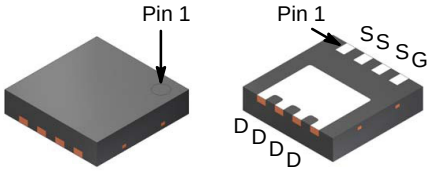
MOSFET – N-Channel, Shielded Gate, POWERTRENCH®

60 V, 87 A, 4.3 mΩ

FDMC86570LET60

V_{DS}	$r_{DS(on)}$ MAX	I_D MAX
60 V	4.3 mΩ @ 10 V	87 A
	6.5 mΩ @ 4.5 V	



Top Bottom

WDFN8 3.3x3.3, 0.65P
(Power 33)
CASE 483 AW

General Description

This N−Channel MOSFET is produced using **onsemi**'s advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized for the on−state resistance and yet maintain superior switching performance.

Features

- Extended T_J Rating to 175°C
- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 4.3 mΩ at V_{GS} = 10 V, I_D = 18 A
- Max $r_{DS(on)}$ = 6.5 mΩ at V_{GS} = 4.5 V, I_D = 15 A
- High Performance Technology for Extremely Low $r_{DS(on)}$
- Termination is Lead−free
- RoHS Compliant

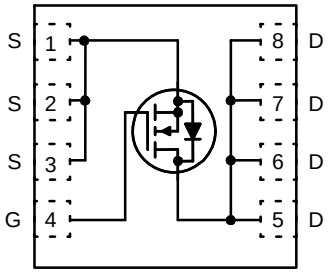
Applications

- DC−DC Conversion

MARKING DIAGRAM

Z = Assembly Plant Code
XYY = 3−Digit Date Code Format
KK = 2−Alphanumeric Lot Run Traceability Code
FDMC86570LT = Device Code

PIN ASSIGNMENT



ORDERING INFORMATION

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

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

Symbol	Parameter				Ratings	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	(Note 5)	87	A
		− Continuous	T_C = 100°C	(Note 5)	62	
		− Continuous	T_A = 25°C	(Note 1a)	18	A
		− Pulsed		(Note 4)	436	A
E_{AS}	Single Pulse Avalanche Energy			(Note 3)	253	mJ
P_D	Power Dissipation		T_C = 25°C		65	W
	Power Dissipation		T_A = 25°C	(Note 1a)	2.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range				−55 to +175	°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		Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	2.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	53	

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

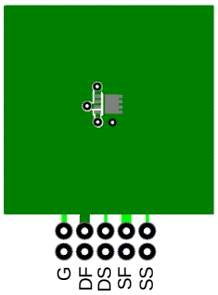
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	60	−	−	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	−	30	−	mV/°C
I_{DSS}	Zero Gate Voltage 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	1.0	1.8	3.0	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 = 18 A	−	3.1	4.3	mΩ
		V_{GS} = 4.5 V, I_D = 15 A	−	4.7	6.5	
		V_{GS} = 10 V, I_D = 18 A, T_J = 125°C	−	5.0	6.9	
g_{FS}	Forward Transconductance	V_{DD} = 5 V, I_D = 18 A	−	75	−	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz	−	4790	−	pF
C_{oss}	Output Capacitance		−	821	−	pF
C_{rss}	Reverse Transfer Capacitance		−	19	−	pF
R_g	Gate Resistance		0.1	0.9	2.7	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 30 V, I_D = 18 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	−	19	34	ns
t_r	Rise Time		−	6.2	12	ns
$t_{d(off)}$	Turn−Off Delay Time		−	38	61	ns
t_f	Fall Time		−	3.9	10	ns

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 30 V, I_D = 18 A	–	63	88	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 4.5 V, V_{DD} = 30 V, I_D = 18 A	–	29	41	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 30 V, I_D = 18 A	–	14	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	6.3	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 18 A (Note 2)	–	0.8	1.3	V
		V_{GS} = 0 V, I_S = 1.9 A (Note 2)	–	0.7	1.2	
t_{rr}	Reverse Recovery Time	I_F = 18 A, di/dt = 100 A/μs	–	43	69	ns
Q_{rr}	Reverse Recovery Charge		–	26	42	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. $R_{\theta CA}$ 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. E_{AS} of 253 mJ is based on starting T_J = 25°C, L = 3 mH, I_{AS} = 13 A, V_{DD} = 60 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 43 A.
4. Pulsed Id please refer to Figure 11 SOA graph for more details.
5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro−mechanical application board design.

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

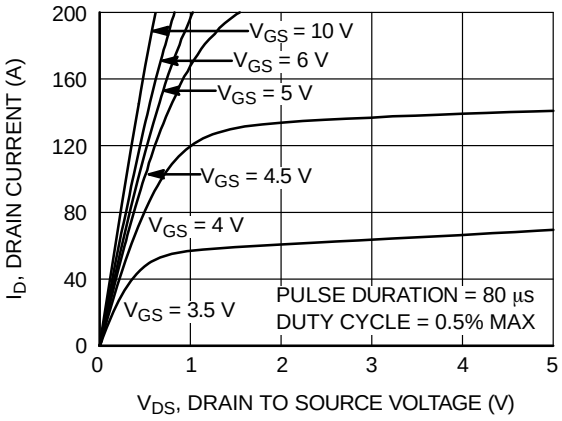


Figure 1. On−Region Characteristics

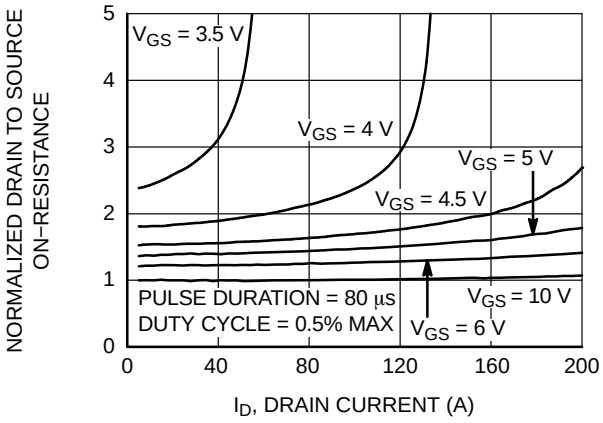


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

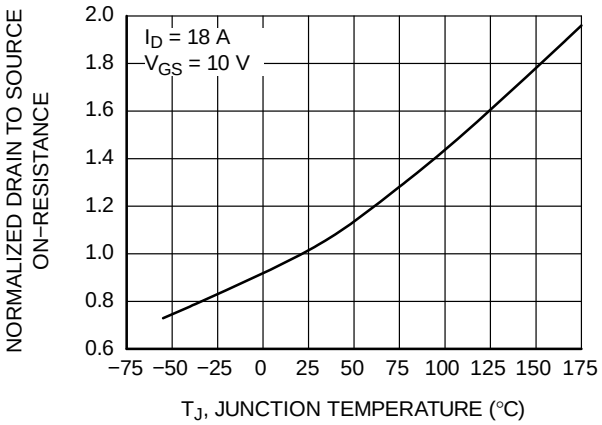


Figure 3. Normalized On−Resistance vs. Junction Temperature

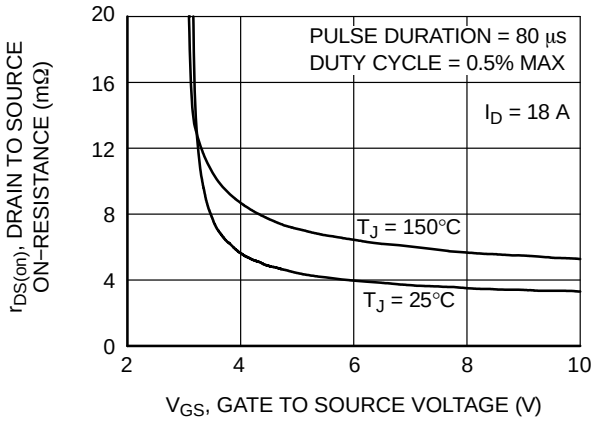


Figure 4. On−Resistance vs. Gate to Source Voltage

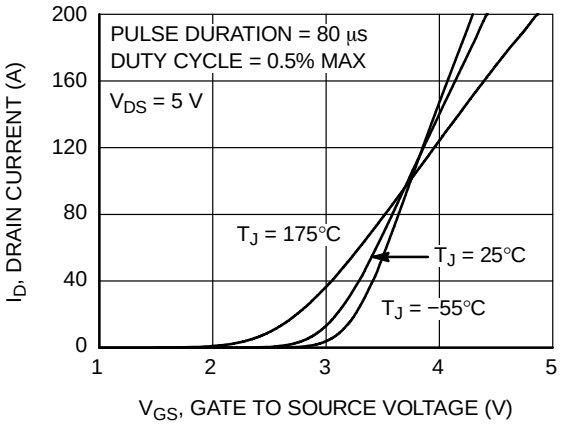


Figure 5. Transfer Characteristics

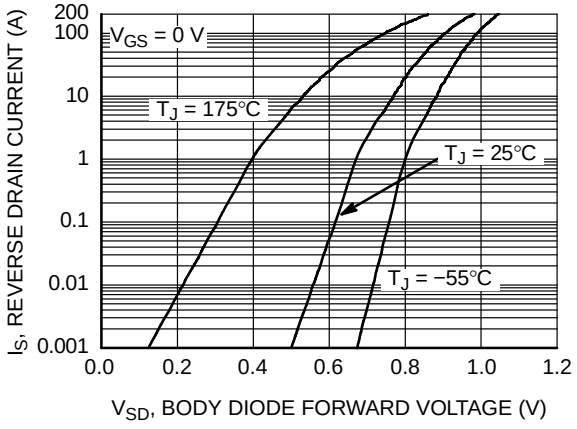


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

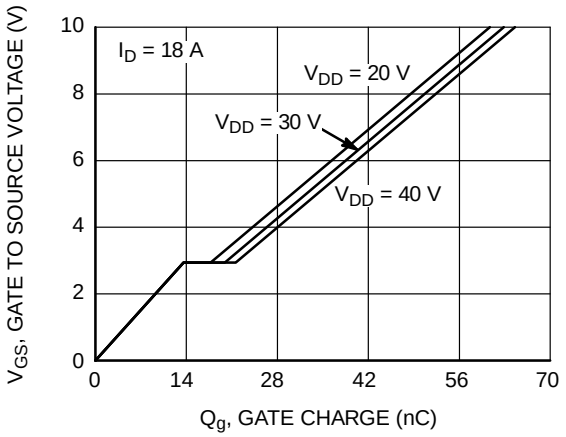


Figure 7. Gate Charge Characteristics

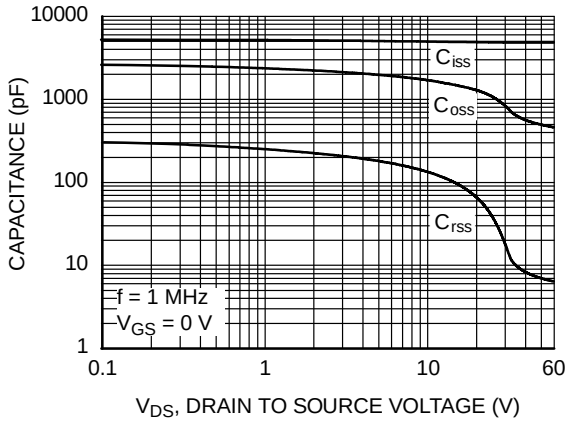


Figure 8. Capacitance vs. Drain to Source Voltage

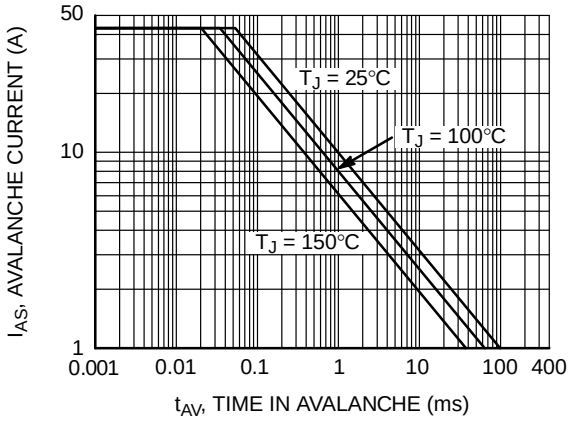


Figure 9. Unclamped Inductive Switching Capability

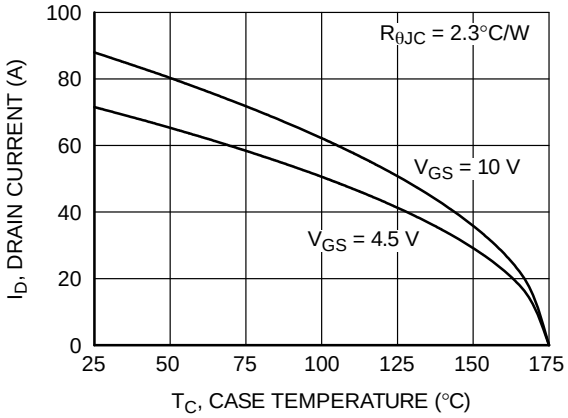


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

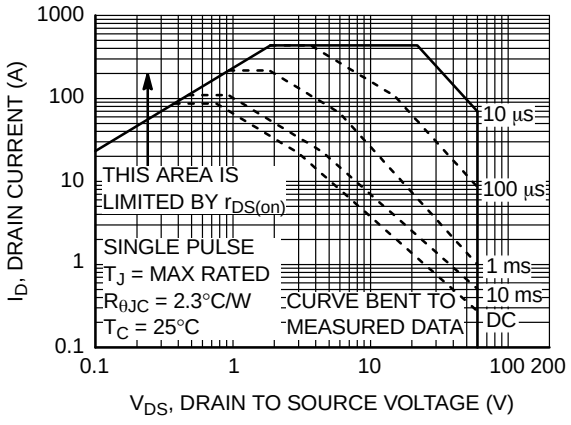


Figure 11. Forward Bias Safe Operating Area

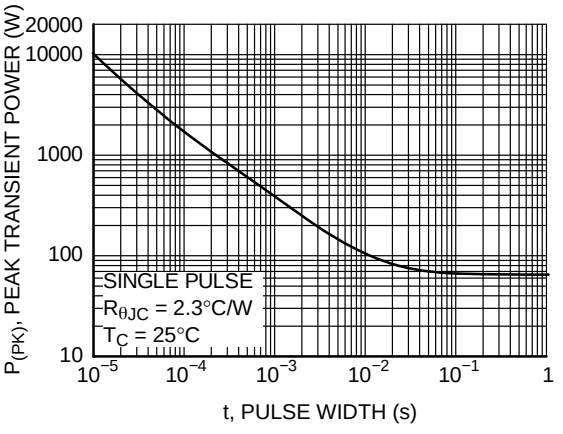


Figure 12. Single Pulse Maximum Power Dissipation

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

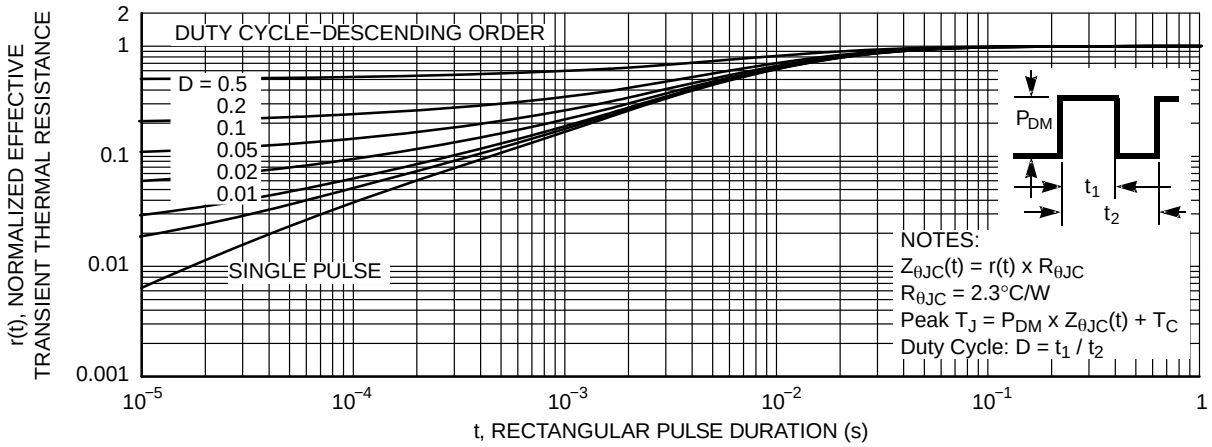


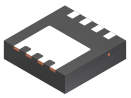
Figure 13. Junction−to−Ambient Transient Thermal Response Curve

PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping†
FDMC86570LET60	FDMC86570LT	WDFN8 3.3x3.3, 0.65P Power 33	13”	12 mm	3000 / Tape & Reel

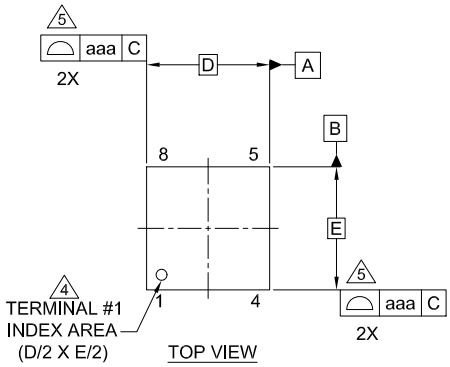
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

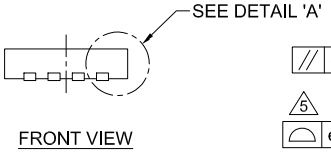
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

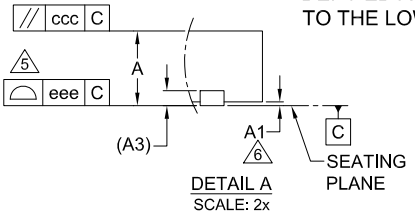


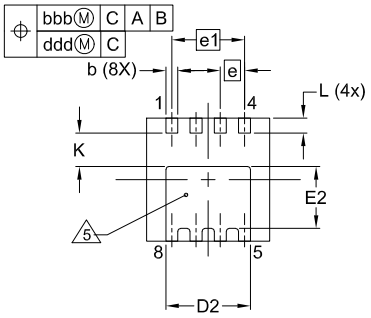
WDFN8 3.30x3.30x0.75, 0.65P
CASE 483AW
ISSUE B

DATE 22 MAR 2024

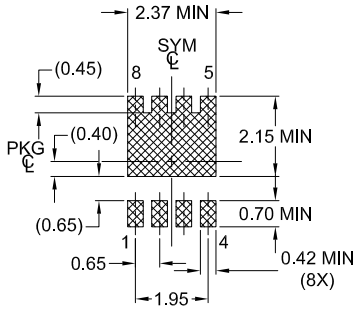








LAND PATTERN
RECOMMENDATION



NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEP95 SEC. 3 SPP-12. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD, EMBEDDED METAL OR MARKED FEATURE.
5. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
6. 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.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	--	--	0.05
A3		0.20 REF	
b	0.27	0.32	0.37
D		3.30 BSC	
D2	2.17	2.27	2.37
E		3.30 BSC	
E2	1.56	1.66	1.76
e		0.65 BSC	
e1		1.95 BSC	
K	0.90	--	--
L	0.30	0.40	0.50
aaa		0.10	
bbb		0.10	
ccc		0.10	
ddd		0.05	
eee		0.05	

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

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.

DOCUMENT NUMBER:	**98AON13672G**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	**WDFN8 3.30x3.30x0.75, 0.65P**		**PAGE 1 OF 1**

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

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For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales