NVMFD5489NL

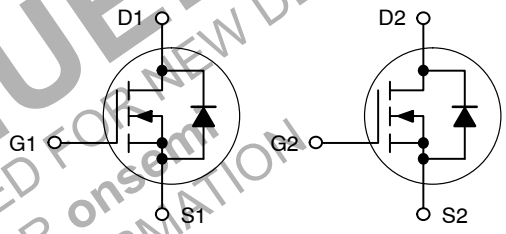
MOSFET – Power, Dual N-Channel, Logic Level
60 V, 65 mΩ, 12 A

ON Semiconductor®

www.onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
60 V	65 mΩ @ 10 V	12 A
	79 mΩ @ 4.5 V	

Dual N−Channel



Features

- Small Footprint (5x6 mm) for Compact Designs
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- 175°C Operating Temperature
- NVMFD5489NLWF – Wettable Flank Option for Enhanced Optical Inspection
- AEC−Q101 Qualified and PPAP Capable
- This is a Pb−Free Device

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	60	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\Psi J-mb}$ (Notes 1, 2, 3, 4)	Steady State	T_{mb} = 25°C	I_D	12	A
		T_{mb} = 100°C		8.8	
Power Dissipation $R_{\Psi J-mb}$ (Notes 1, 2, 3)		T_{mb} = 25°C	P_D	23.4	W
		T_{mb} = 100°C		11.7	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3 & 4)	Steady State	T_A = 25°C	I_D	4.5	A
		T_A = 100°C		3.2	
Power Dissipation $R_{\theta JA}$ (Notes 1 & 3)		T_A = 25°C	P_D	3.0	W
		T_A = 100°C		1.5	
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	62	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to 175	°C
Source Current (Body Diode)			I_S	22	A
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, $I_{L(pk)}$ = 19.5 A, L = 0.1 mH, R_G = 25 Ω)			E_{AS}	19	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.

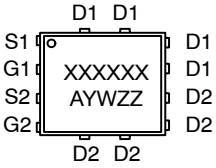
THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction−to−Mounting Board (top) − Steady State (Notes 2, 3)	$R_{\Psi J-mb}$	6.4	°C/W
Junction−to−Ambient − Steady State (Note 3)	$R_{\theta JA}$	50	
Junction−to−Ambient − Steady State (min footprint)		161	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Psi (Ψ) is used as required per JESD51−12 for packages in which substantially less than 100% of the heat flows to single case surface.

DFN8 5x6 (SO8FL) CASE 506BT

MARKING DIAGRAM



XXXXXX = 5489NL (NVMFD5489NL) or 5489LW (NVMFD5489NLWF)
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NVMFD5489NLT1G	DFN8 (Pb−Free)	1500/ Tape & Reel
NVMFD5489NLT3G	DFN8 (Pb−Free)	5000/ Tape & Reel
NVMFD5489NLWFT1G	DFN8 (Pb−Free)	1500/ Tape & Reel
NVMFD5489NLWFT3G	DFN8 (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 Specification Brochure, BRD8011/D.

3. Surface−mounted on FR4 board using a 650 mm^2, 2 oz. Cu pad.
4. Continuous DC current rating. Maximum current for pulses as long as 1 second are higher but are dependent on pulse duration and duty cycle.

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		60			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	Reference to 25°C, I_D = 250 μA			67		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 60 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		1.5		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	Reference to 25°C, I_D = 250 μA			4.86		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 15 A			52	65	mΩ
		V_{GS} = 4.5 V, I_D = 7.5 A			66	79	
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 25 V			330		pF
Output Capacitance	C_{oss}				80		
Reverse Transfer Capacitance	C_{rss}				39		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 48 V, I_D = 6 A			12.4		nC
Threshold Gate Charge	$Q_{G(TH)}$				0.31		
Gate−to−Source Charge	Q_{GS}				1.3		
Gate−to−Drain Charge	Q_{GD}				4.74		
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 48 V, I_D = 6 A, R_G = 2.5 Ω			7		ns
Rise Time	t_r				11		
Turn−Off Delay Time	$t_{d(off)}$				31		
Fall Time	t_f				21		
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 = 125°C		0.71		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, d_{IS}/d_t = 100 A/μs, I_S = 10 A			24.2		ns
Charge Time	t_a				20.2		
Discharge Time	t_b				4.0		
Reverse Recovery Charge	Q_{RR}				26.5		nC
PACKAGE PARASITIC VALUES							
Source Inductance	L_S	T_A = 25°C			0.93		nH
Drain Inductance	L_D				0.005		
Gate Inductance	L_G				1.84		
Gate Resistance	R_G				12		Ω

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

TYPICAL CHARACTERISTICS

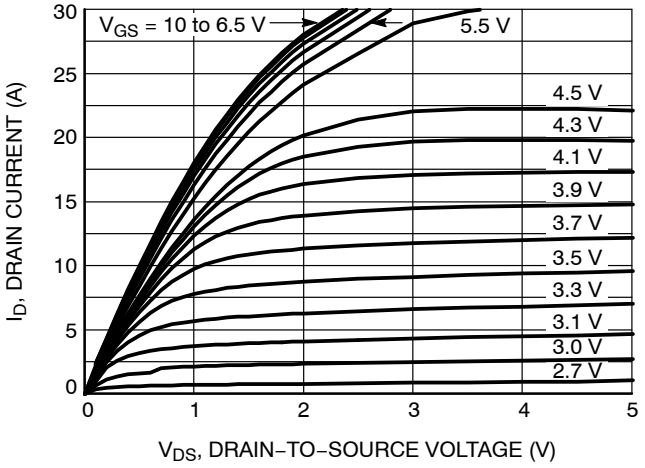


Figure 1. On−Region Characteristics

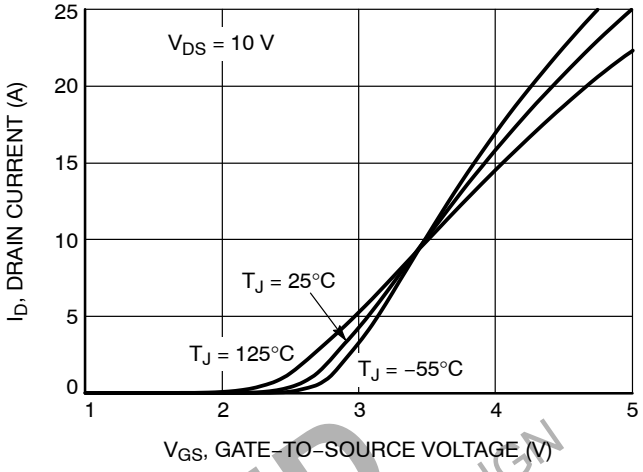


Figure 2. Transfer Characteristics

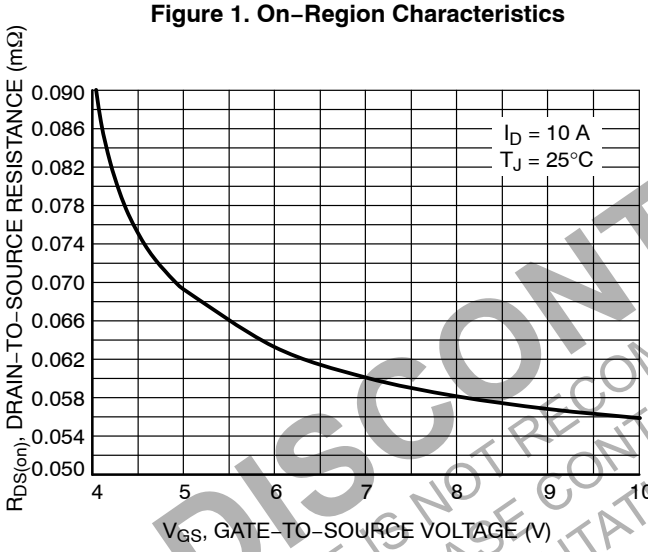


Figure 3. On−Resistance vs. V_{GS}

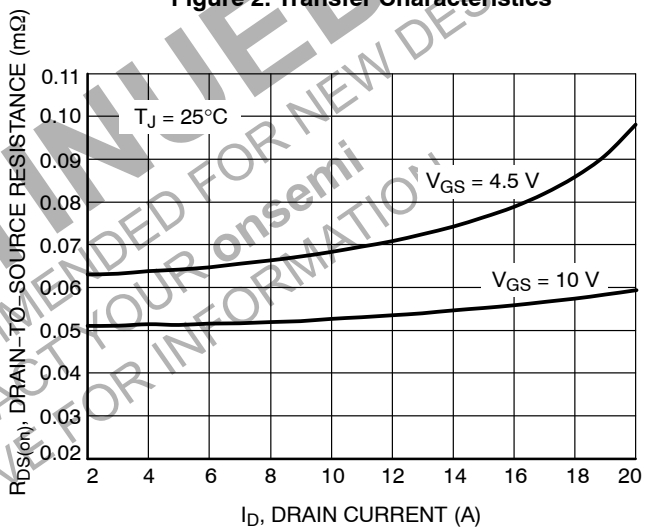


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

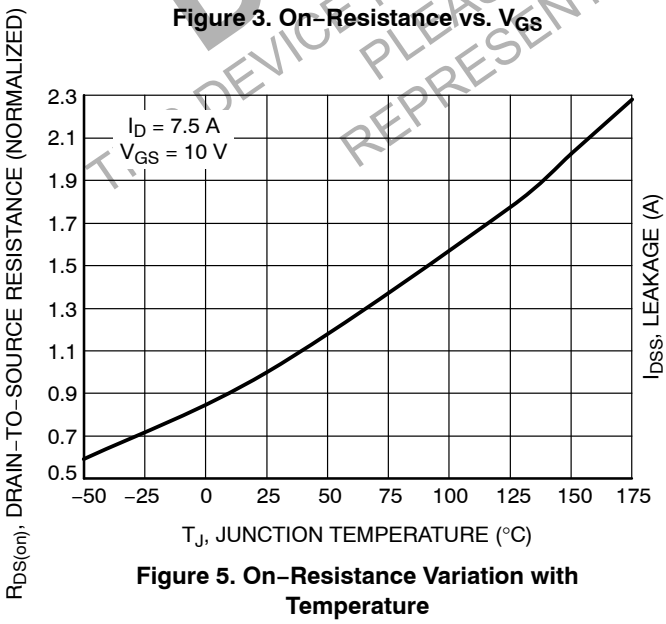


Figure 5. On−Resistance Variation with Temperature

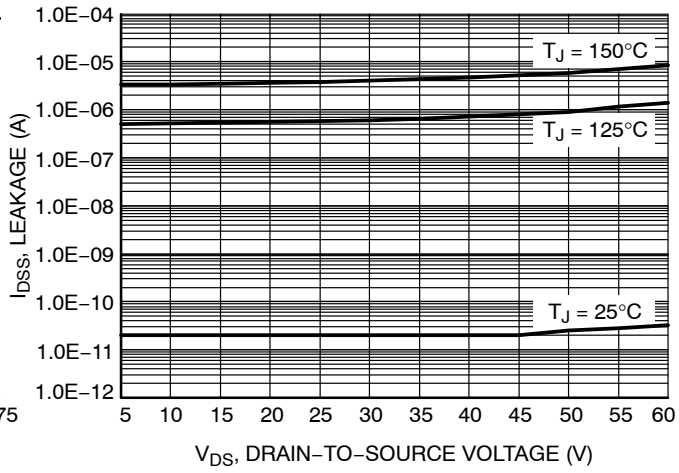


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

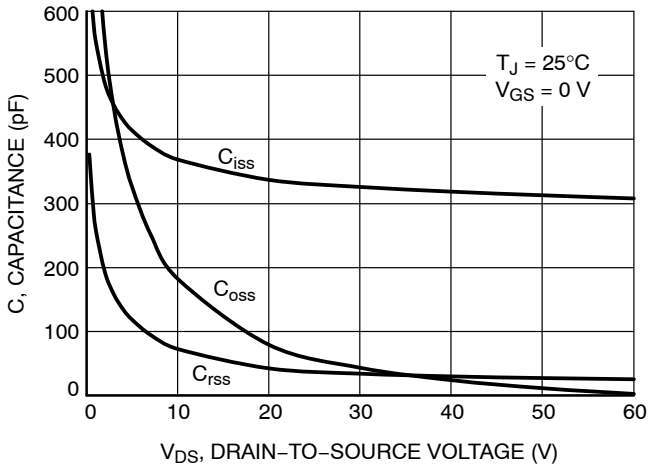


Figure 7. Capacitance Variation

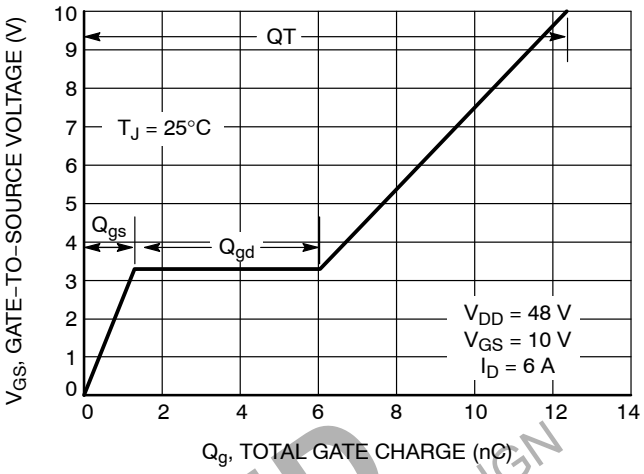


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

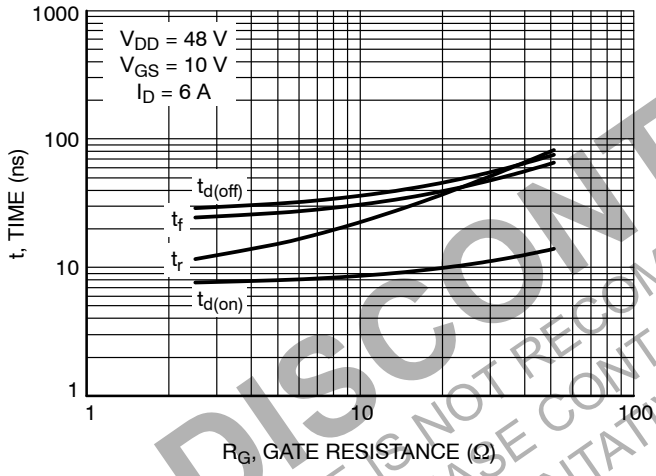


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

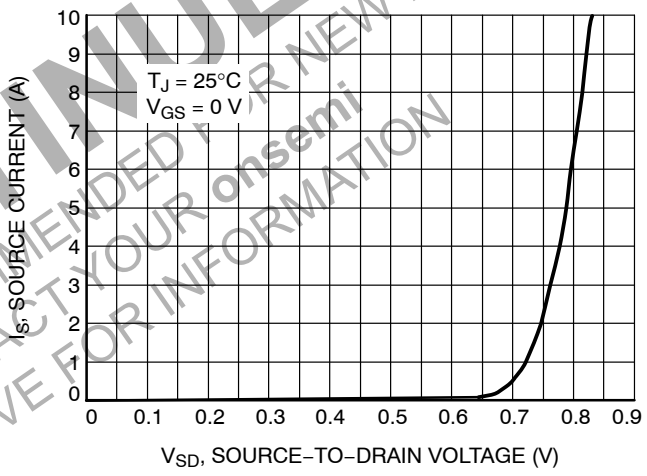


Figure 10. Diode Forward Voltage vs. Current

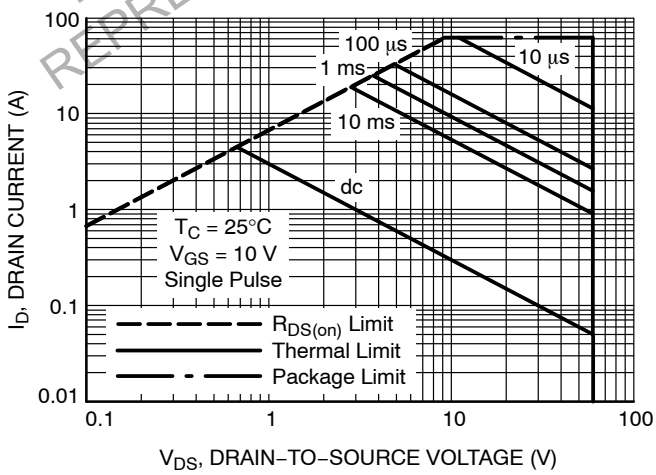


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS

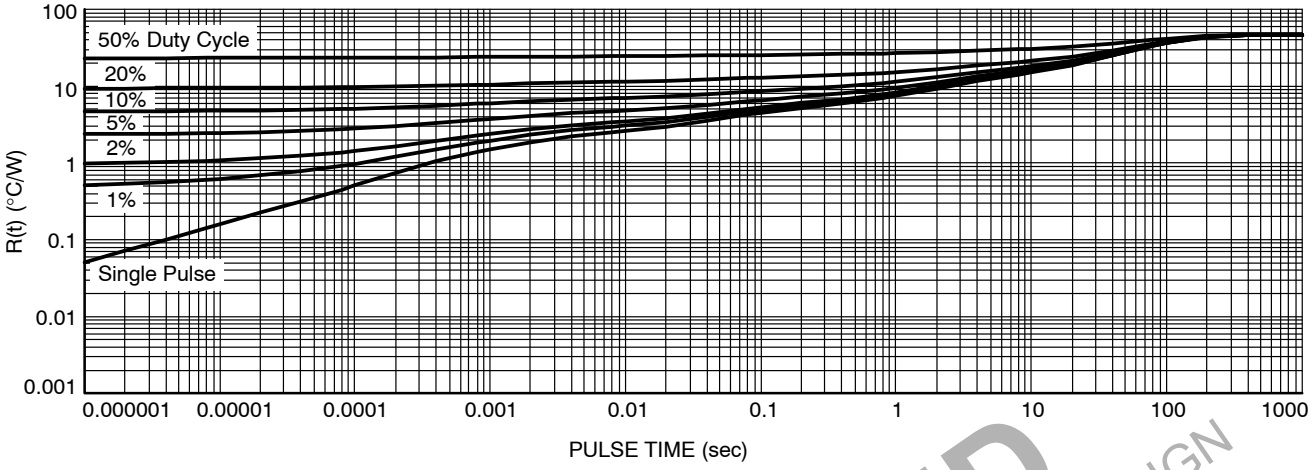
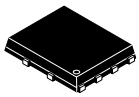


Figure 12. Thermal Response

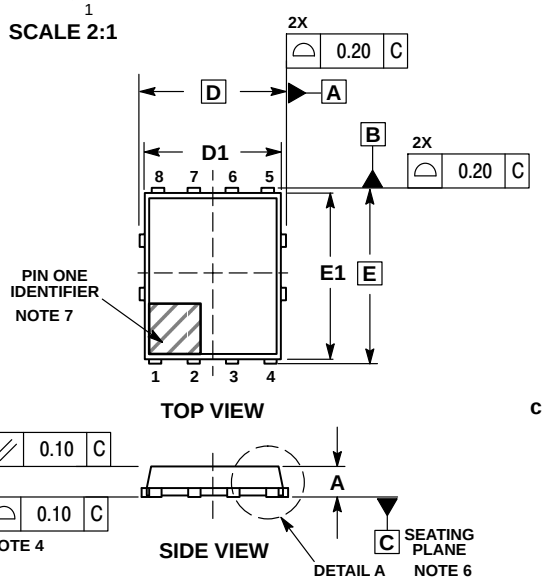
DFN8 5x6, 1.27P Dual Flag (SO8FL−Dual)

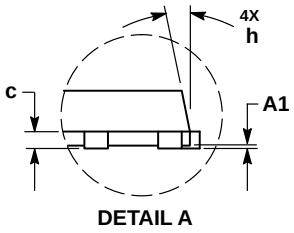
CASE 506BT
ISSUE F

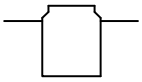
DATE 23 NOV 2021



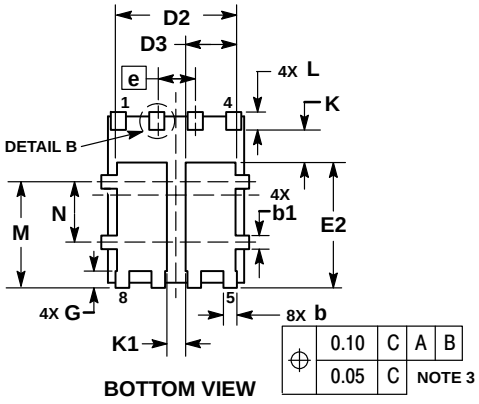
SCALE 2:1







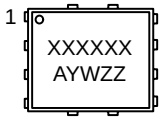
DETAIL B
ALTERNATE CONSTRUCTION



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
4. PROFILE TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
6. SEATING PLANE IS DEFINED BY THE TERMINALS. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
7. A VISUAL INDICATOR FOR PIN 1 MUST BE LOCATED IN THIS AREA.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.90	–––	1.10
A1	–––	–––	0.05
b	0.33	0.42	0.51
b1	0.33	0.42	0.51
c	0.20	–––	0.33
D		5.15 BSC	
D1	4.70	4.90	5.10
D2	3.90	4.10	4.30
D3	1.50	1.70	1.90
E		6.15 BSC	
E1	5.70	5.90	6.10
E2	3.90	4.15	4.40
e		1.27 BSC	
G	0.45	0.55	0.65
h	–––	–––	12 °
K	0.51	–––	–––
K1	0.56	–––	–––
L	0.48	0.61	0.71
M	3.25	3.50	3.75
N	1.80	2.00	2.20

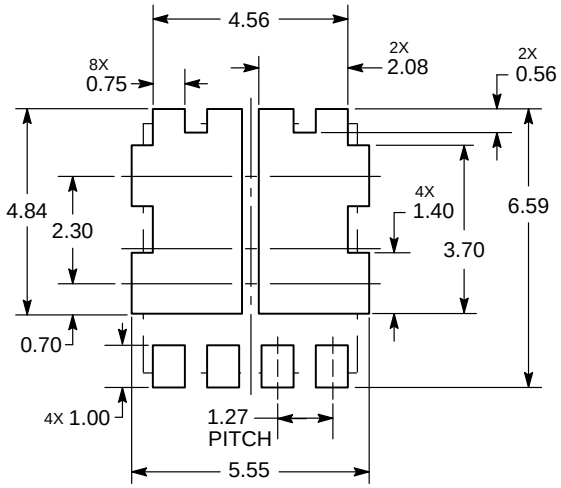
GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

SOLDERING FOOTPRINT*



DIMENSION: MILLIMETERS

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

DOCUMENT NUMBER:	**98AON50417E**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.	
DESCRIPTION:	**DFN8 5X6, 1.27P DUAL FLAG (SO8FL−DUAL)**		**PAGE 1 OF 1**

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales