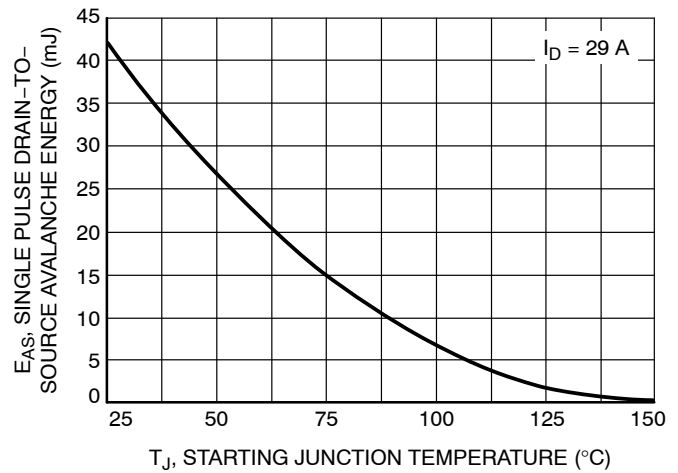
Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL CHARACTERISTICS
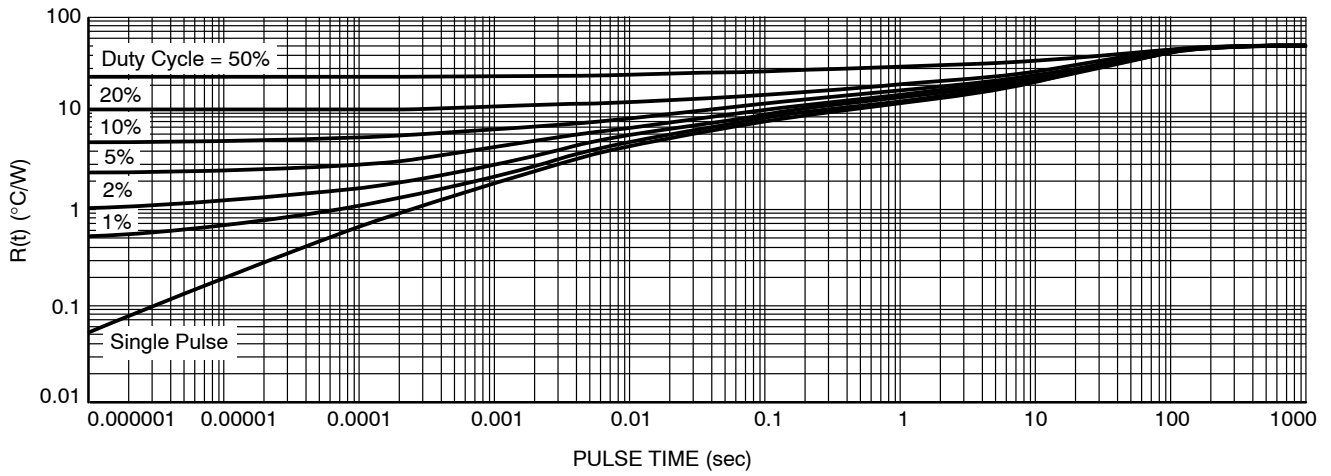
Figure 13. Thermal Response
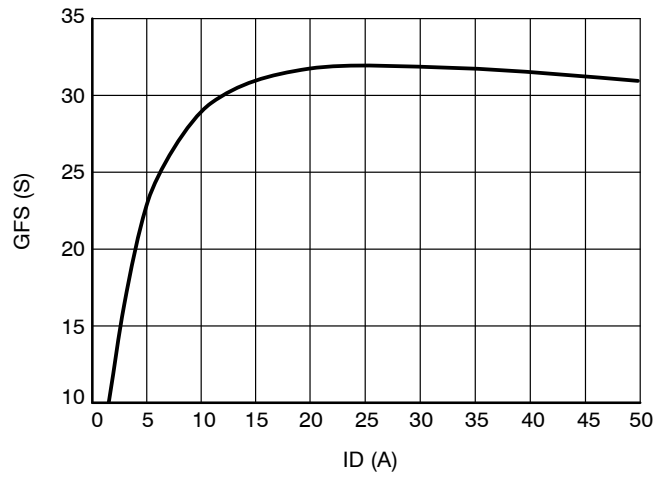
Figure 14. GFS vs. ID

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PACKAGE DIMENSIONS

DFN5 5x6, 1.27P
(SO−8FL)
CASE 488AA
ISSUE G

TOP VIEW

SIDE VIEW

DETAIL A

DETAIL A

BOTTOM VIEW

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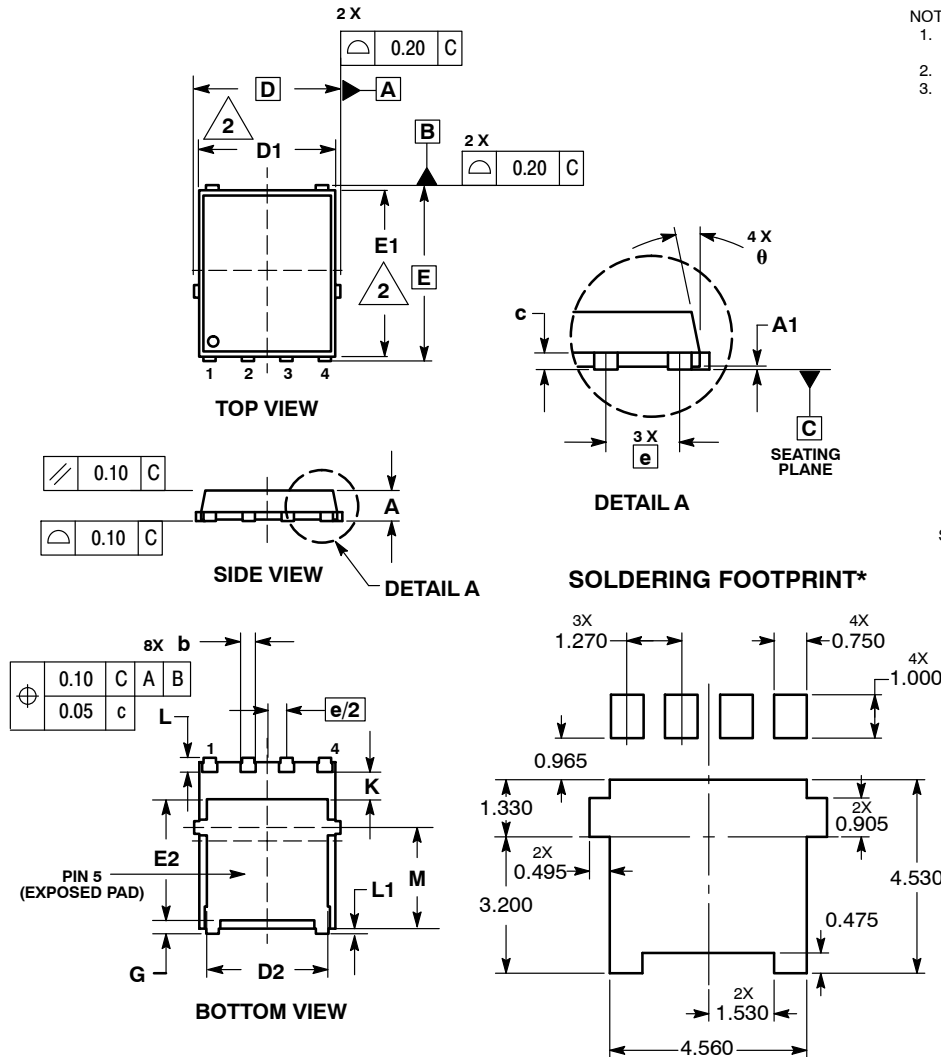
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	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	1.20	1.35	1.50
L	0.51	0.61	0.71
L1	0.05	0.17	0.20
M	3.00	3.40	3.80
θ	0 °	−−−	12 °

STYLE 1:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. 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.