

MOSFET – Power, Single N-Channel

60 V, 4.0 mΩ, 100 A

NVMYS4D1N06CL

Features

- Small Footprint (5x6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- LFPAK4 Package, Industry Standard
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Symbol	Parameter		Value	Unit	
V_{DSS}	Drain-to-Source Voltage		60	V	
V_{GS}	Gate-to-Source Voltage		± 20	V	
I_D	Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3)	Steady State	$T_C = 25^\circ\text{C}$	100	A
			$T_C = 100^\circ\text{C}$	71	
P_D	Power Dissipation $R_{\theta JC}$ (Notes 1, 2)		$T_C = 25^\circ\text{C}$	79	W
			$T_C = 100^\circ\text{C}$	40	
I_D	Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	22	A
			$T_A = 100^\circ\text{C}$	15	
P_D	Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		$T_A = 25^\circ\text{C}$	3.7	W
			$T_A = 100^\circ\text{C}$	1.8	
I_{DM}	Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	820	A	
T_J, T_{stg}	Operating Junction and Storage Temperature Range		-55 to +175	$^\circ\text{C}$	
I_S	Source Current (Body Diode)		100	A	
E_{AS}	Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}, I_{L(pk)} = 5 \text{ A}$)		185	mJ	
T_L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		260	$^\circ\text{C}$	

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

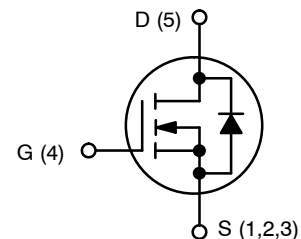
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State	1.9	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 2)	39	

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. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
60 V	4.0 mΩ @ 10 V	100 A
	5.7 mΩ @ 4.5 V	

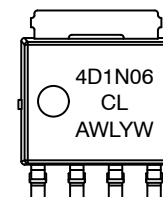


**LFPAK4
CASE 760AB**



N-CHANNEL MOSFET

MARKING DIAGRAM



- 4D1N06CL = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- W = Work Week

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

NVMYS4D1N06CL

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
$V_{(BR)DSS}/T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient			28		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{ V}, V_{DS} = 48\text{ V}$	$T_J = 25^\circ\text{C}$		10	μA
			$T_J = 125^\circ\text{C}$		250	
I_{GSS}	Gate-to-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 4)

$V_{GS(TH)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 80\ \mu\text{A}$	1.2		2.0	V
$V_{GS(TH)}/T_J$	Negative Threshold Temperature Coefficient			-5.4		mV/°C
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		3.3	4.0	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$		4.6	5.7	
g_{FS}	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 50\text{ A}$		105		S

CHARGES, CAPACITANCES & GATE RESISTANCE

C_{ISS}	Input Capacitance	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 25\text{ V}$		2200		pF
C_{OSS}	Output Capacitance			900		
C_{RSS}	Reverse Transfer Capacitance			17		
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 4.5\text{ V}, V_{DS} = 30\text{ V}; I_D = 50\text{ A}$		16		nC
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 10\text{ V}, V_{DS} = 30\text{ V}; I_D = 50\text{ A}$		34		
$Q_{G(TH)}$	Threshold Gate Charge	$V_{GS} = 4.5\text{ V}, V_{DS} = 30\text{ V}; I_D = 50\text{ A}$		1.5		
Q_{GS}	Gate-to-Source Charge			5.6		
Q_{GD}	Gate-to-Drain Charge			5.1		
V_{GP}	Plateau Voltage			2.8		V

SWITCHING CHARACTERISTICS (Note 5)

$t_{d(ON)}$	Turn-On Delay Time	$V_{GS} = 4.5\text{ V}, V_{DS} = 30\text{ V}, I_D = 50\text{ A}, R_G = 2.5\ \Omega$		10		ns
t_r	Rise Time			15		
$t_{d(OFF)}$	Turn-Off Delay Time			24		
t_f	Fall Time			5.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Forward Diode Voltage	$V_{GS} = 0\text{ V}, I_S = 50\text{ A}$	$T_J = 25^\circ\text{C}$		0.88	1.2	V
			$T_J = 125^\circ\text{C}$		0.78		
t_{RR}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 50\text{ A}$		41		ns	
t_a	Charge Time			21			
t_b	Discharge Time			20			
Q_{RR}	Reverse Recovery Charge			32		nC	

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.

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

5. Switching characteristics are independent of operating junction temperatures.

NVMYS4D1N06CL

TYPICAL CHARACTERISTICS

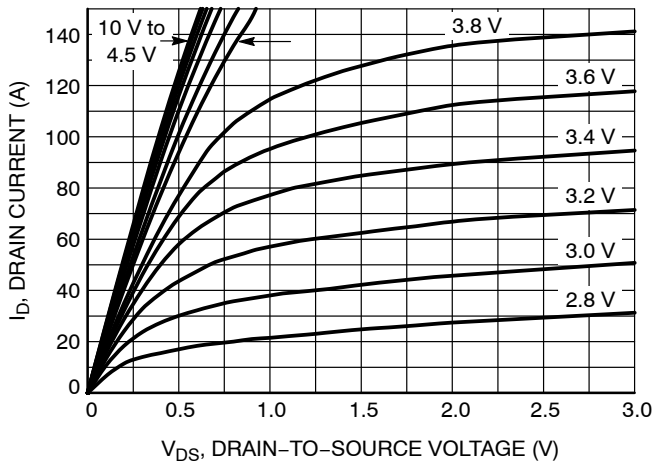


Figure 1. On-Region Characteristics

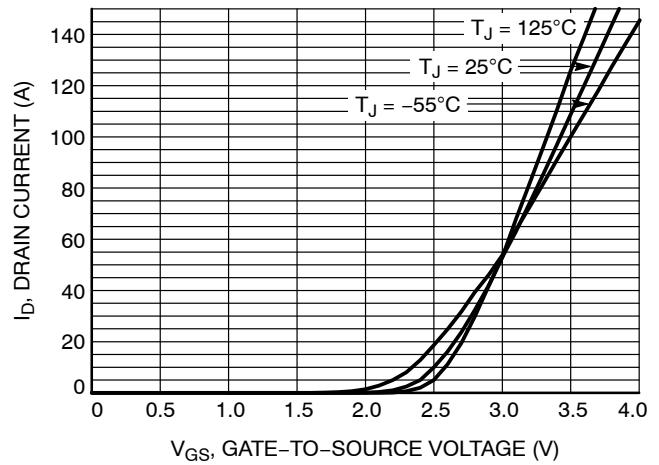


Figure 2. Transfer Characteristics

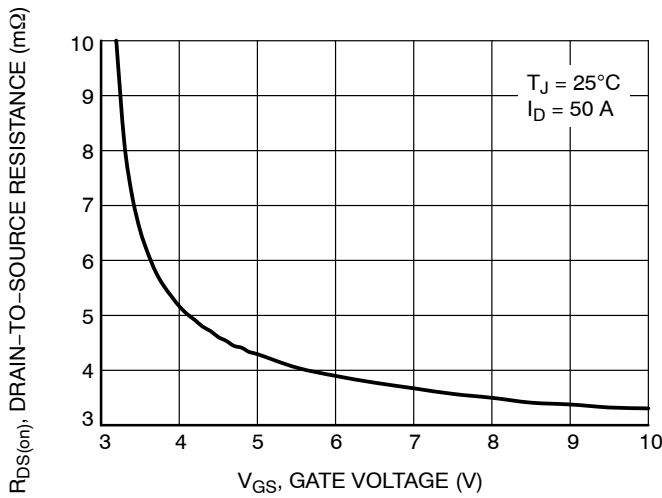


Figure 3. On-Resistance vs. Gate-to-Source Voltage

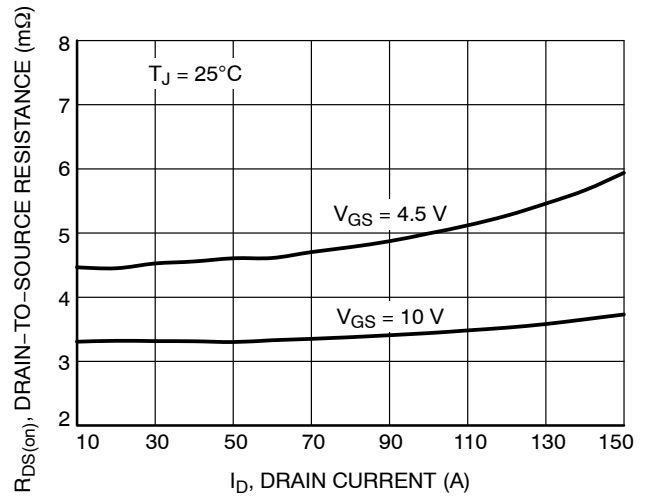


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

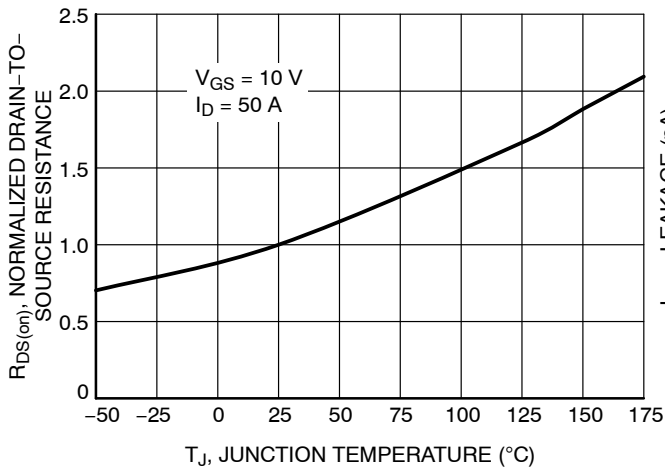


Figure 5. On-Resistance Variation with Temperature

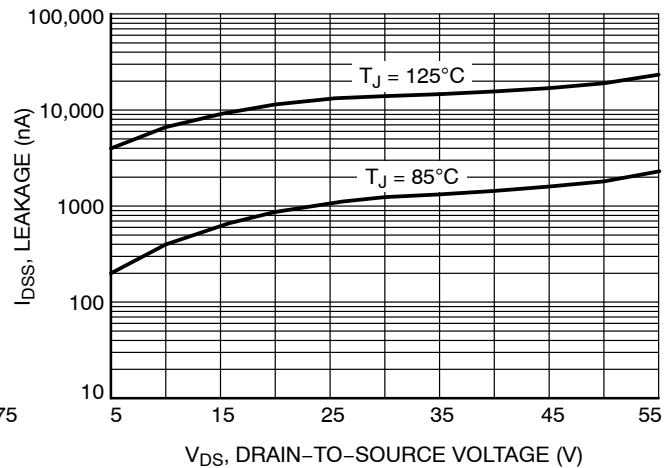


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (continued)

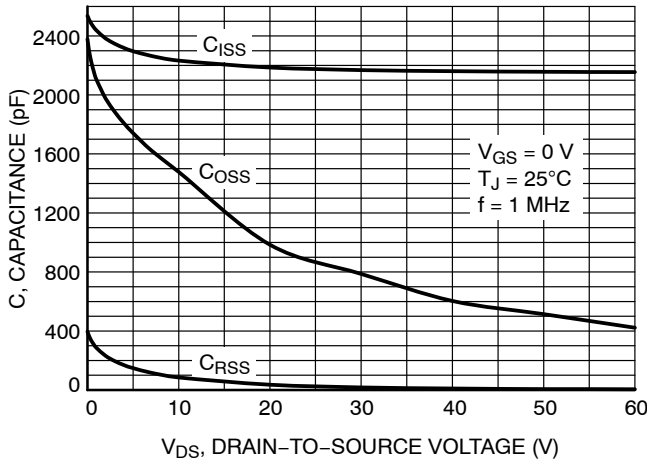


Figure 7. Capacitance Variation

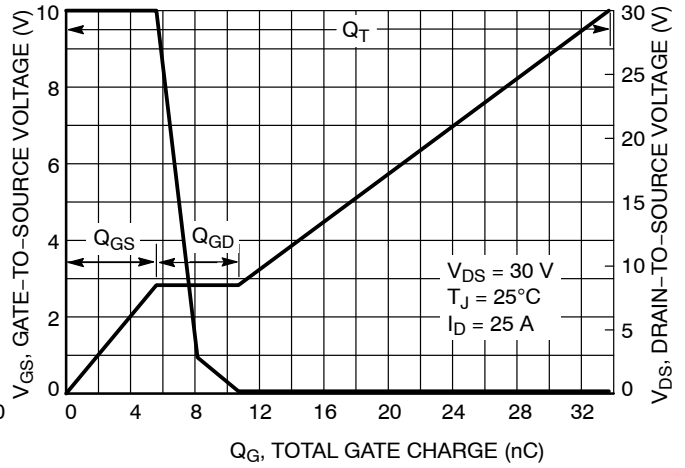


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

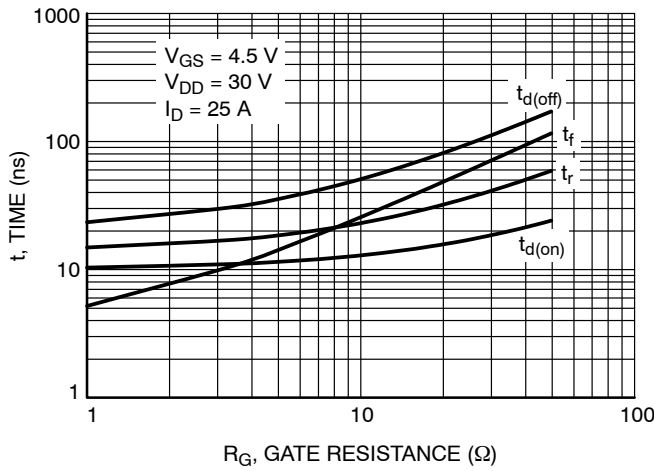


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

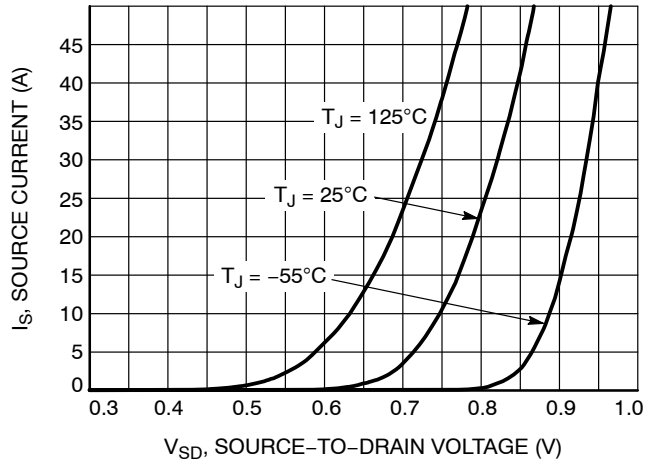


Figure 10. Diode Forward Voltage vs. Current

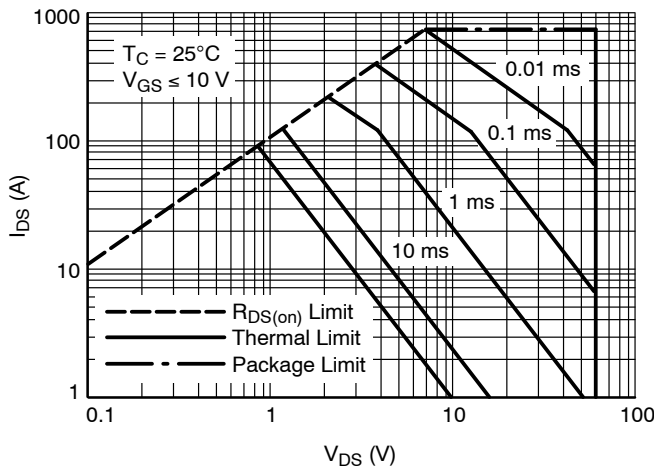


Figure 11. Safe Operating Area

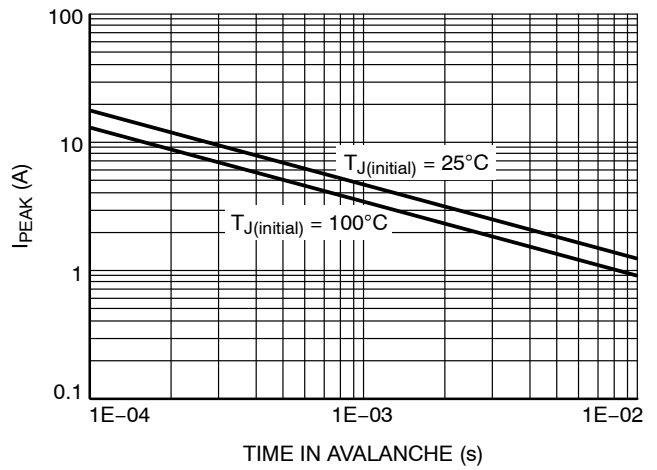


Figure 12. I_{PEAK} vs. Time in Avalanche

NVMYS4D1N06CL

TYPICAL CHARACTERISTICS (continued)

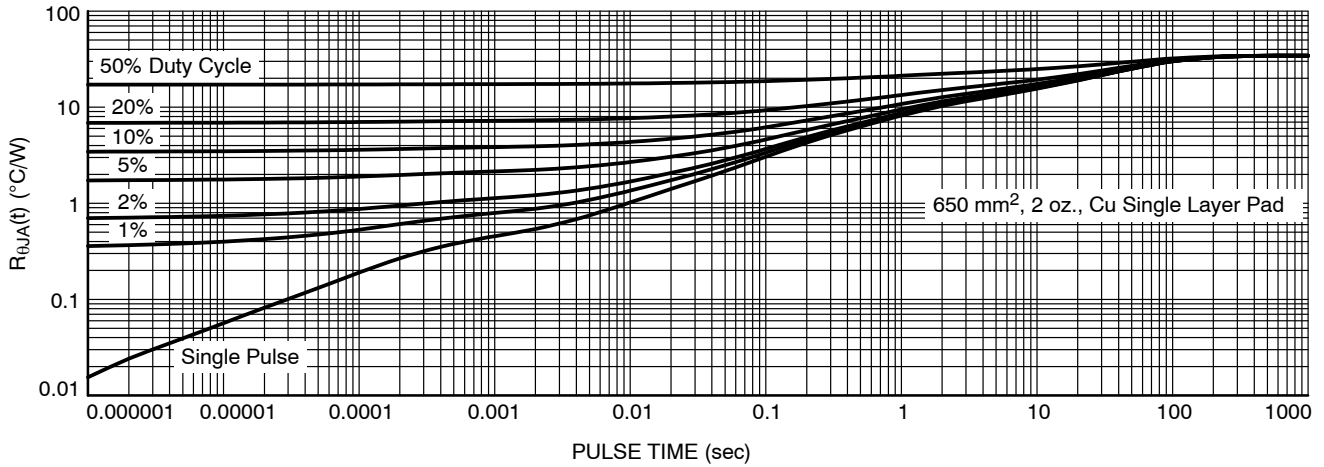


Figure 13. Thermal Characteristics

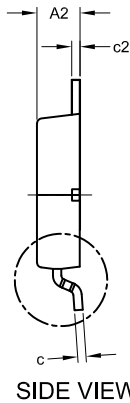
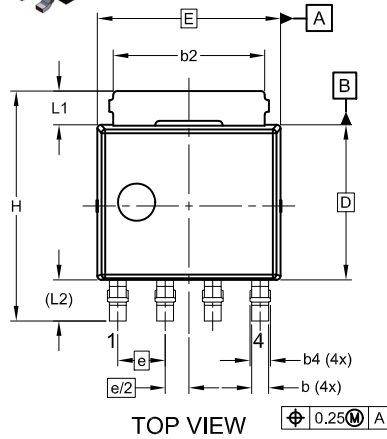
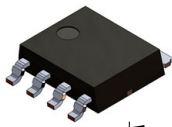
DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVMYS4D1N06CLTWG	4D1N06CL	LFPAK4 (Pb-Free)	3,000 / 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](#).

LFLPAK4 4.90x4.15x1.15MM, 1.27P
CASE 760AB
ISSUE D

DATE 22 MAY 2024

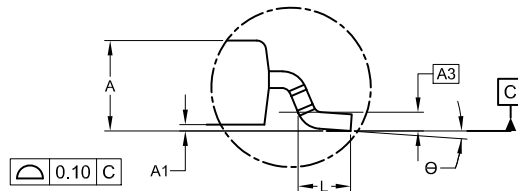


NOTES:

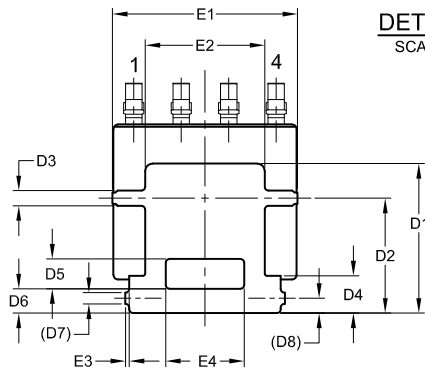
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.150mm PER SIDE.
4. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.

TOP VIEW $\varnothing 0.25 \text{ (M) A}$

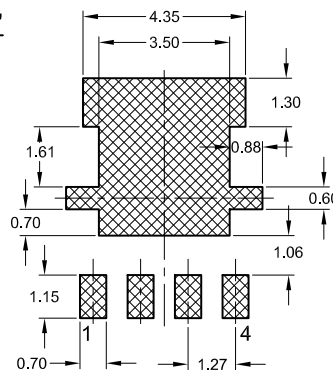
SIDE VIEW



DETAIL 'A'
SCALE: 2:1



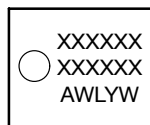
BOTTOM VIEW



RECOMMENDED LAND PATTERN

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- W = Work Week

*This information is generic. Please refer to device data sheet for actual part marking. Some products may not follow the Generic Marking.

MILLIMETER			
DIM	MIN	NOM	MAX
A	1.10	1.20	1.30
A1	0.00	0.08	0.15
A2	1.10	1.15	1.20
A3	0.25 BSC		
b	0.40	0.45	0.50
b2	3.80	4.10	4.40
b4	0.45	0.55	0.65
c	0.19	0.22	0.25
c2	0.19	0.22	0.25
D	4.15 BSC		
D1	3.80	4.00	4.20
D2	3.00	3.10	3.20
D3	0.30	0.40	0.50
D4	0.90	1.00	1.10
D5	0.70	0.80	0.90
D6	0.55	0.65	0.75
D7	0.31 REF		
D8	0.40 REF		
E	4.90 BSC		
E1	4.85	4.95	5.05
E2	3.10	3.20	3.30
E3	0.00	0.10	0.20
E4	2.00	2.10	2.20
e	1.27 BSC		
e/2	0.635 BSC		
e1	0.40 REF		
H	6.00	6.15	6.30
L	0.50	0.70	0.90
L1	0.80	0.90	1.00
L2	1.10 REF		
Θ	0°	4°	8°

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DESCRIPTION:	LFLPAK4 4.90x4.15x1.15MM, 1.27P	PAGE 1 OF 1

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