

MOSFET – P-Channel, POWERTRENCH®

-100 V, -15 A, 67 mΩ

FDMC86139P

General Description

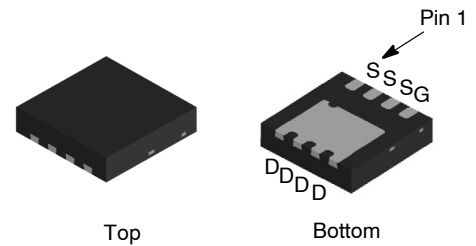
This P-Channel MOSFET is produced using **onsemi**'s advanced POWERTRENCH technology. This very high density process is especially tailored to minimize on-state resistance and optimized for superior switching performance.

Features

- Max $r_{DS(on)}$ = 67 mΩ at $V_{GS} = -10$ V, $I_D = -4.4$ A
- Max $r_{DS(on)}$ = 89 mΩ at $V_{GS} = -6$ V, $I_D = -3.6$ A
- Very Low RDS-On Mid Voltage P Channel Silicon Technology Optimised for Low Qg
- This Product is Optimised for Fast Switching Applications as well as Load Switch Applications
- 100% UIL Tested
- These Devices are Pb-Free and are RoHS Compliant

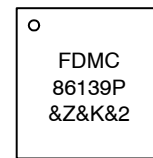
Applications

- Active Clamp Switch
- Load Switch



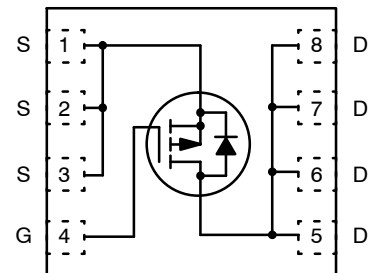
**WDFN8 3.3x3.3, 0.65P
 CASE 511DH**

MARKING DIAGRAM



- | | |
|--------|-----------------------------|
| FDMC | = Specific Device Code |
| 86139P | = Specific Device Code |
| &Z | = Assembly Location |
| &K | = Lot Run Traceability Code |
| &2 | = Date Code (Year and Week) |

PIN ASSIGNMENT



P-Channel MOSFET

ORDERING INFORMATION

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

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

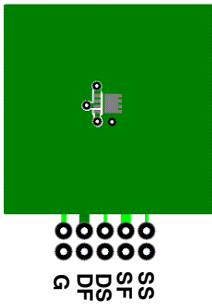
Symbol	Parameter	Rating	Unit	
V_{DS}	Drain to Source Voltage	100	V	
V_{GS}	Gate to Source Voltage	± 25	V	
I_D	Drain Current	Continuous	$T_C = 25^\circ\text{C}$	A
		Continuous (Note 1a)	$T_A = 25^\circ\text{C}$	
		Pulsed		
E_{AS}	Single Pulse Avalanche Energy (Note 3)	121	mJ	
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	40	W
	Power Dissipation (Note 1a)	$T_A = 25^\circ\text{C}$	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to + 150	$^\circ\text{C}$	

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 CHARACTERISTICS

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

- $R_{\theta JA}$ 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. $53^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b. $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.
- Starting $T_J = 25^\circ\text{C}$; P-ch: L = 3 mH, $I_{AS} = -9\text{ A}$, $V_{DD} = -100\text{ V}$, $V_{GS} = -10\text{ V}$. 100% test at L = 0.1 mH, $I_{AS} = -28\text{ A}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250 \mu\text{A}$, $V_{GS} = 0 \text{ V}$	-100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$, referenced to 25°C	-	-63	-	mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -80 \text{ V}$, $V_{GS} = 0 \text{ V}$	-	-	-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 25 \text{ V}$, $V_{DS} = 0 \text{ V}$	-	-	± 100	nA

ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250 \mu\text{A}$	-2	-3	-4	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	-	7	-	mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10 \text{ V}$, $I_D = -4.4 \text{ A}$	-	56	67	m Ω
		$V_{GS} = -6 \text{ V}$, $I_D = -3.6 \text{ A}$	-	69	89	
		$V_{GS} = -10 \text{ V}$, $I_D = -4.4 \text{ A}$, $T_J = 125^\circ\text{C}$	-	87	104	
g_{FS}	Forward Transconductance	$V_{DS} = -10 \text{ V}$, $I_D = -4.4 \text{ A}$	-	12	-	S

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = -50 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	-	1001	1335	pF
C_{oss}	Output Capacitance		-	178	240	pF
C_{riss}	Reverse Transfer Capacitance		-	10	15	pF
R_g	Gate Resistance		0.1	1.6	3.2	Ω

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -50 \text{ V}$, $I_D = -4.4 \text{ A}$, $V_{GS} = -10 \text{ V}$, $R_{GEN} = 6 \Omega$	-	11	20	ns
t_r	Rise Time		-	2.5	10	ns
$t_{d(off)}$	Turn-Off Delay Time		-	17	30	ns
t_f	Fall Time		-	4	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{DD} = -50 \text{ V}$, $I_D = -4.4 \text{ A}$, $V_{GS} = 0 \text{ V}$ to -10 V	-	16	22	nC
		$V_{DD} = -50 \text{ V}$, $I_D = -4.4 \text{ A}$, $V_{GS} = 0 \text{ V}$ to -6 V	-	9.8	14	
Q_{gs}	Total Gate Charge	$V_{DD} = -50 \text{ V}$, $I_D = -4.4 \text{ A}$	-	4.5	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	3.2	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}$, $I_S = -4.4 \text{ A}$ (Note 2)	-	-0.84	-1.3	V
		$V_{GS} = 0 \text{ V}$, $I_S = -1.9 \text{ A}$ (Note 2)	-	-0.79	-1.2	
t_{rr}	Reverse Recovery Time	$I_F = -4.4 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$	-	70	112	ns
Q_{rr}	Reverse Recovery Charge		-	141	225	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.

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

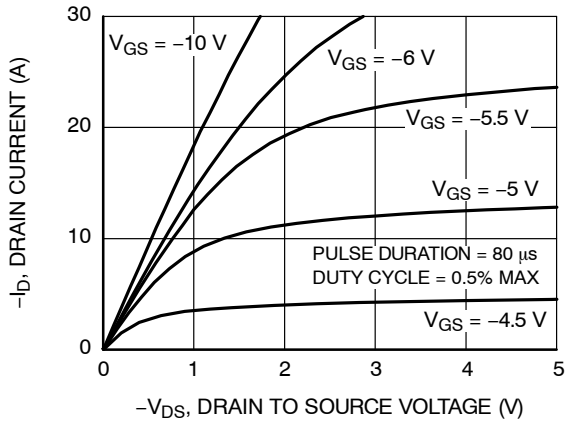


Figure 1. On Region Characteristics

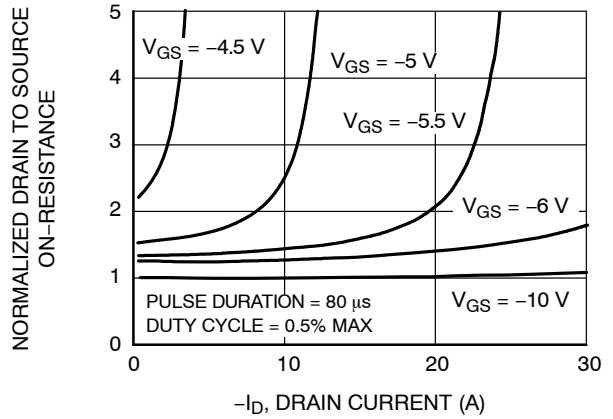


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

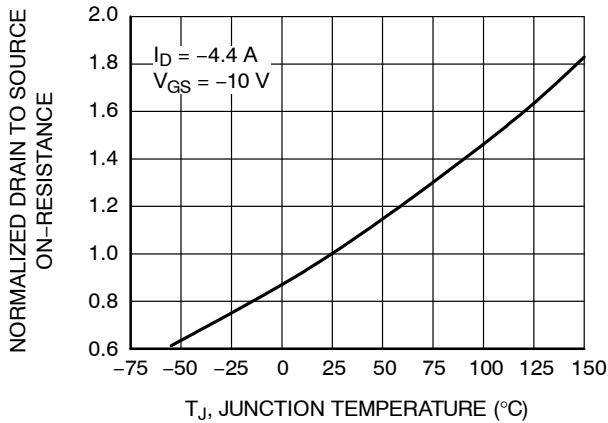


Figure 3. Normalized On Resistance vs. Junction Temperature

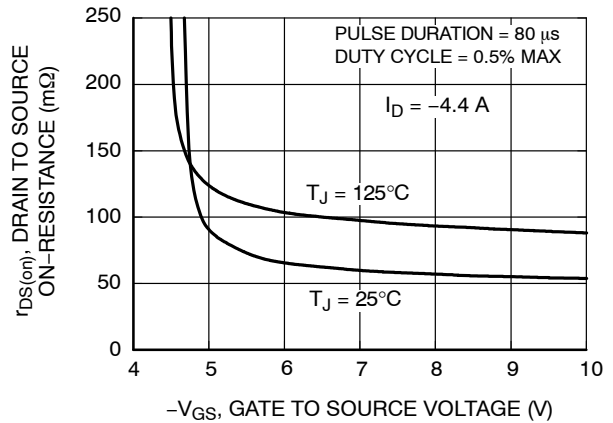


Figure 4. On-Resistance vs. Gate to Source Voltage

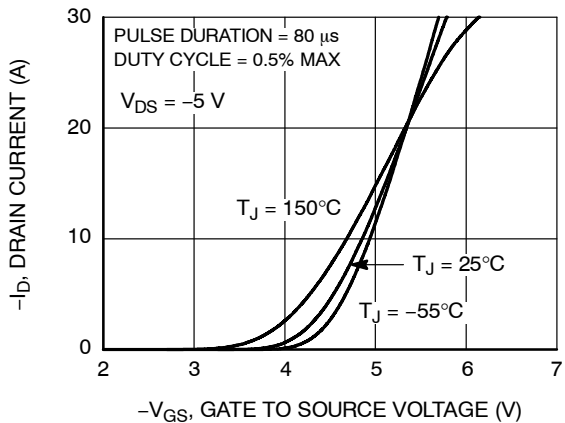


Figure 5. Transfer Characteristics

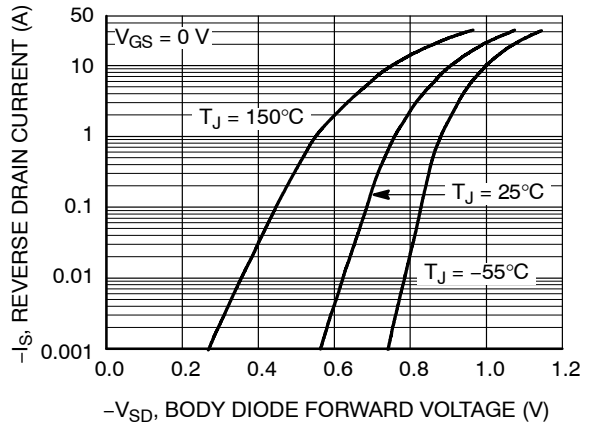


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

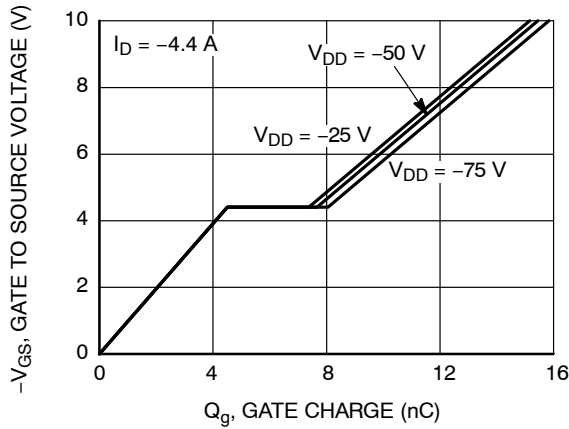


Figure 7. Gate Charge Characteristics

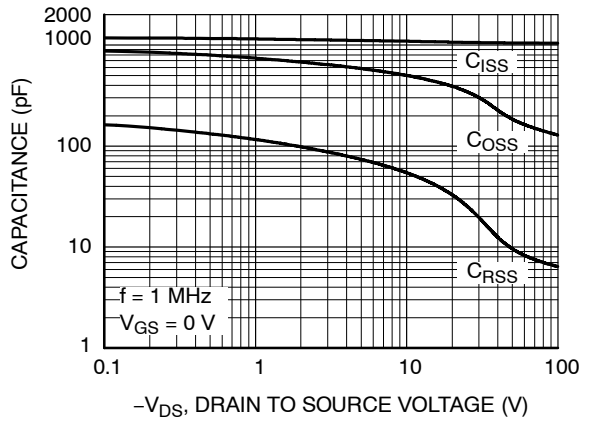


Figure 8. Capacitance vs. Drain to Source Voltage

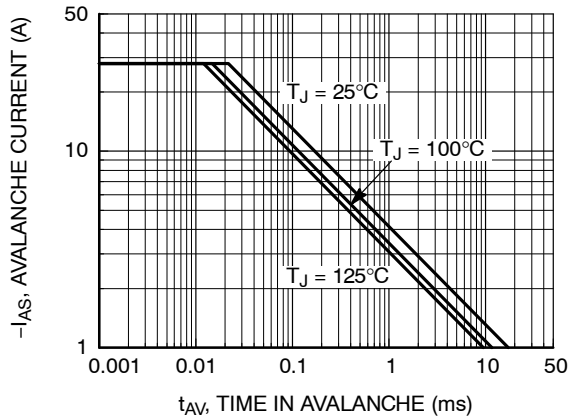


Figure 9. Unclamped Inductive Switching Capability

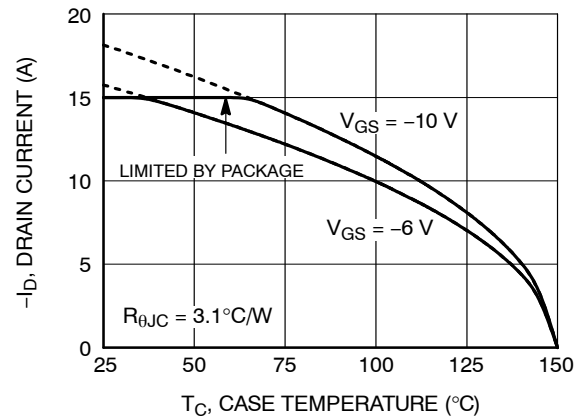


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

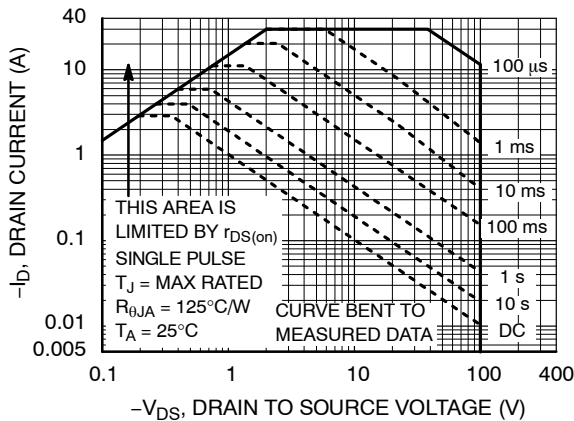


Figure 11. Forward Bias Safe Operating Area

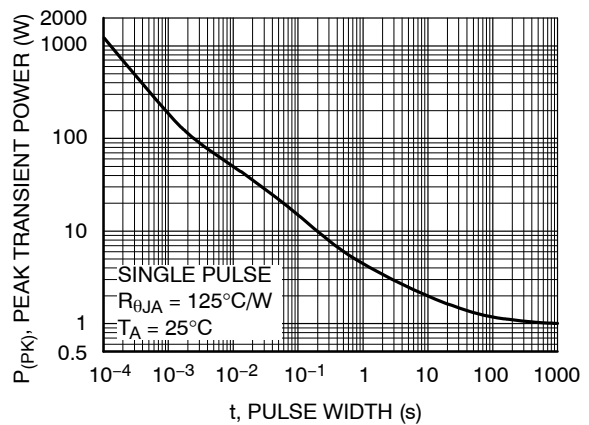


Figure 12. Single Pulse Maximum Power Dissipation

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

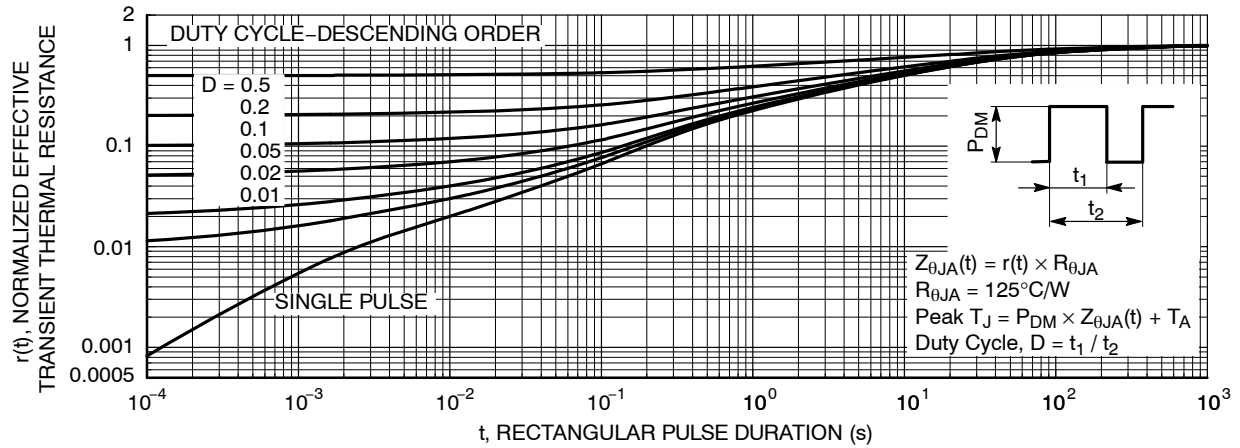


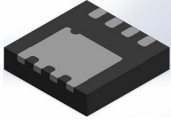
Figure 13. Junction-to-Ambient Transient Thermal Response Curve

ORDERING INFORMATION

Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping [†]
FDMC86139P	FDMC86139P	WDFN8 3.3x3.3, 0.65P Power 33 (Pb-Free)	13"	12 mm	3000 / Tape & Reel

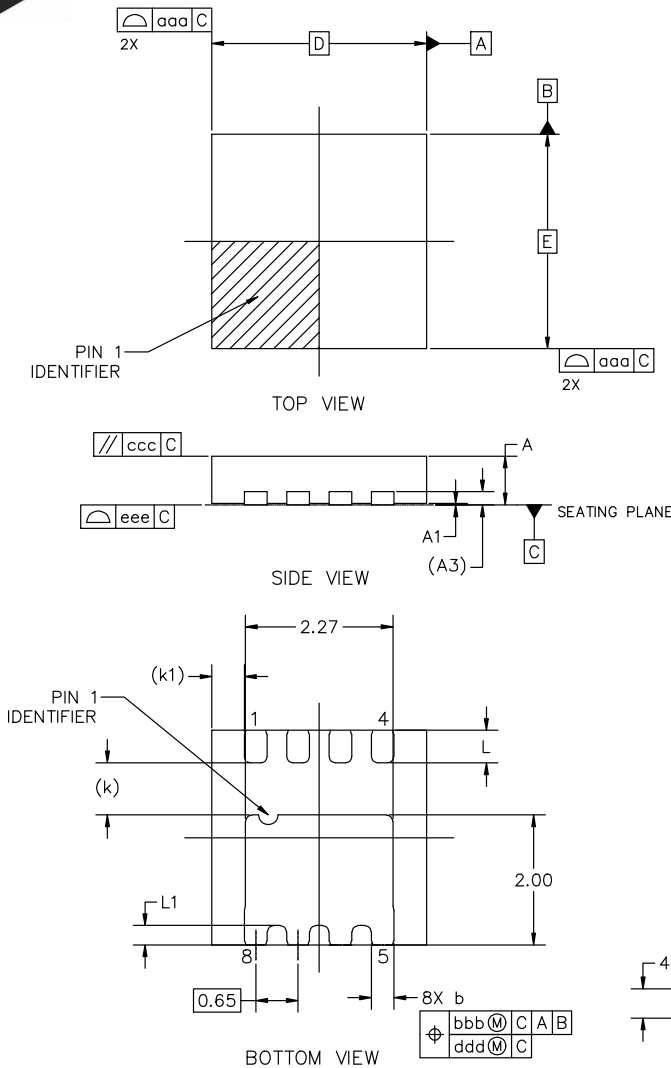
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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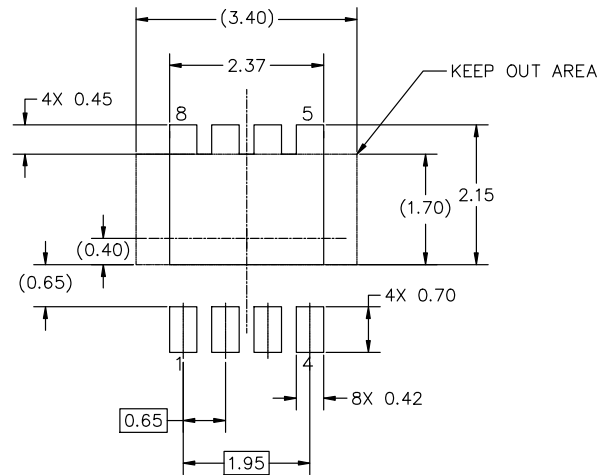
WDFN-8 3.30x3.30x0.75, 0.65P
CASE 511DH
ISSUE A

DATE 04 DEC 2025



- NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M, 2018.
 2. CONTROLLING DIMENSION: MILLIMETERS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.025	0.05
A3	0.20 REF		
b	0.30	0.35	0.40
D	3.30 BSC		
D2	2.22	2.27	2.32
E	3.30 BSC		
E2	1.95	2.00	2.05
e	0.65 BSC		
k	0.80 REF		
k1	0.50 REF		
L	0.45	0.50	0.55
L1	0.25	0.30	0.35
TOLERANCE FORM & POSITION			
aaa	0.05		
bbb	0.10		
ccc	0.10		
ddd	0.05		
eee	0.08		



GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED MOUNTING FOOTPRINT
* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques reference manual, SOLDERRM/D.

DOCUMENT NUMBER:	98AON13625G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WDFN-8 3.30x3.30x0.75, 0.65P	PAGE 1 OF 1

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