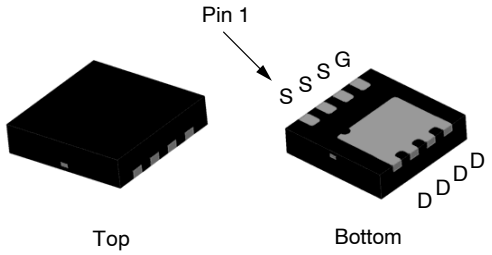
MOSFET – N-Channel, POWERTRENCH®
60 V, 22 A, 7.9 mΩ

FDMC86520L

V_{DS}	$r_{DS(on)}$ MAX	I_D MAX
60 V	7.9 mΩ @ 10 V	22 A
	11.7 mΩ @ 4.5 V	



WDFN8 3.3x3.3, 0.65P
CASE 511DH

General Description

This N−Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch node 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 and body diode reverse recovery performance.

Features

- Max $r_{DS(on)}$ = 7.9 mΩ at V_{GS} = 10 V, I_D = 13.5 A
- Max $r_{DS(on)}$ = 11.7 mΩ at V_{GS} = 4.5 V, I_D = 11.5 A
- Low Profile − 1 mm Max in Power 33
- 100% UIL Tested
- This Device is Pb−Free, Halide Free and RoHS Compliant

Applications

- Primary Switch in Isolated DC−DC
- Synchronous Rectifier
- Load Switch

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

Symbol	Parameter			Rating	Unit
V_{DS}	Drain to Source Voltage			60	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current	Continuous	T_C = 25°C	22	A
		Continuous (Note 1a)	T_A = 25°C	13.5	
		Pulsed		60	
E_{AS}	Single Pulse Avalanche Energy (Note 3)			79	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.

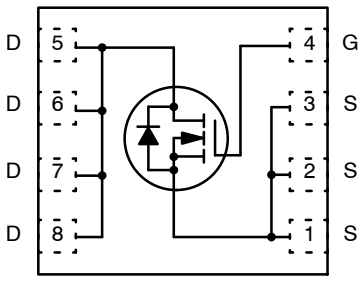
THERMAL CHARACTERISTICS

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

MARKING DIAGRAM

&Z = Assembly Plant Code
&2 = 2−Digit Date Code (Year and Week)
&K = 2−Digit Lot Run Code
FDMC86520L = Specific Device Code

PIN ASSIGNMENT



P−Channel MOSFET

ORDERING INFORMATION

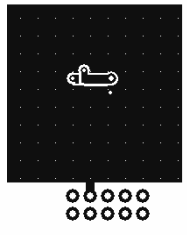
See detailed ordering and shipping information on page 5 of this data sheet.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

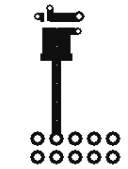
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	60	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	29	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 V, V_{GS} = 0 V	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1	1.7	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	–7	–	mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 13.5 A	–	6.5	7.9	mΩ
		V_{GS} = 4.5 V, I_D = 11.5 A	–	9.1	11.7	
		V_{GS} = 10 V, I_D = 13.5 A, T_J = 125°C	–	9	11	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 13.5 A	–	49	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz	–	3420	4550	pF
C_{oss}	Output Capacitance		–	638	850	pF
C_{rss}	Reverse Transfer Capacitance		–	25	40	pF
R_g	Gate Resistance		–	0.5	–	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 30 V, I_D = 13.5 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	15	30	ns
t_r	Rise Time		–	5.2	10	ns
$t_{d(off)}$	Turn–Off Delay Time		–	32	55	ns
t_f	Fall Time		–	3.4	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 30 V, I_D = 13.5 A	–	45	64	nC
		V_{GS} = 0 V to 4.5 V, V_{DD} = 30 V, I_D = 13.5 A	–	21	30	
Q_{gs}	Total Gate Charge	V_{DD} = 30 V, I_D = 13.5 A	–	9.6	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	4.9	–	nC
DRAIN–SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 13.5 A (Note 2)	–	0.82	1.3	V
		V_{GS} = 0 V, I_S = 2 A (Note 2)	–	0.71	1.2	
t_{rr}	Reverse Recovery Time	I_F = 13.5 A, di/dt = 100 A/μs	–	38	62	ns
Q_{rr}	Reverse Recovery Charge		–	21	34	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.

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 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 in^2 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 μs, Duty cycle < 2.0%.
3. Starting T_J = 25°C; N–ch: L = 0.3 mH, I_{AS} = 23 A, V_{DD} = 54 V, V_{GS} = 10 V.

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

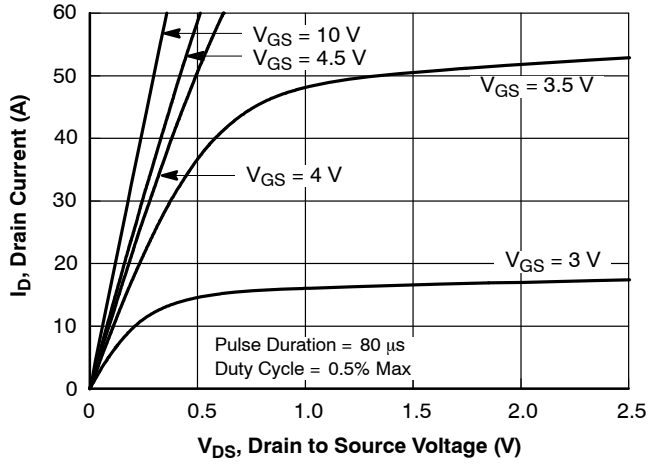


Figure 1. On Region Characteristics

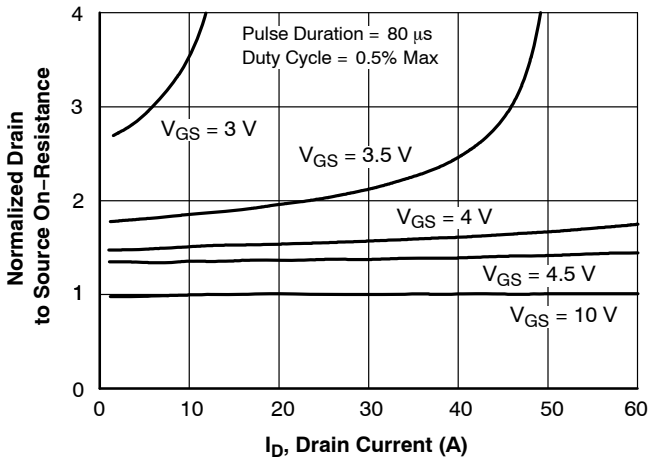


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

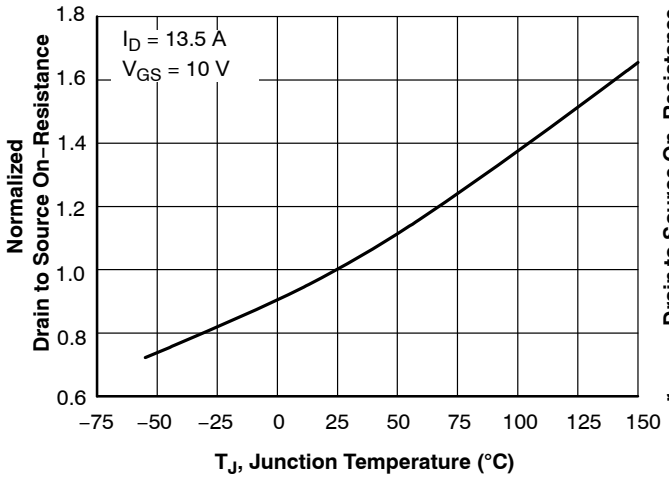


Figure 3. Normalized On Resistance vs. Junction Temperature

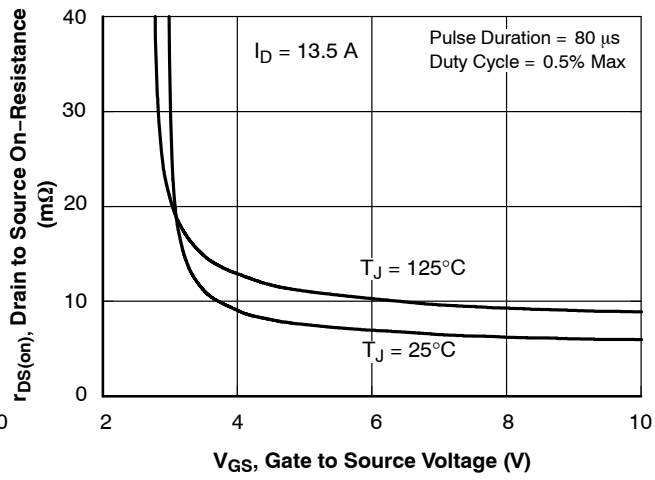


Figure 4. On−Resistance vs. Gate to Source Voltage

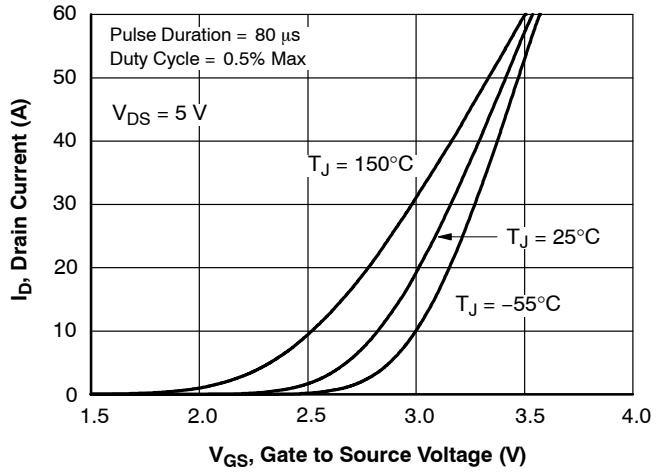


Figure 5. Transfer Characteristics

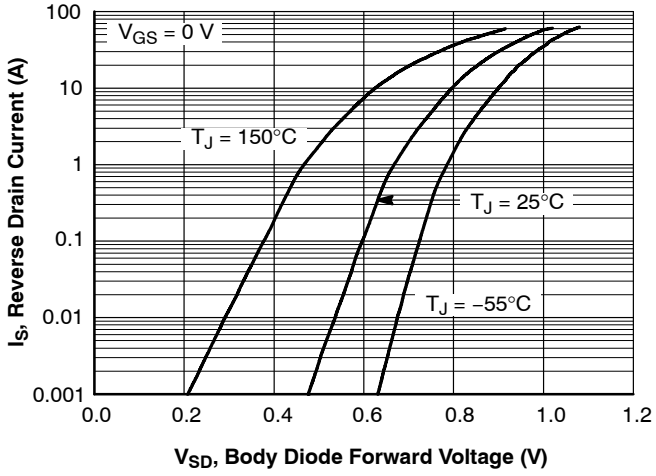


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

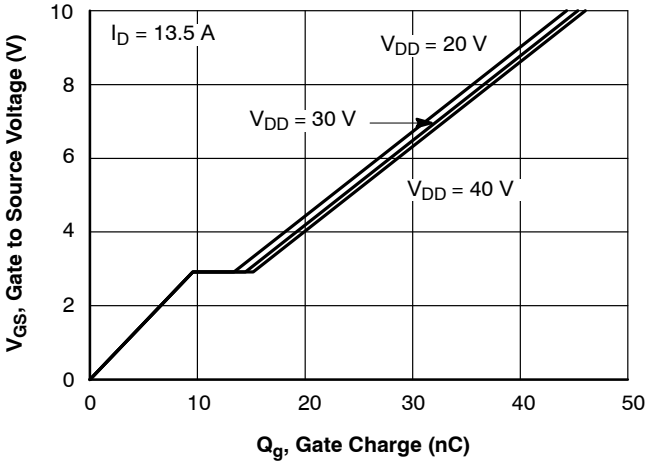


Figure 7. Gate Charge Characteristics

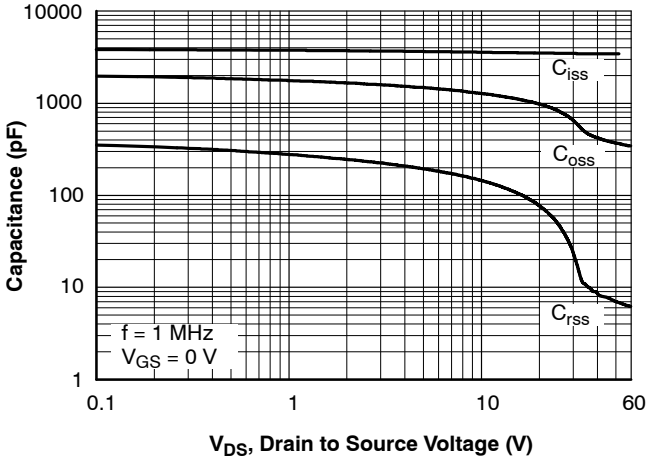


Figure 8. Capacitance vs. Drain to Source Voltage

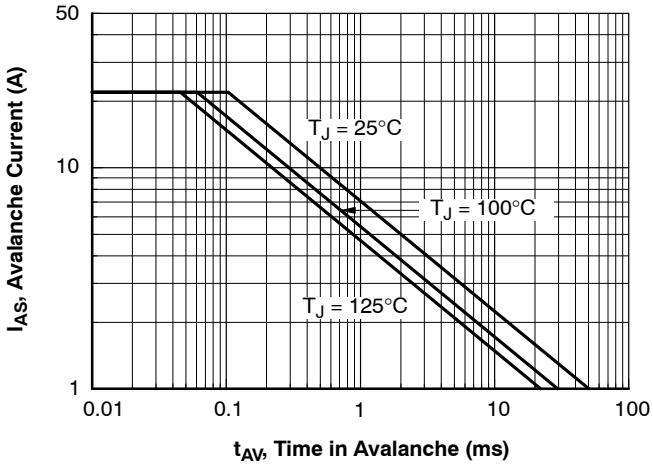


Figure 9. Unclamped Inductive Switching Capability

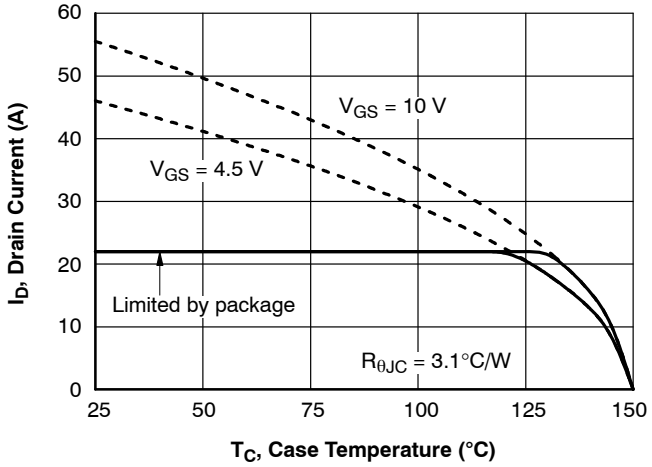


Figure 10. Maximum Continuous Drain Current vs Case Temperature

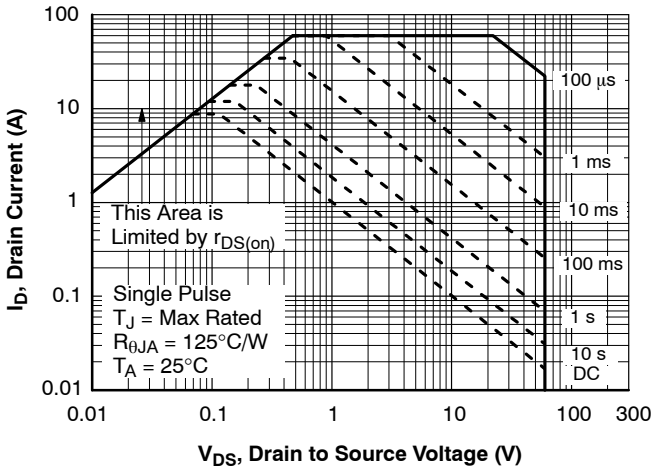


Figure 11. Forward Bias Safe Operating Area

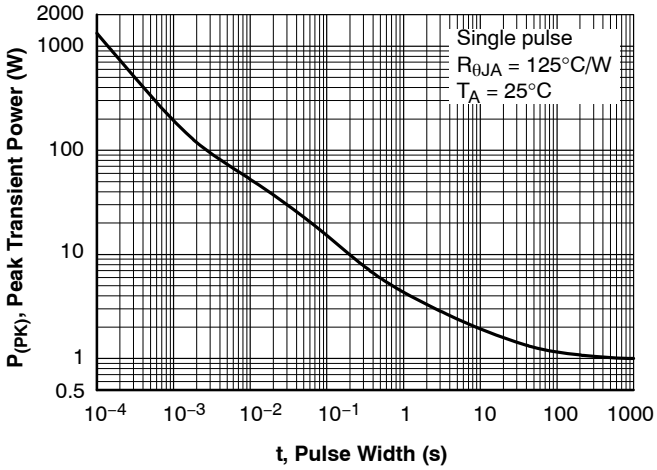


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

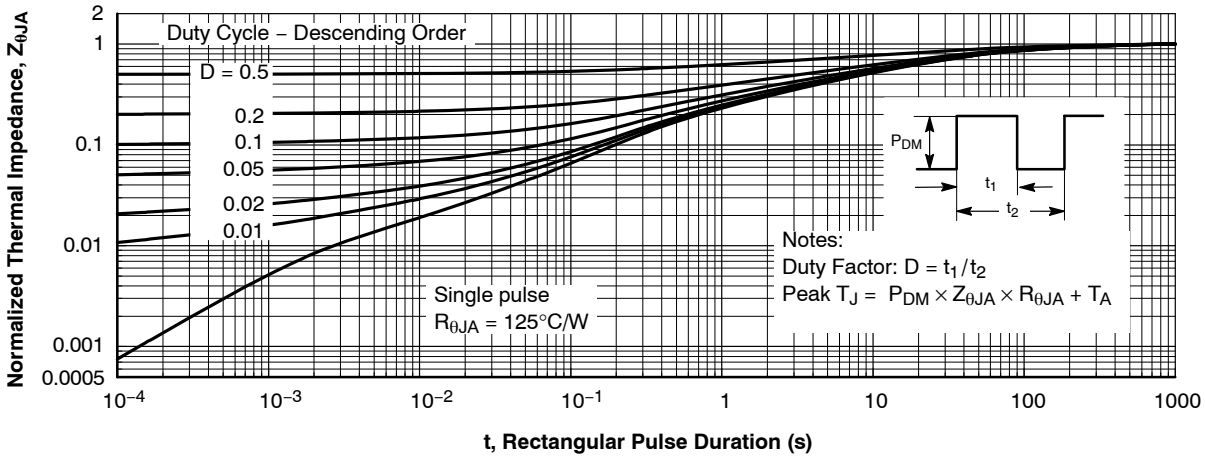


Figure 13. Junction−to−Ambient Transient Thermal Response Curve

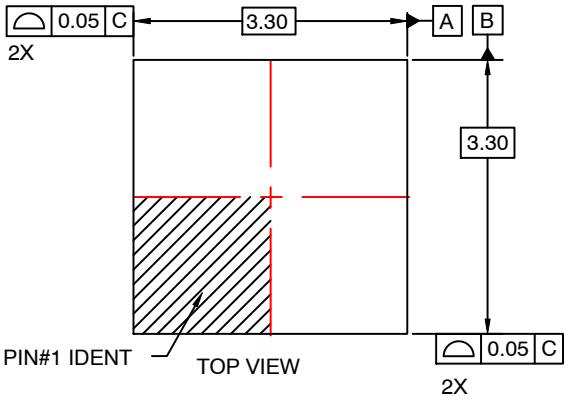
ORDERING INFORMATION

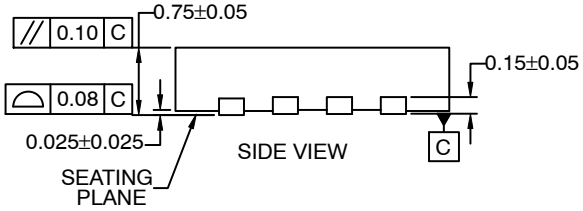
Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping†
FDMC86520L	FDMC86520L	WDFN8 3.3x3.3, 0.65P Power 33 (Pb−Free, Halide Free)	13”	12 mm	3000 / Tape & Reel

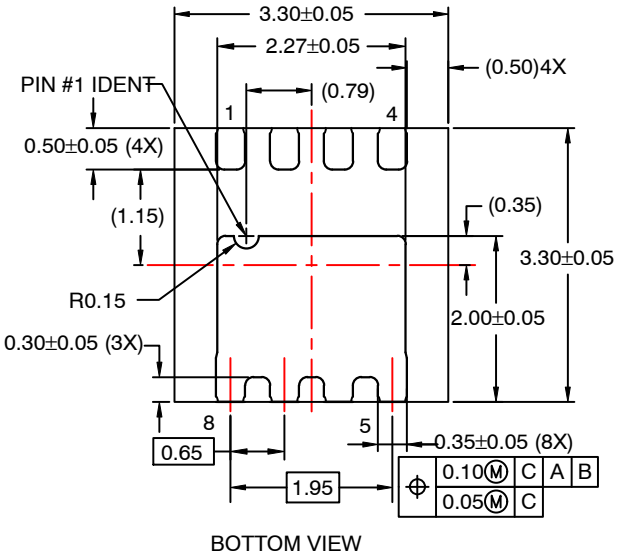
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, .BRD8011/D.

WDFN8 3.3x3.3, 0.65P
CASE 511DH
ISSUE O

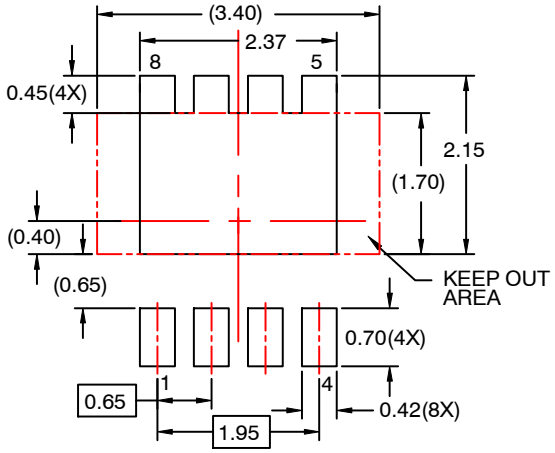
DATE 31 JUL 2016







BOTTOM VIEW



RECOMMENDED LAND PATTERN

NOTES:

A. DOES NOT CONFORM TO JEDEC REGISTRATION MO−229

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

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