NVMFD5853NL, NVMFD5853NLWF

Power MOSFET

40 V, 10 mΩ, 34 A, Dual N−Channel Logic Level, Dual SO−8FL

Features

- Small Footprint (5x6 mm) for Compact Designs
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- NVMFD5853NLWF − Wettable Flanks Product
- 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}	40	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	34	A
		T_{mb} = 100°C		24	
Power Dissipation $R_{\Psi J-mb}$ (Notes 1, 2, 3)		T_{mb} = 25°C	P_D	24	W
		T_{mb} = 100°C		12	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3 & 4)	Steady State	T_A = 25°C	I_D	12	A
		T_A = 100°C		8.5	
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}	165	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to 175	°C
Source Current (Body Diode)			I_S	34	A
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, V_{GS} = 10 V, $I_{L(pk)}$ = 28.3 A, L = 0.1 mH, R_G = 25 Ω)			E_{AS}	40	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.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction−to−Mounting Board (top) − Steady State (Notes 2, 3)	$R_{\Psi J-mb}$	6.2	°C/W
Junction−to−Ambient − Steady State (Note 3)	$R_{\theta JA}$	51	
Junction−to−Ambient − Steady State (min footprint)		162	

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.
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.

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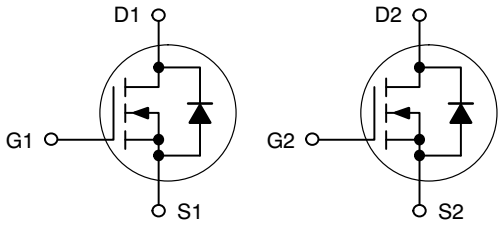
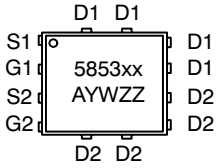
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	10 mΩ @ 10 V	34 A
	15 mΩ @ 4.5 V	

Dual N−Channel



DFN8 5x6
(SO8FL)
CASE 506BT

MARKING DIAGRAM



5853NL = Specific Device Code for NVMFD5853NL
5853LW = Specific Device Code for NVMFD5853NLWF
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NVMFD5853NLT1G	DFN8 (Pb−Free)	1500 / Tape & Reel
NVMFD5853NLWFT1G	DFN8 (Pb−Free)	1500 / 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.

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		40			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				37.1		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 = 125°C			100	
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		1.4		2.4	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				5.9		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 15 A			8.4	10	mΩ
		V_{GS} = 4.5 V, I_D = 15 A			12.7	15	
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 5 A			22		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 25 V			1100		pF
Output Capacitance	C_{oss}				152		
Reverse Transfer Capacitance	C_{rss}				100		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 32 V, I_D = 15 A			12.8		nC
Threshold Gate Charge	$Q_{G(TH)}$				1.0		
Gate−to−Source Charge	Q_{GS}				3.7		
Gate−to−Drain Charge	Q_{GD}				7.0		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 32 V, I_D = 15 A			23		nC
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 4.5 V, V_{DS} = 20 V, I_D = 15 A, R_G = 2.5 Ω			10		ns
Rise Time	t_r				53		
Turn−Off Delay Time	$t_{d(off)}$				17		
Fall Time	t_f				30		
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 20 V, I_D = 15 A, R_G = 2.5 Ω			9.0		ns
Rise Time	t_r				23		
Turn−Off Delay Time	$t_{d(off)}$				22		
Fall Time	t_f				4.3		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 20 A	T_J = 25°C		0.84	1.1	V
			T_J = 125°C		0.69		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, d_{IS}/d_t = 100 A/μs, I_S = 15 A			20		ns
Charge Time	t_a				12		
Discharge Time	t_b				8.1		
Reverse Recovery Charge	Q_{RR}				12.1		nC

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

TYPICAL CHARACTERISTICS

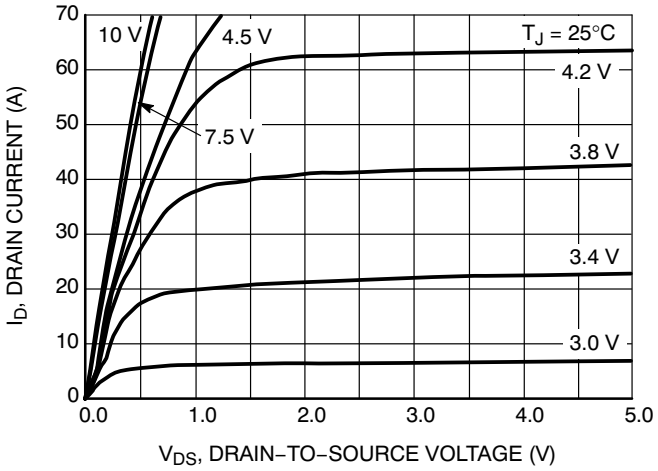


Figure 1. On−Region Characteristics

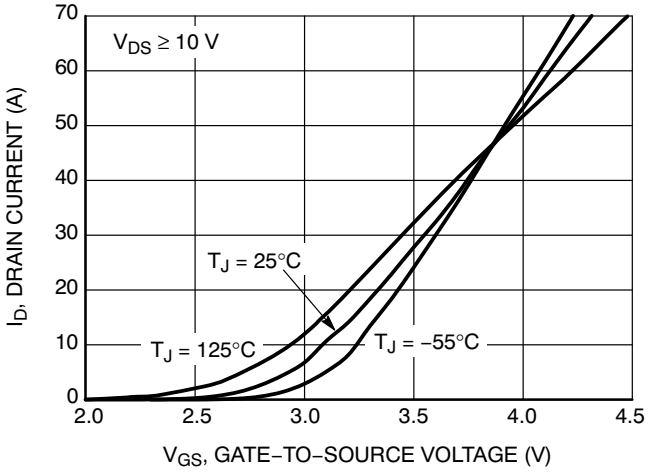


Figure 2. Transfer Characteristics

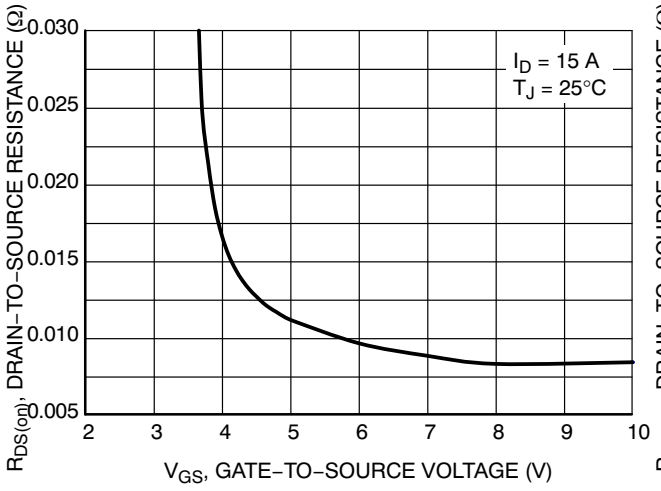


Figure 3. On−Resistance vs. V_{GS}

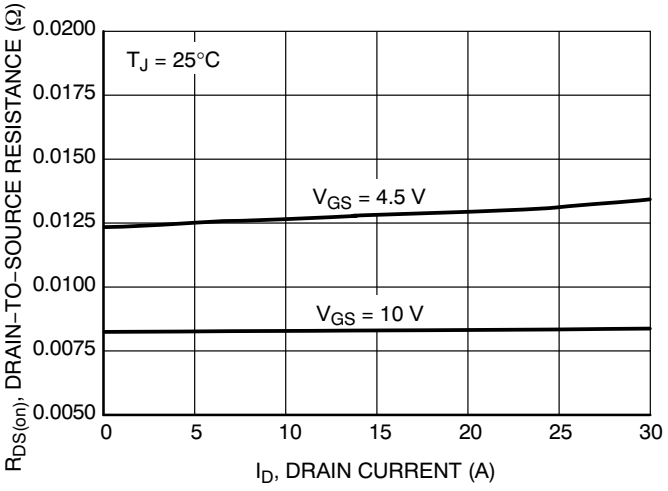


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

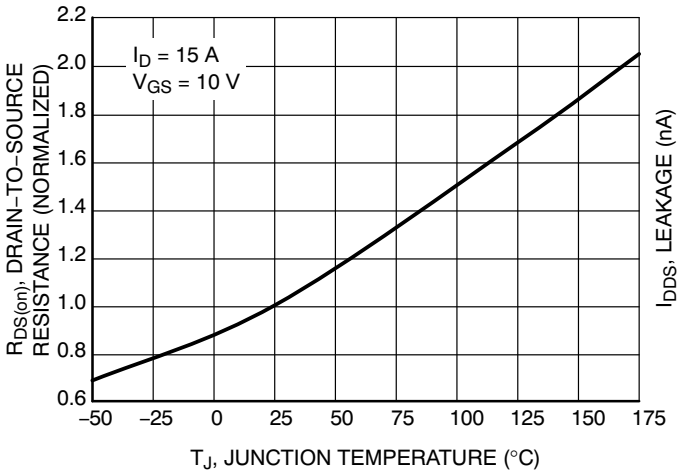


Figure 5. On−Resistance Variation with Temperature

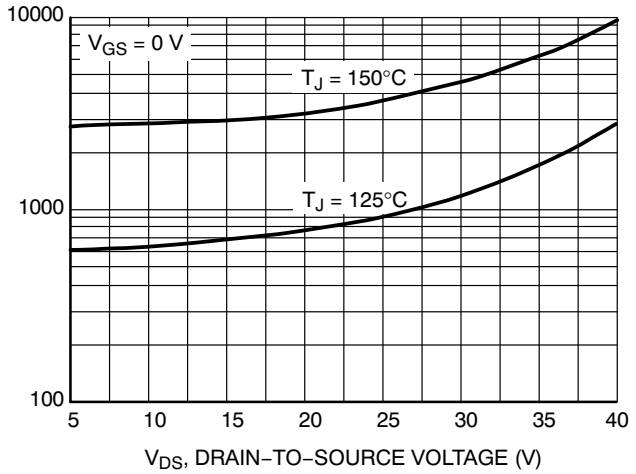


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

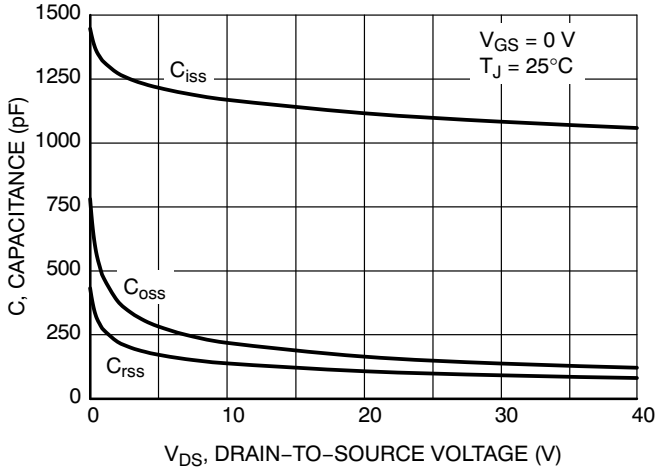


Figure 7. Capacitance Variation

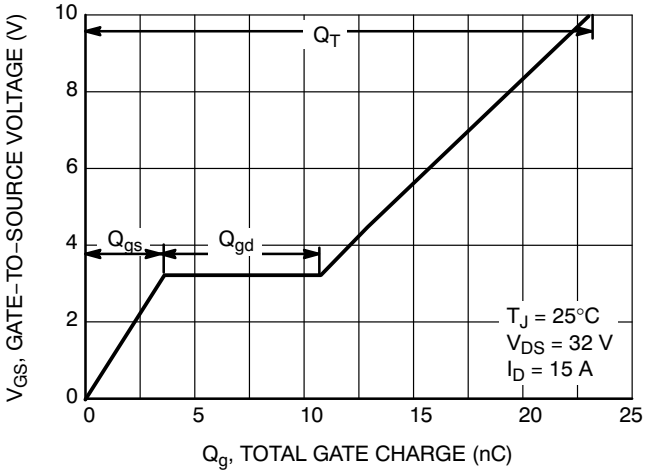


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

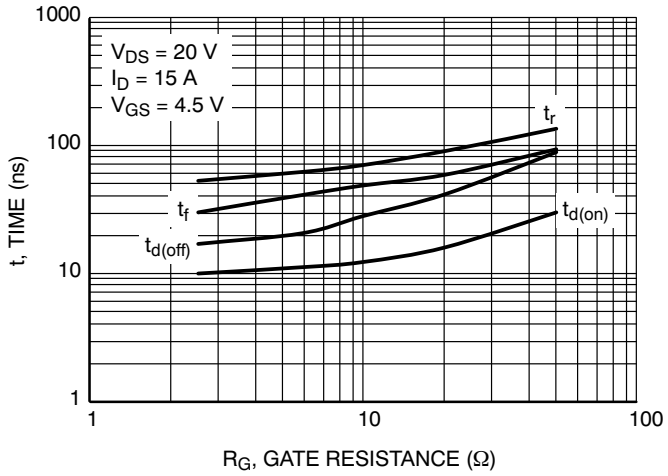


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

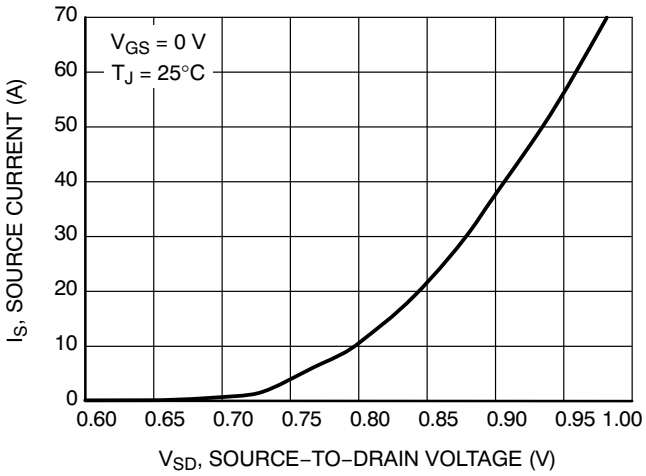


Figure 10. Diode Forward Voltage vs. Current

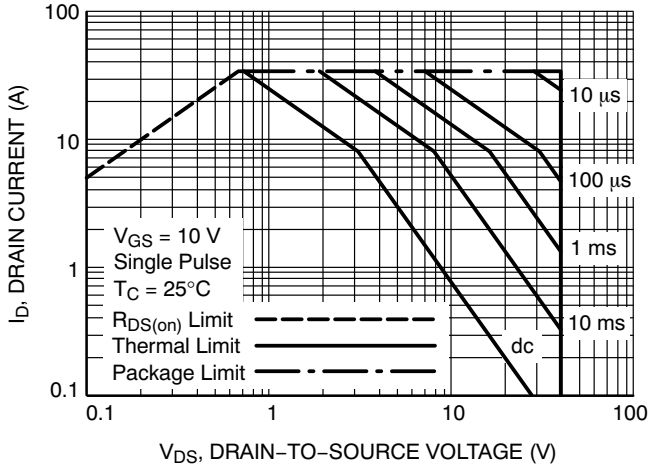


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS

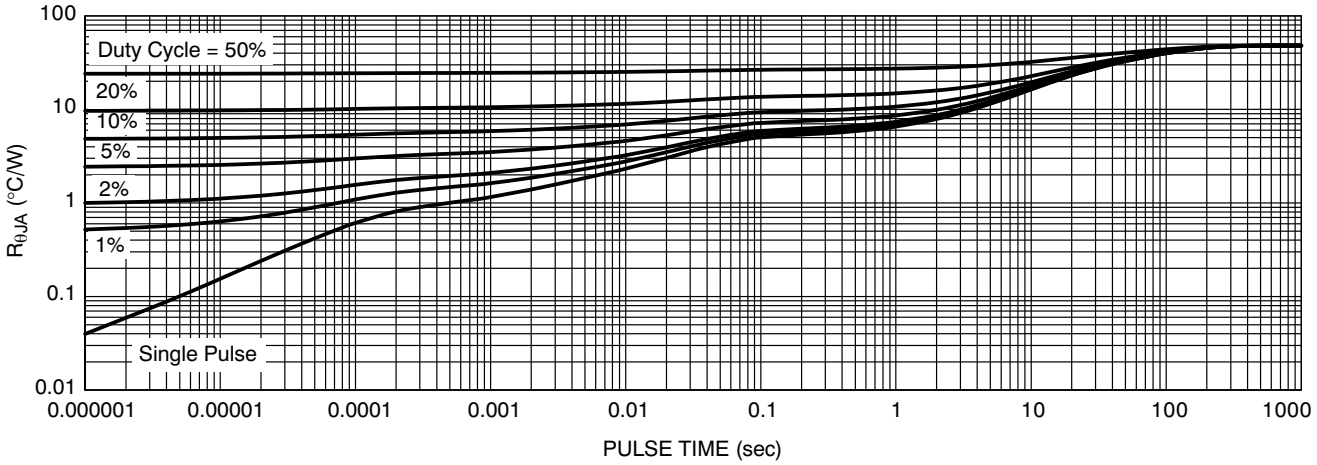
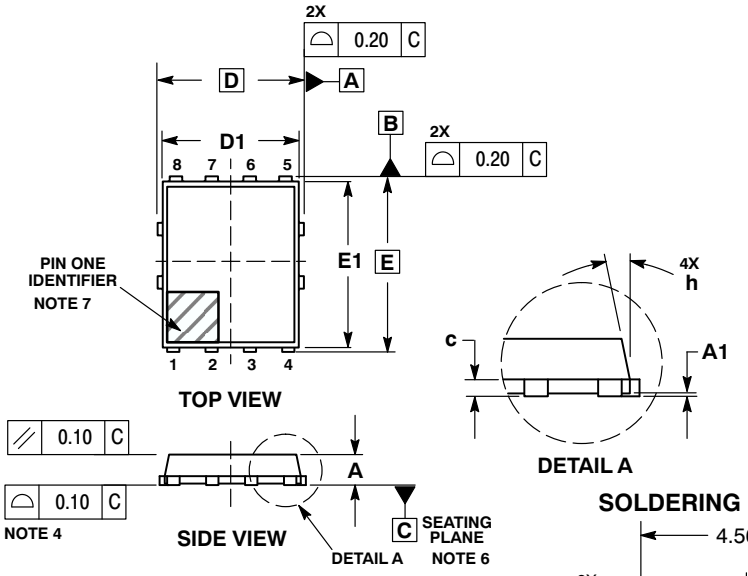
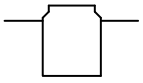


Figure 12. Thermal Response

PACKAGE DIMENSIONS

DFN8 5x6, 1.27P Dual Flag (SO8FL−Dual)
CASE 506BT
ISSUE E

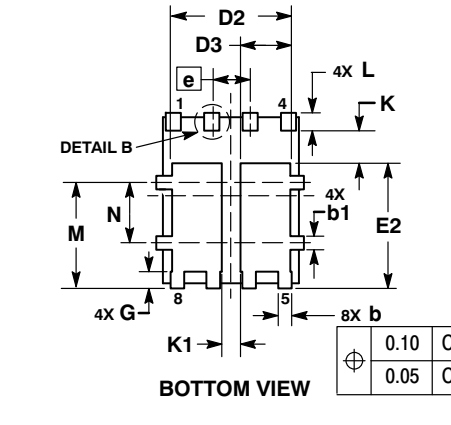




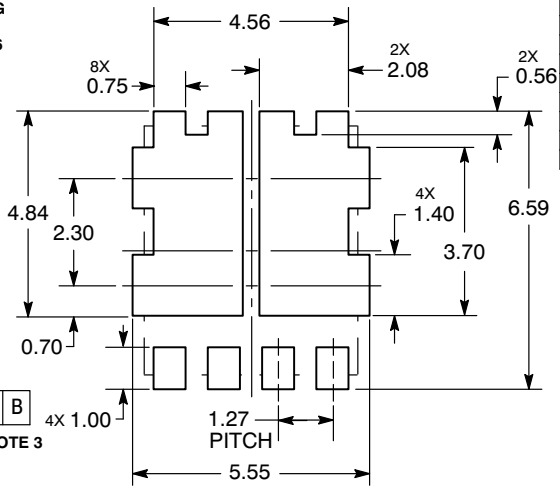
DETAIL B
ALTERNATE CONSTRUCTION

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	MAX	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



SOLDERING FOOTPRINT*



DIMENSION: MILLIMETERS

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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