

MOSFET – N-Channel, POWER TRENCH®

40 V, 49 A, 2.5 mΩ

FDMC8321L

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch mode ringing of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(on)}$, fast switching speed body diode reverse recovery performance.

Features

- Max $R_{DS(on)}$ = 2.5 mΩ at V_{GS} = 10 V, I_D = 22 A
Max $R_{DS(on)}$ = 4.1 mΩ at V_{GS} = 4.5 V, I_D = 18 A
- Advanced Package and Silicon Combination for Low $R_{DS(on)}$ and High Efficiency
- Next Generation Enhanced Body Diode Technology, Engineered for Soft Recovery
- 100% UIL Tested
- Pb-Free, Halide Free and RoHS Compliant

Applications

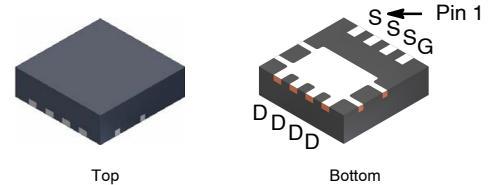
- Synchronous Rectifier
- Load Switch/Orring
- Motor Switch

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Rating	Unit
V_{DS}	Drain to Source Voltage		40	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current	Continuous T_C = 25°C	49	A
		Continuous (Note 1a) T_A = 25°C	22	
		Pulsed	100	
E_{AS}	Single Pulse Avalanche Energy (Note 3)		86	mJ
P_D	Power Dissipation	T_C = 25°C	40	W
	Power Dissipation (Note 1a)	T_A = 25°C	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to + 150	°C

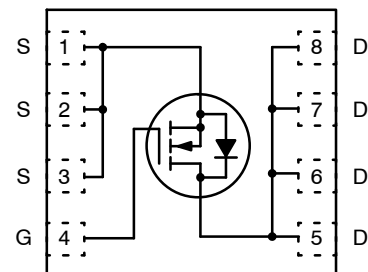
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

V_{DS}	$R_{DS(on)}$ MAX	I_D MAX
40 V	2.5 mΩ @ 10 V	49 A
	4.1 mΩ @ 4.5 V	



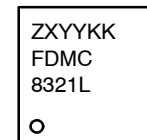
PQFN8 3.3 × 3.3, 0.65P
(Power 33)
CASE 483AK

ELECTRICAL CONNECTION



N-Channel MOSFET

MARKING DIAGRAM



Z = Assembly Plant Code
XYX = 3-Digit Date Code (Year and Week)
KK = 2-Digits Lot Run Traceability Code
FDMC8321L = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

FDMC8321L

THERMAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	3.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	$^\circ\text{C/W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	40	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	–	22	–	$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 32\ \text{V}$, $V_{GS} = 0\ \text{V}$	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$	–	–	± 100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	1.0	1.7	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	–	–5	–	$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Static Drain to Source On-Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 22\ \text{A}$ $V_{GS} = 4.5\ \text{V}$, $I_D = 18\ \text{A}$ $V_{GS} = 10\ \text{V}$, $I_D = 22\ \text{A}$, $T_J = 125^\circ\text{C}$	–	1.9 2.7 2.8	2.5 4.1 3.7	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 5\ \text{V}$, $I_D = 22\ \text{A}$	–	114	–	S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 20\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	–	2930	3900	pF
C_{oss}	Output Capacitance		–	1000	1330	pF
C_{rss}	Reverse Transfer Capacitance		–	60	90	pF
R_g	Gate Resistance		0.1	0.7	2.5	Ω

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20\ \text{V}$, $I_D = 22\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$	–	12	22	ns
t_r	Rise Time		–	6.1	12	ns
$t_{d(off)}$	Turn-Off Delay Time		–	32	51	ns
t_f	Fall Time		–	4.9	10	ns
$Q_{g(TOT)}$	Total Gate Charge at 10 V	$V_{DD} = 20\ \text{V}$, $I_D = 22\ \text{A}$	–	44	61	nC
$Q_{g(TOT)}$	Total Gate Charge at 5 V		–	21	32	nC
Q_{gs}	Gate to Source Charge		–	7.7	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	5.8	–	nC

DRAIN-SOURCE DIODE CHARACTERISTICS

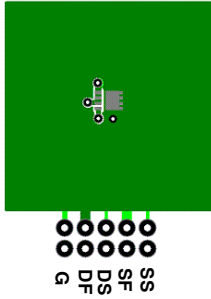
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_S = 2\ \text{A}$ (Note 2)	–	0.69	1.2	V
		$V_{GS} = 0\ \text{V}$, $I_S = 22\ \text{A}$ (Note 2)	–	0.77	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 22\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$	–	41	65	ns
Q_{rr}	Reverse Recovery Charge		–	20	33	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.

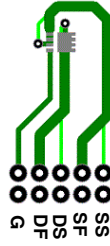
FDMC8321L

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 53°C/W when mounted
on a 1 in² pad of 2 oz copper



b) 125°C/W when mounted
on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μ s, Duty Cycle < 2.0%.
3. Starting $T_J = 25^\circ\text{C}$; N-ch: $L = 0.3$ mH, $I_{AS} = 24$ A, $V_{DD} = 36$ V, $V_{GS} = 10$ V.

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

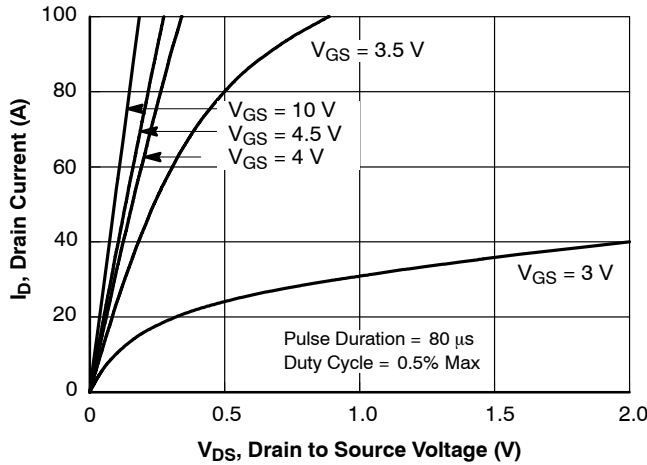


Figure 1. On Region Characteristics

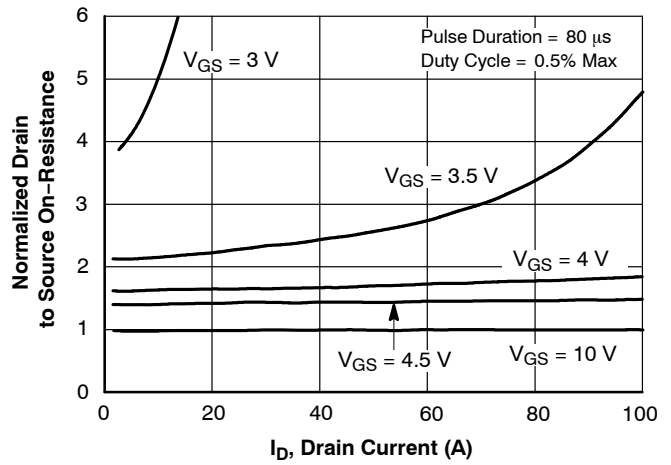


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

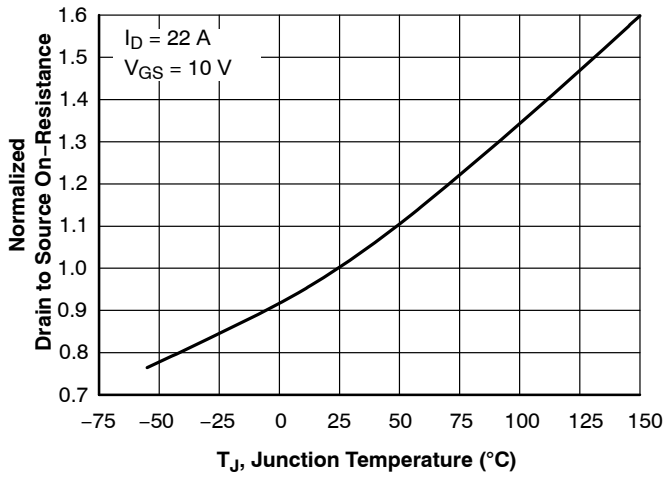


Figure 3. Normalized On Resistance vs. Junction Temperature

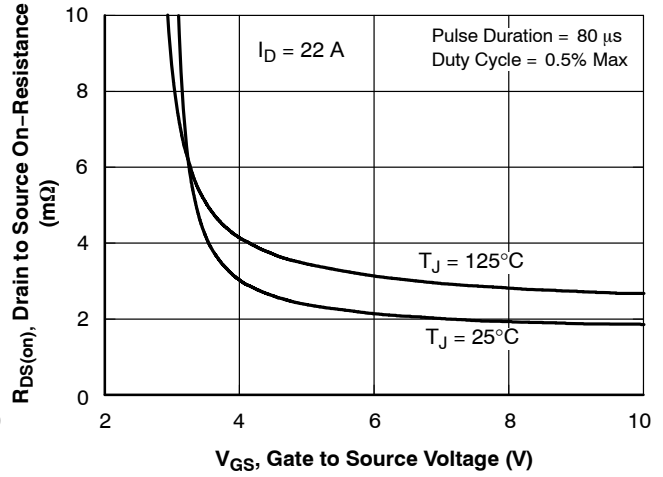


Figure 4. On-Resistance vs. Gate to Source Voltage

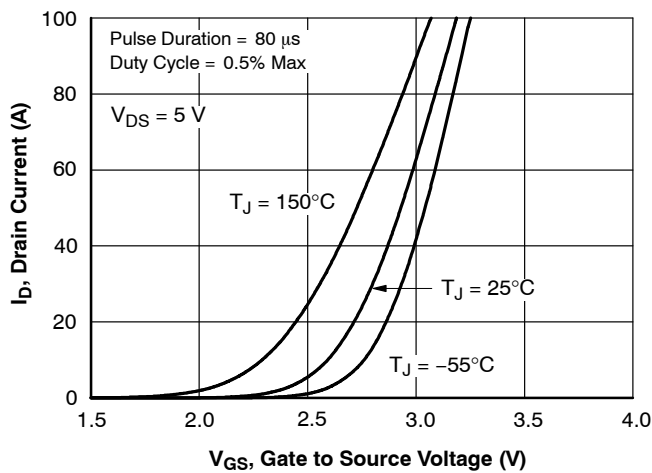


Figure 5. Transfer Characteristics

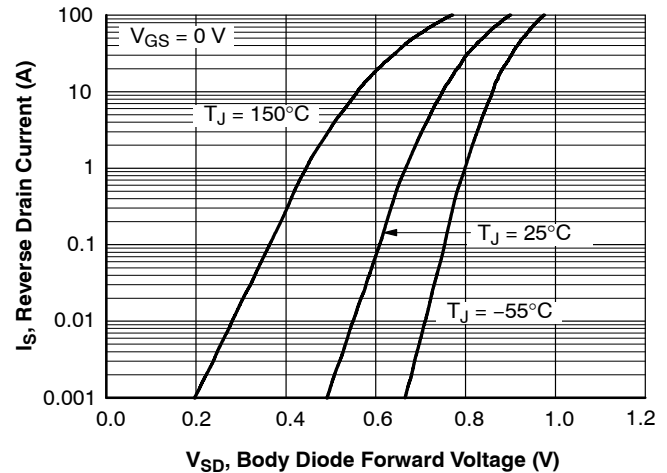


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

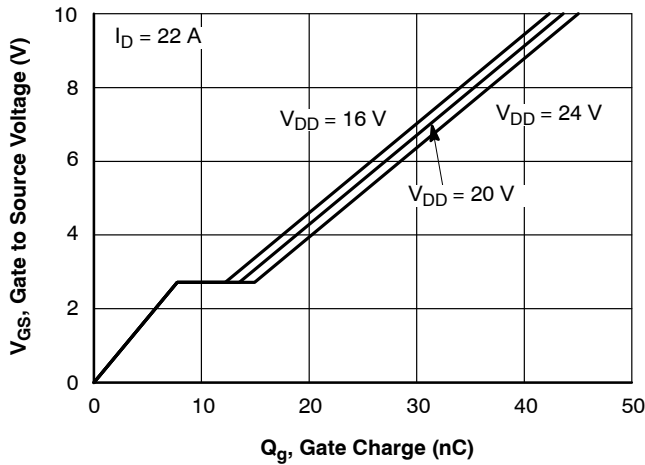


Figure 7. Gate Charge Characteristics

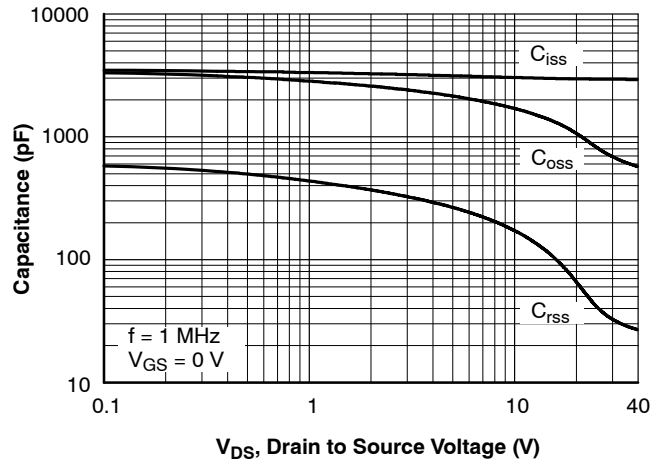


Figure 8. Capacitance vs. Drain to Source Voltage

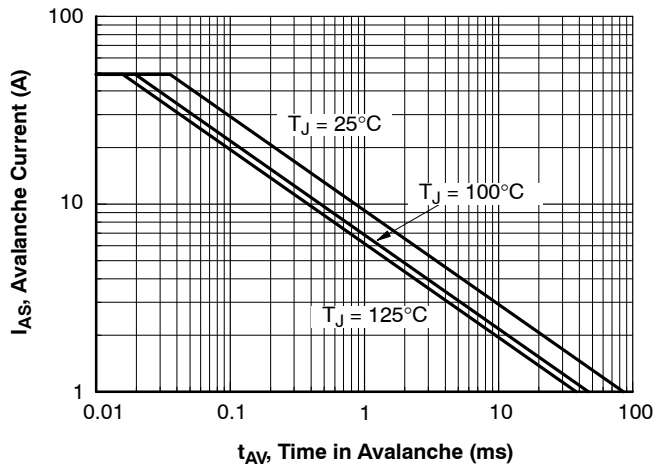


Figure 9. Unclamped Inductive Switching Capability

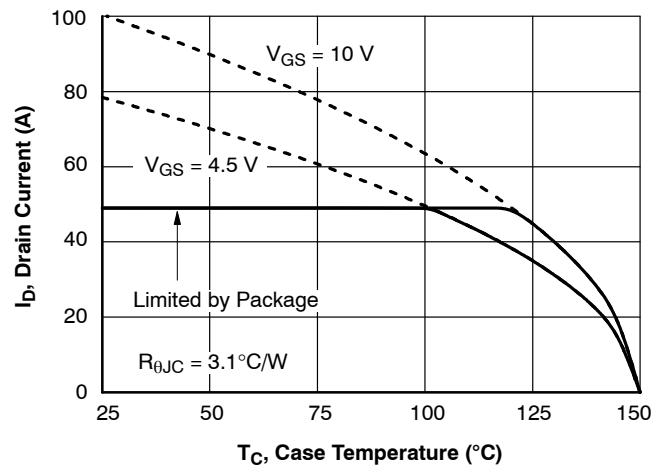


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

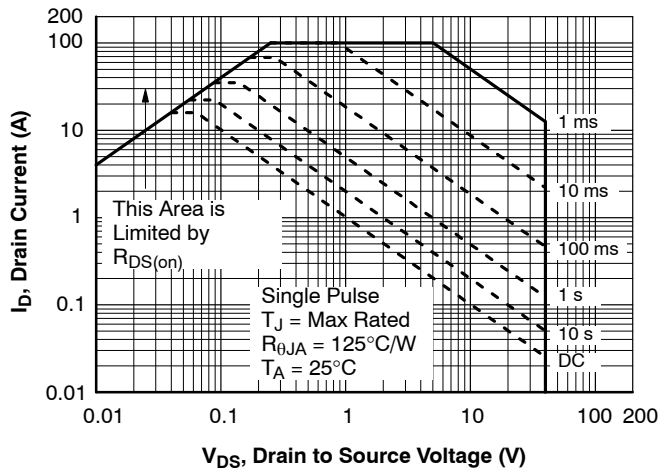


Figure 11. Forward Bias Safe Operating Area

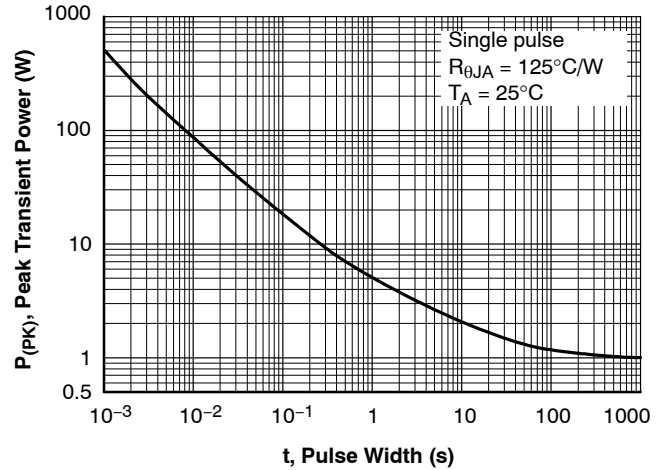


Figure 12. Single Pulse Maximum Power Dissipation

FDMC8321L

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

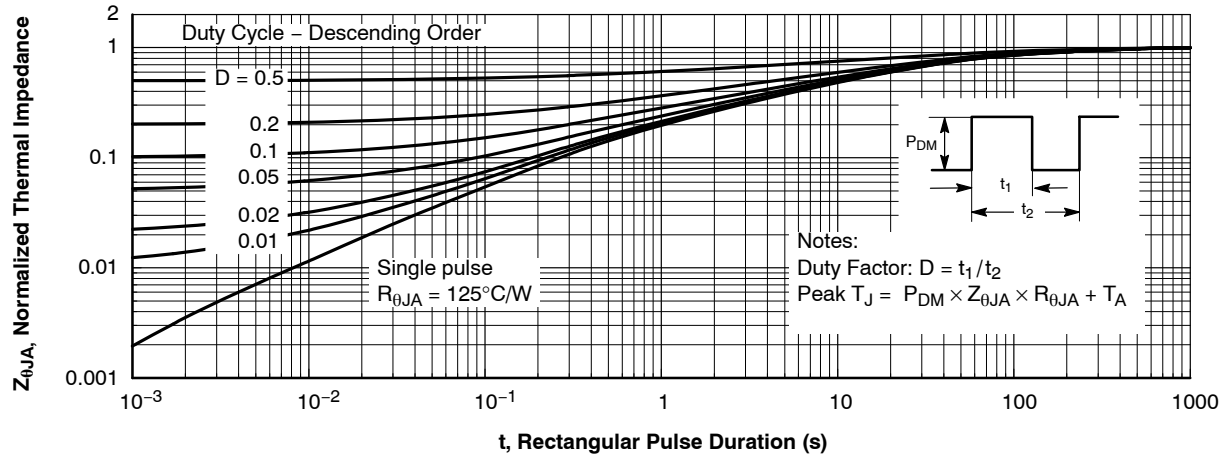
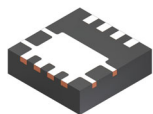


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

PACKAGE MARKING AND ORDERING INFORMATION

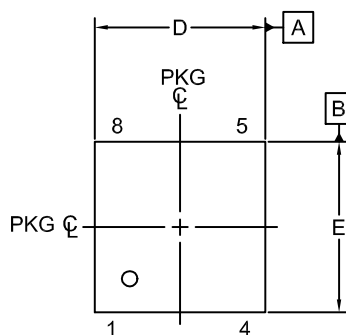
Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping [†]
FDMC8321L	FDMC8321L	PQFN8 3.3 x 3.3, 0.65P (Power 33) (Pb-Free/Halide Free)	13"	12 mm	3000 / Tape & Reel

[†]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](#).



PQFN8 3.3X3.3, 0.65P
CASE 483AK
ISSUE B

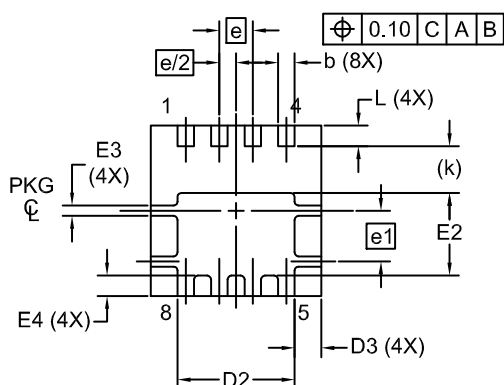
DATE 12 OCT 2021



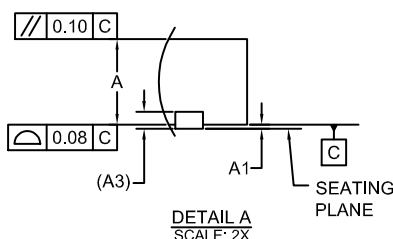
TOP VIEW



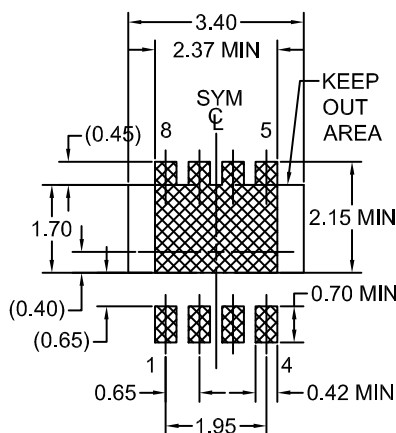
FRONT VIEW



BOTTOM VIEW



DETAIL A
SCALE: 2X



LAND PATTERN RECOMMENDATION

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

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. 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.
6. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	-	0.05
A3	0.20 REF		
b	0.27	0.32	0.37
D	3.20	3.30	3.40
D2	2.17	2.27	2.37
D3	0.42	0.52	0.62
E	3.20	3.30	3.40
E2	1.50	1.60	1.70
E3	0.10	0.20	0.30
E4	0.29	0.39	0.49
e	0.65 BSC		
e/2	0.325 BSC		
e1	0.98 BSC		
k	0.91 REF		
L	0.30	0.40	0.50

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DESCRIPTION:	PQFN8 3.3X3.3, 0.65P	PAGE 1 OF 1

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