

MOSFET – Power, Single N-Channel

40 V, 342 A, 0.81 mΩ

NTMJS0D9N04C

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
- LFAK8 Package, Industry Standard
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

Symbol	Parameter			Value	Unit
V_{DS}	Drain-to-Source Voltage			40	V
V_{GS}	Gate-to-Source Voltage			20	V
I_D	Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	342	A
			$T_C = 100^\circ\text{C}$	242	
P_D			$T_C = 25^\circ\text{C}$	180	W
			$T_C = 100^\circ\text{C}$	90	
I_D	Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	52	A
			$T_A = 100^\circ\text{C}$	37	
P_D			$T_A = 25^\circ\text{C}$	4.2	W
			$T_A = 100^\circ\text{C}$	2.1	
I_{DM}	Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$		900	A
T_J, T_{stg}	Operating Junction and Storage Temperature Range			-55 to +175	$^\circ\text{C}$
I_S	Source Current (Body Diode)			150	A
E_{AS}	Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 33 \text{ A}$)			1945	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

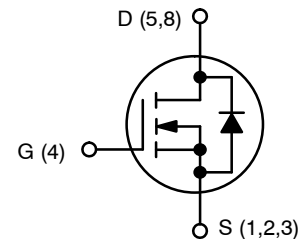
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State	0.83	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 2)	35.9	

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.

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	0.81 mΩ @ 10 V	342 A

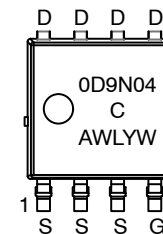


**LFAK8
CASE 760AA**



N-CHANNEL MOSFET

MARKING DIAGRAM



0D9N04C= Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
W = Work Week

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NTMJS0D9N04C

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
$V_{(BR)DSS}/T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient			14		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$	$T_J = 25^\circ\text{C}$		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 6)

$V_{GS(TH)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	2.0		4.0	V
$V_{GS(TH)}/T_J$	Threshold Temperature Coefficient			7.4		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		0.68	0.81	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 50\text{ A}$		400		S

CHARGES, CAPACITANCES & GATE RESISTANCE

C_{ISS}	Input Capacitance	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 20\text{ V}$		7400		pF
C_{OSS}	Output Capacitance			4600		
C_{RSS}	Reverse Transfer Capacitance			127		
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 50\text{ A}$		117		nC
$Q_{G(TH)}$	Threshold Gate Charge	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 50\text{ A}$		18		
Q_{GS}	Gate-to-Source Charge			29		
Q_{GD}	Gate-to-Drain Charge			28		
V_{GP}	Plateau Voltage			4.3		V

SWITCHING CHARACTERISTICS (Note 7)

$t_{d(ON)}$	Turn-On Delay Time	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 50\text{ A}, R_G = 2.5\text{ }\Omega$		20		ns
t_r	Rise Time			14		
$t_{d(OFF)}$	Turn-Off Delay Time			71		
t_f	Fall Time			26		

DRAIN-SOURCE DIODE CHARACTERISTICS

V _{SD}	Forward Diode Voltage	V _{GS} = 0 V, I _S = 50 A	T _J = 25°C		0.8	1.2	V
			T _J = 125°C		0.6		
t _{RR}	Reverse Recovery Time	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 50 A			82		ns
t _a	Charge Time				54		
t _b	Discharge Time				28		
Q _{RR}	Reverse Recovery Charge					148	

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 $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

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.

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

7. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

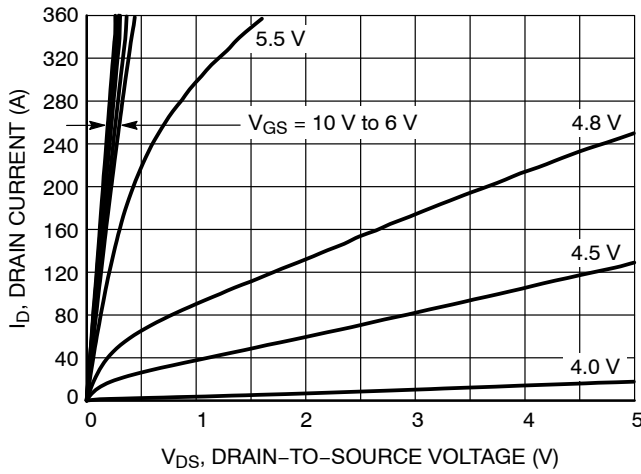


Figure 1. On-Region Characteristics

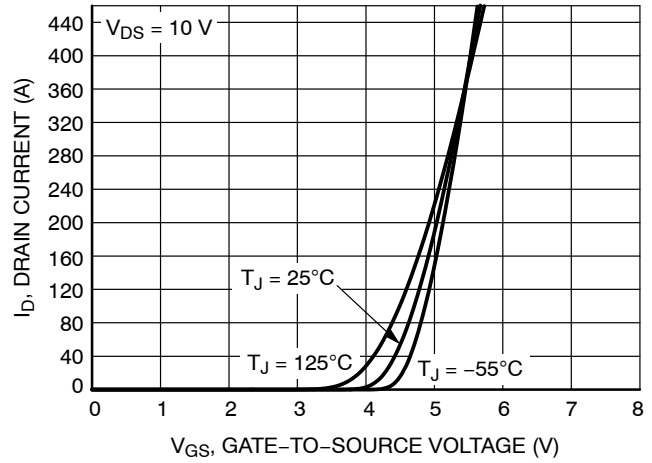


Figure 2. Transfer Characteristics

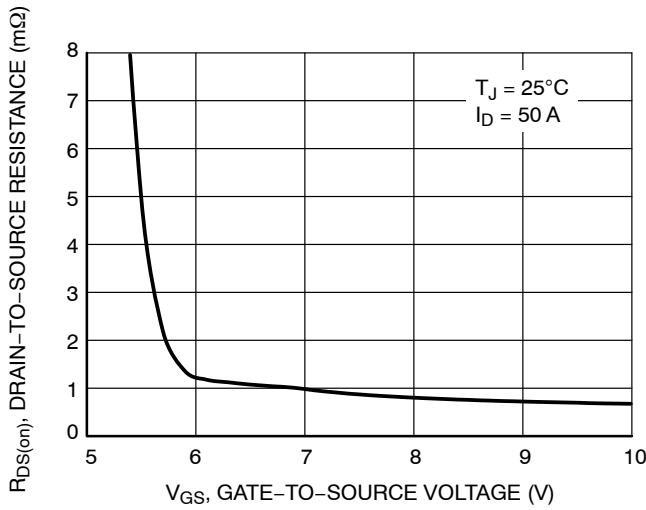


Figure 3. On-Resistance vs. Gate-to-Source Voltage

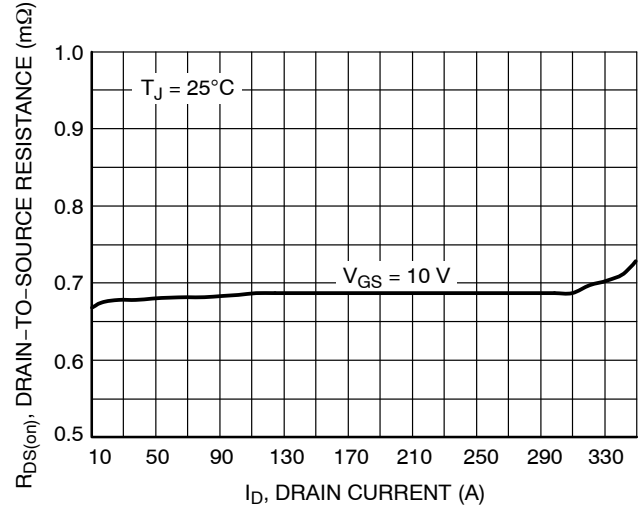


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

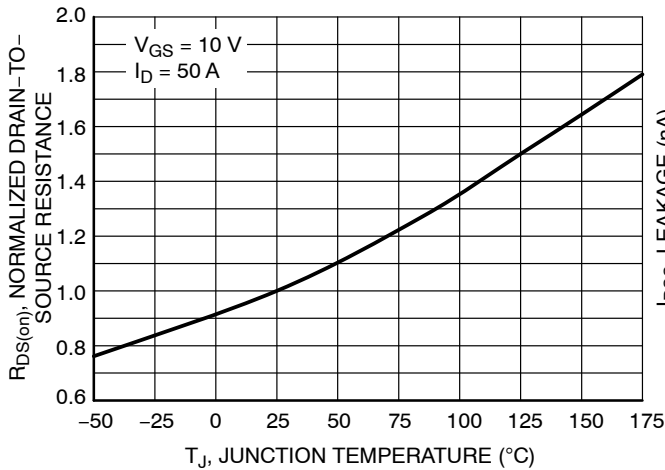


Figure 5. On-Resistance Variation with Temperature

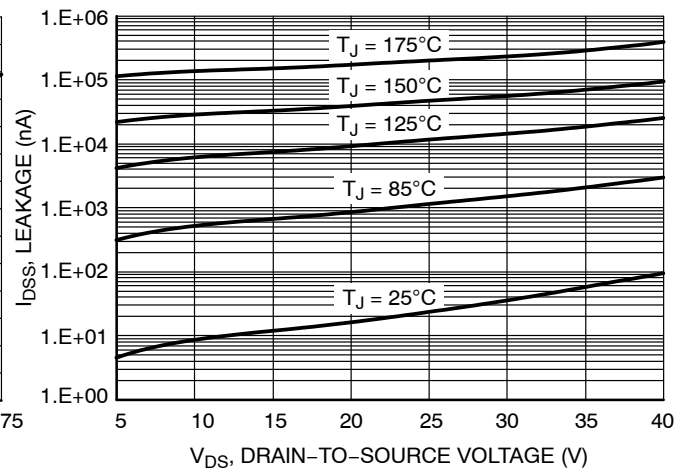


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS (continued)

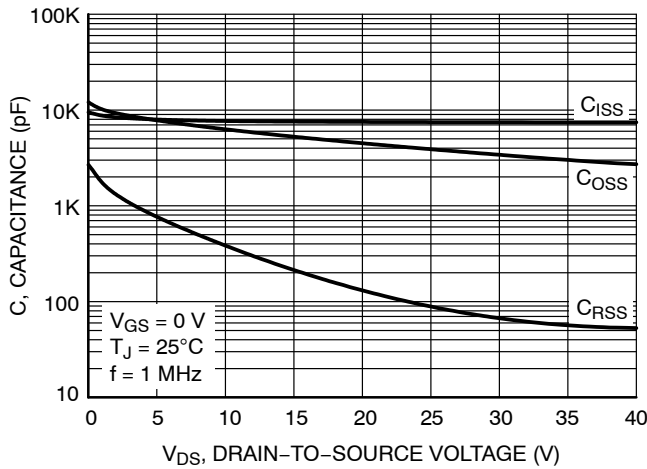


Figure 7. Capacitance Variation

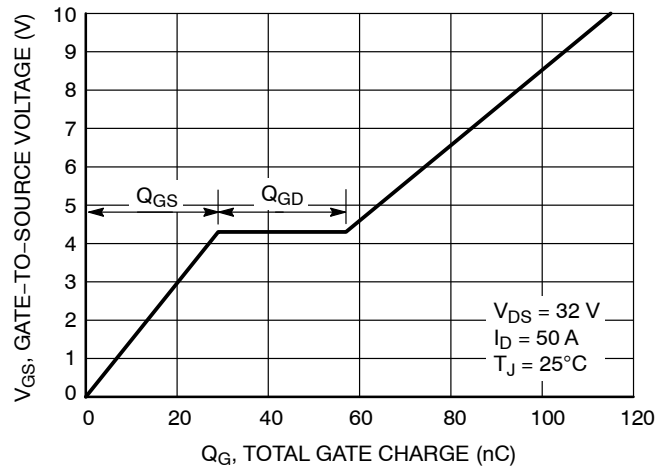


Figure 8. Gate-to-Source Voltage vs. Total Charge

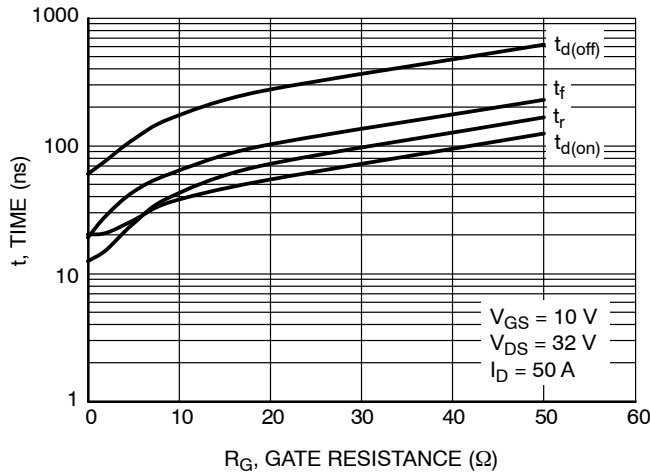


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

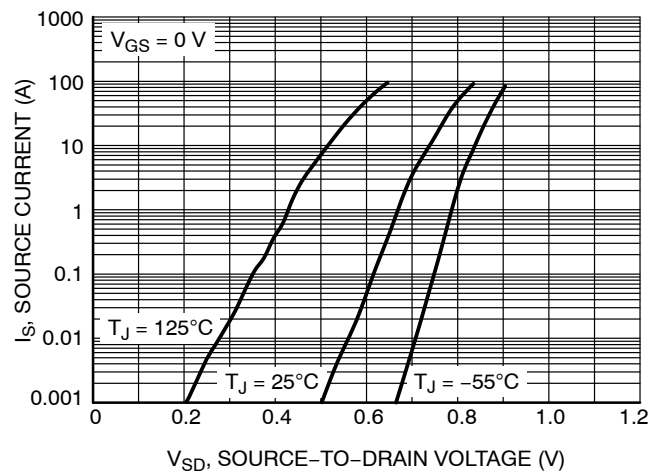


Figure 10. Diode Forward Voltage vs. Current

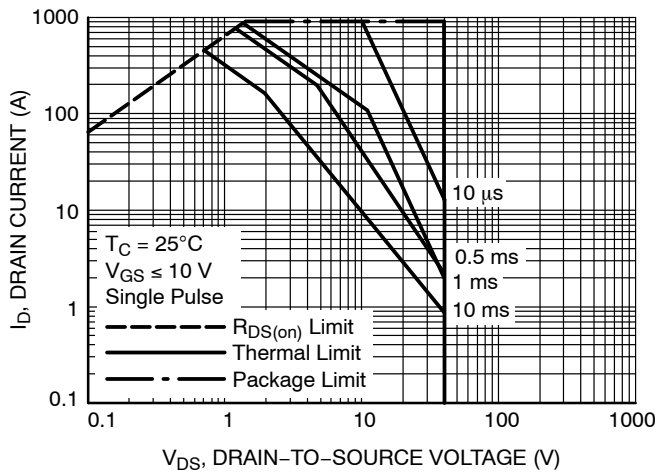


Figure 11. Maximum Rated Forward Biased Safe Operating Area

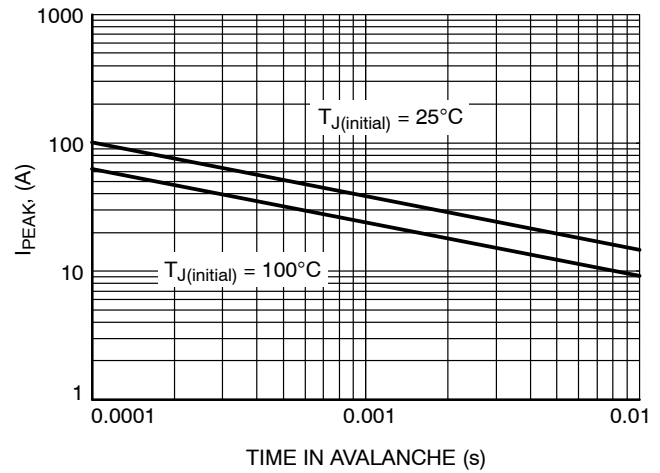


Figure 12. Maximum Drain Current vs. Time in Avalanche

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TYPICAL CHARACTERISTICS (continued)

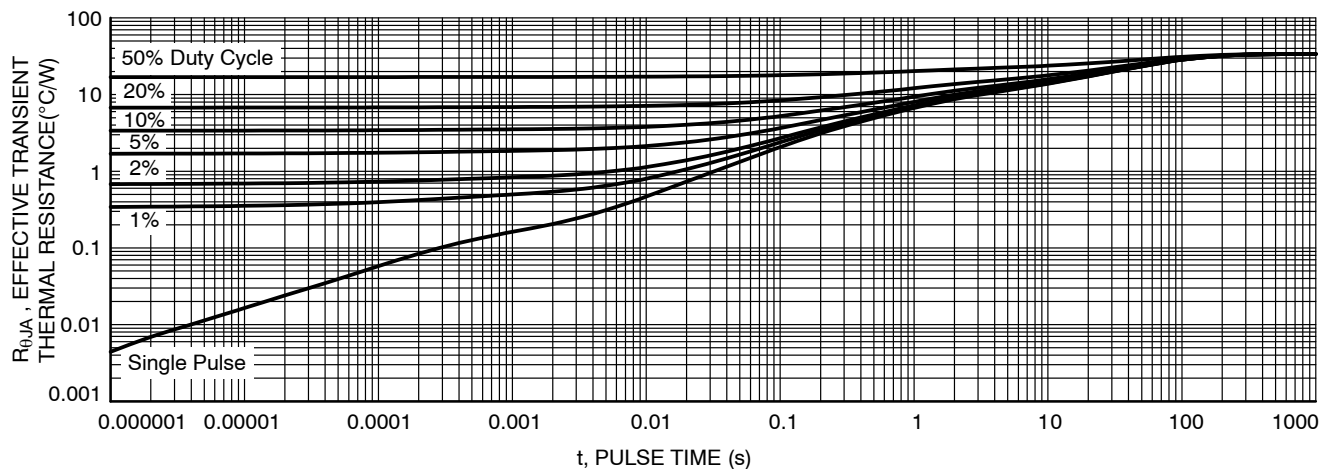


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

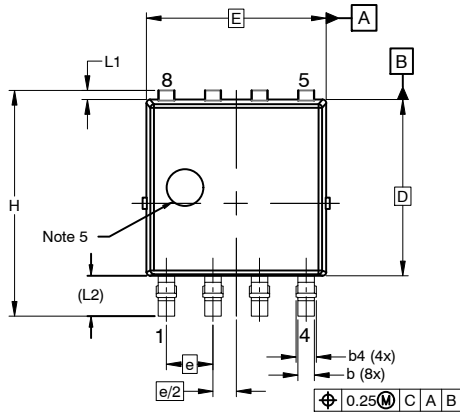
Device	Marking	Package	Shipping [†]
NTMJS0D9N04CTWG	0D9N04C	LFPAK8 (Pb-Free)	3,000 / Tape & Reel

[†]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](#).

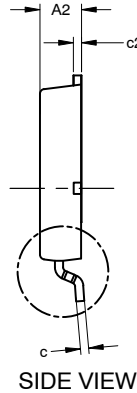


LFPAK8 4.90x4.80x1.12MM, 1.27P
CASE 760AA
ISSUE D

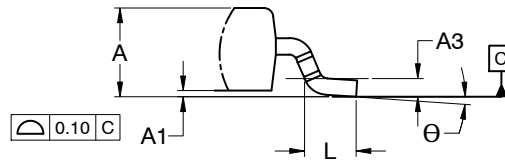
DATE 22 APR 2024



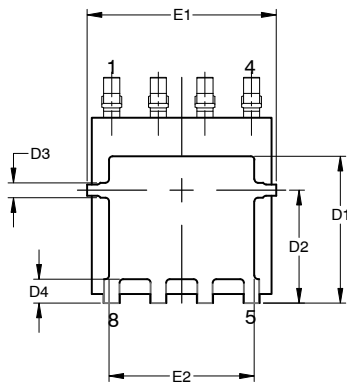
TOP VIEW



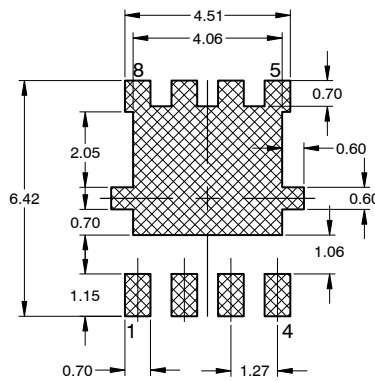
SIDE VIEW



DETAIL 'A'



BOTTOM VIEW



RECOMMENDED LAND PAD

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.
5. OPTIONAL MOLD FEATURE.

MILLIMETERS			
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
b4	0.45	0.55	0.65
c	0.19	0.22	0.25
c2	0.19	0.22	0.25
D	4.70	4.80	4.90
D1	3.80	4.00	4.20
D2	2.98	3.08	3.18
D3	0.30	0.40	0.50
D4	0.55	0.65	0.75
E	4.80	4.90	5.00
E1	5.05	5.15	5.25
E2	3.91	3.96	4.01
e	1.27 BSC		
e/2	0.635 BSC		
H	6.00	6.15	6.30
L	0.50	0.70	0.90
L1	0.15	0.25	0.35
L2	1.10 REF		
Θ	0°	4°	8°

**GENERIC
MARKING DIAGRAM***



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

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

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

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DESCRIPTION:	LFPAK8 4.90x4.80x1.12MM, 1.27P	PAGE 1 OF 1

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