

MOSFET – N 沟道屏蔽栅极 POWER TRENCH®

60 V, 87 A, 4.3 mΩ

FDMC86570LET60

概述

此 N 沟道 MOSFET 采用安森美 (onsemi) 带屏蔽栅极技术的先进 POWER TRENCH 工艺生产。该工艺针对导通阻抗优化，可保持卓越开关性能。

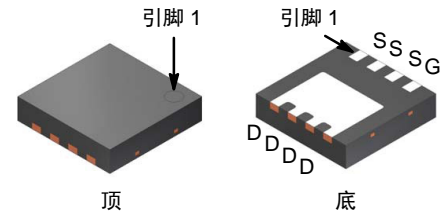
特性

- T_J 额定值扩展: 175°C
- 屏蔽栅极 MOSFET 技术
- 最大 $r_{DS(on)} = 4.3 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$, $I_D = 18 \text{ A}$
- 最大 $r_{DS(on)} = 6.5 \text{ m}\Omega$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 15 \text{ A}$
- 高性能沟道技术可实现极低的 $r_{DS(on)}$
- 终端为无铅产品
- 符合 RoHS 标准

应用

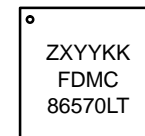
- DC-DC 转换

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



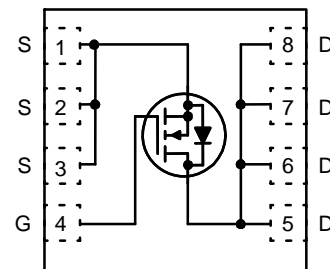
WDFN8 3.3x3.3, 0.65P
(Power 33)
CASE 483 AW

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.

FDMC86570LET60

MOSFET 最大额定值 ($T_A = 25^\circ\text{C}$ 除非另有说明)

符号	参数	额定值	单位
V_{DS}	漏极-源极电压	60	V
V_{GS}	栅极-源极电压	± 20	V
I_D	漏极电流 – 连续 $T_C = 25^\circ\text{C}$ (注 5)	87	A
	– 连续 $T_C = 100^\circ\text{C}$ (注 5)	62	
	– 连续 $T_A = 25^\circ\text{C}$ (注 1a)	18	A
	– 脉冲 (注 4)	436	A
E_{AS}	单脉冲雪崩能量 (注 3)	253	mJ
P_D	功耗 $T_C = 25^\circ\text{C}$	65	W
	功耗 $T_A = 25^\circ\text{C}$ (注 1a)	2.8	
T_J, T_{STG}	功耗	-55 至 +175	$^\circ\text{C}$

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.

(参考译文)

如果电压超过最大额定值表中列出的值范围，器件可能会损坏。如果超过任何这些限值，将无法保证器件功能，可能会导致器件损坏，影响可靠性。

热性能

符号	参数	额定值	单位
$R_{\theta JC}$	热性能 (注 1)	2.3	$^\circ\text{C/W}$
$R_{\theta JA}$	结至环境热阻 (注 1a)	53	

电气特性 ($T_J = 25^\circ\text{C}$ 除非另有说明)

符号	参数	测试条件	最小值	典型值	最大值	单位
----	----	------	-----	-----	-----	----

关断特性

BV_{DSS}	漏极-源极击穿电压	$I_D = 250\ \mu\text{A}, V_{GS} = 0\ \text{V}$	60	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	击穿电压温度系数	$I_D = 250\ \mu\text{A}$, 参考 25°C	–	30	–	$\text{mV}/^\circ\text{C}$
I_{DSS}	零栅极电压漏极电流	$V_{DS} = 48\ \text{V}, V_{GS} = 0\ \text{V}$	–	–	1	μA
I_{GSS}	栅极-源极漏电流	$V_{GS} = \pm 20\ \text{V}, V_{DS} = 0\ \text{V}$	–	–	± 100	nA

导通特性

$V_{GS(th)}$	栅极-源极阈值电压	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0	1.8	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	栅极-源极阈值电压温度系数	$I_D = 250\ \mu\text{A}$, 参考 25°C	–	–7	–	$\text{mV}/^\circ\text{C}$
$r_{DS(on)}$	漏极至源极静态导通电阻	$V_{GS} = 10\ \text{V}, I_D = 18\ \text{A}$	–	3.1	4.3	$\text{m}\Omega$
		$V_{GS} = 4.5\ \text{V}, I_D = 15\ \text{A}$	–	4.7	6.5	
		$V_{GS} = 10\ \text{V}, I_D = 18\ \text{A}, T_J = 125^\circ\text{C}$	–	5.0	6.9	
g_{FS}	正向跨导	$V_{DD} = 5\ \text{V}, I_D = 18\ \text{A}$	–	75	–	S

动态特性

C_{iss}	输入电容	$V_{DS} = 30\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$	–	4790	–	pF
C_{oss}	输出电容		–	821	–	pF
C_{rss}	反向传输电容		–	19	–	pF
R_g	栅极阻抗		0.1	0.9	2.7	Ω

FDMC86570LET60

电气特性 ($T_J = 25^\circ\text{C}$ 除非另有说明) (continued)

符号	参数	测试条件	最小值	典型值	最大值	单位
开关特性						
$t_{d(on)}$	导通延迟时间	$V_{DD} = 30\text{ V}$, $I_D = 18\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\ \Omega$	–	19	34	ns
t_r	上升时间		–	6.2	12	ns
$t_{d(off)}$	关断延迟时间		–	38	61	ns
t_f	下降时间		–	3.9	10	ns
$Q_{g(TOT)}$	总栅极电荷	$V_{GS} = 0\text{ V}$ 至 10 V , $V_{DD} = 30\text{ V}$, $I_D = 18\text{ A}$	–	63	88	nC
$Q_{g(TOT)}$	总栅极电荷	$V_{GS} = 0\text{ V}$ 至 4.5 V , $V_{DD} = 30\text{ V}$, $I_D = 18\text{ A}$	–	29	41	nC
Q_{gs}	栅极–源极电荷	$V_{DD} = 30\text{ V}$, $I_D = 18\text{ A}$	–	14	–	nC
Q_{gd}	栅极–漏极“米勒”电荷		–	6.3	–	nC

漏极–源极二极管特性

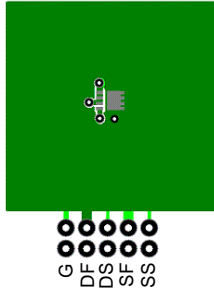
V_{SD}	源极–漏极二极管正向电压	$V_{GS} = 0\text{ V}$, $I_S = 18\text{ A}$ (注 2)	–	0.8	1.3	V
		$V_{GS} = 0\text{ V}$, $I_S = 1.9\text{ A}$ (注 2)	–	0.7	1.2	
t_{rr}	反向恢复时间	$I_F = 18\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	–	43	69	ns
Q_{rr}	反向恢复电荷		–	26	42	nC

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.

(参考译文)

除非另有说明，“电气特性”表格中列出的是所列测试条件下的产品性能参数。如果在不同条件下运行，产品性能可能与“电气特性”表格中所列性能参数不一致。

1. $R_{\theta JA}$ 取决于安装在一平方英寸衬垫，2 oz 铜焊盘以及 FR-4 材质尺寸 1.5 x 1.5 in. 的衬垫上的器件。 $R_{\theta CA}$ 由用户的电路板设计确定。



a. 53 安装在 2 oz 最小 1 in² 铜焊盘上时的 $^\circ\text{C}/\text{W}$



b. 125 安装在 2 oz 最小铜焊盘上时的 $^\circ\text{C}/\text{W}$

2. 脉冲测试：脉冲宽度： $< 300\ \mu\text{s}$ ，占空比： $< 2.0\%$ 。

3. E_{AS} 为 253 mJ，依据起始 $T_J = 25^\circ\text{C}$ 、 $L = 3\text{ mH}$ 、 $I_{AS} = 13\text{ A}$ 、 $V_{DD} = 60\text{ V}$ 、 $V_{GS} = 10\text{ V}$ 。100% 经过测试 ($L = 0.1\text{ mH}$ ， $I_{AS} = 43\text{ A}$)。

4. 有关脉冲编号的更多详情，请参考图 11 中的 SOA 图形。

5. 计算得到的连续电流仅限于最大结温，实际连续电流将受限于散热以及电气机械应用的电路板设计。

典型特性 ($T_J = 25^\circ\text{C}$ 除非另有说明)

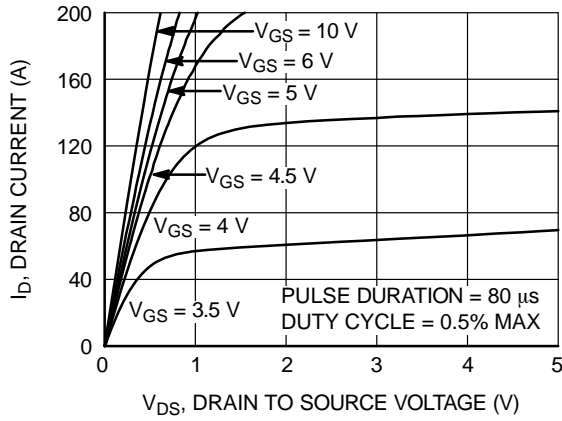


图 1. 通态区域特性

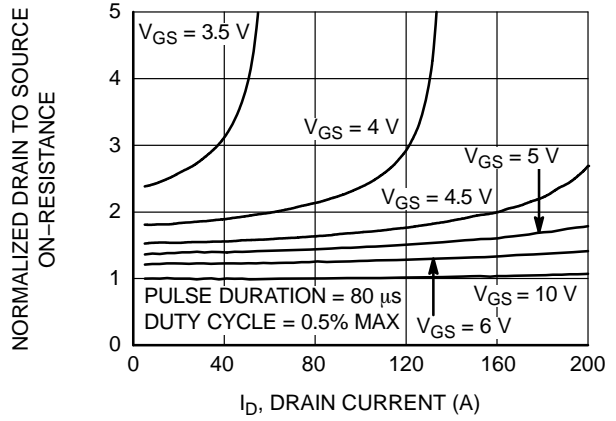


图 2. 标准化导通电阻与漏极电流和栅极电压的关系

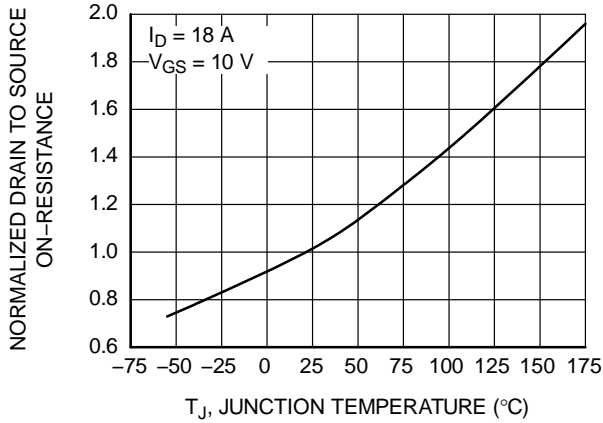


图 3. 标准化导通电阻与结温的关系

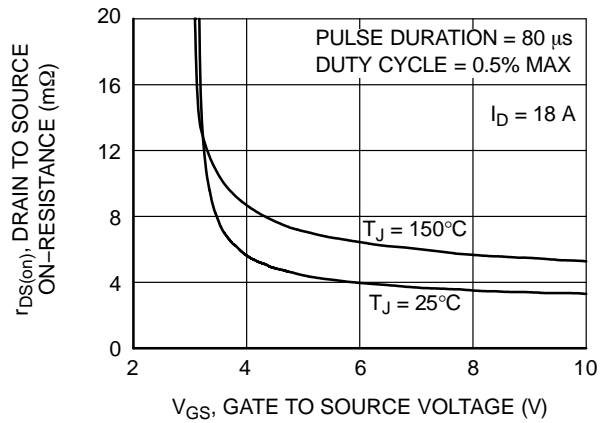


图 4. 导通电阻与栅极-源极电压的关系

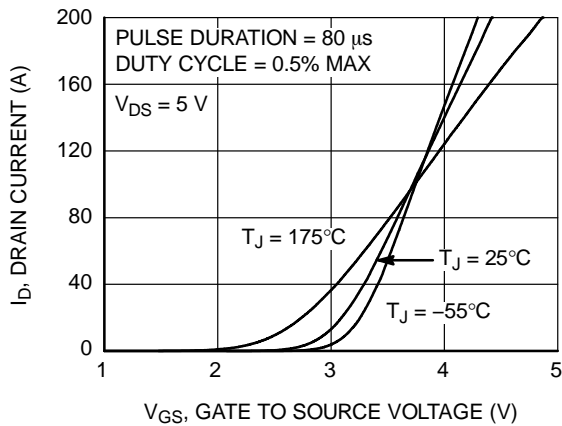


图 5. 转换特性

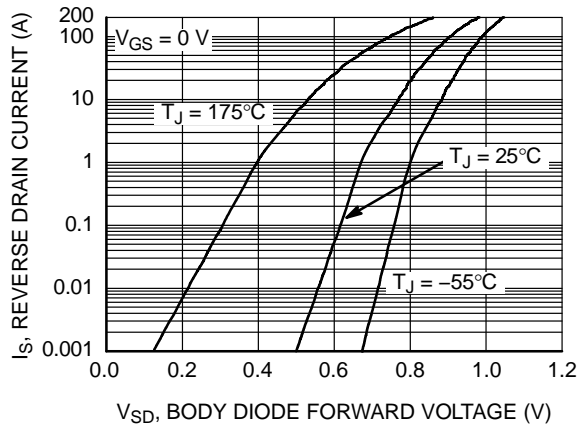


图 6. 源极-漏极二极管正向电压与源电流的关系

FDMC86570LET60

典型特性 ($T_J = 25^\circ\text{C}$ 除非另有说明)

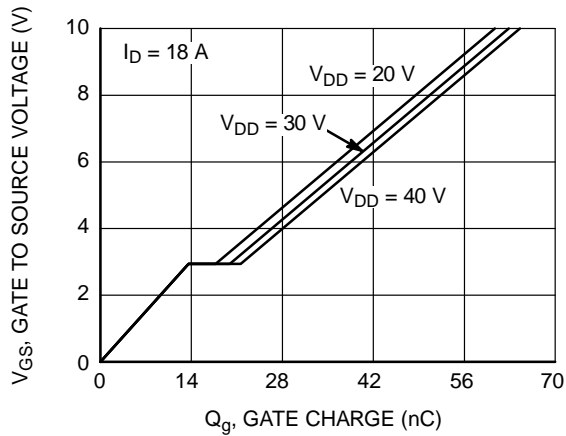


图 7. 栅极电荷特性

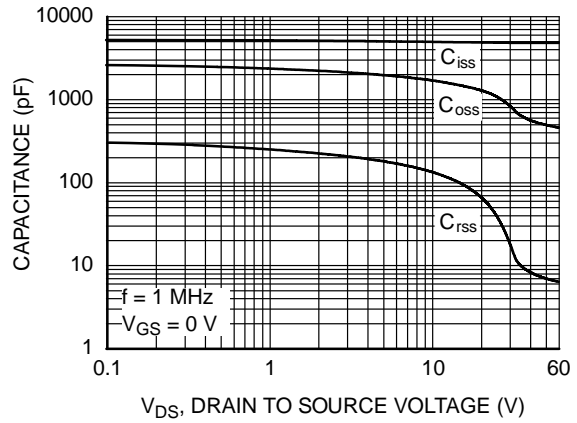


图 8. 电容与漏极-源极电压的关系

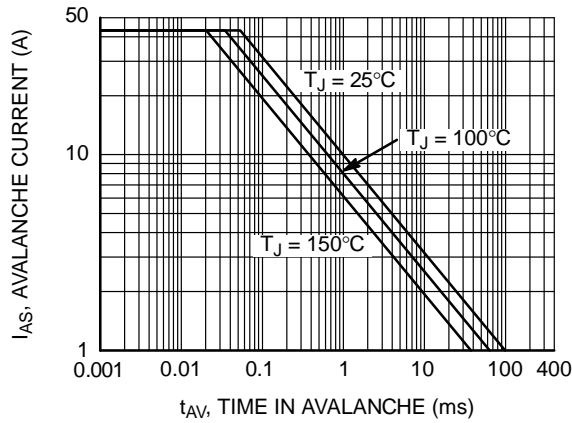


图 9. 非箝位电感开关能力

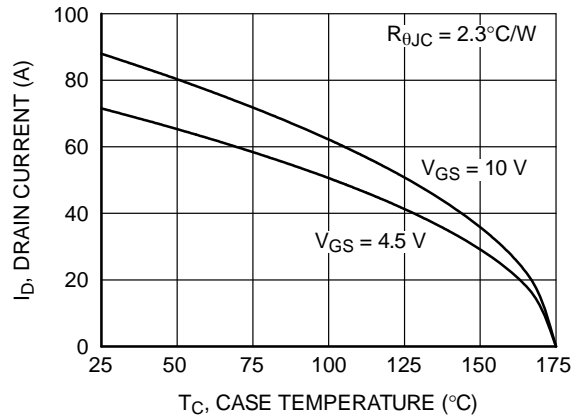


图 10. 最大连续漏极电流与壳温的关系

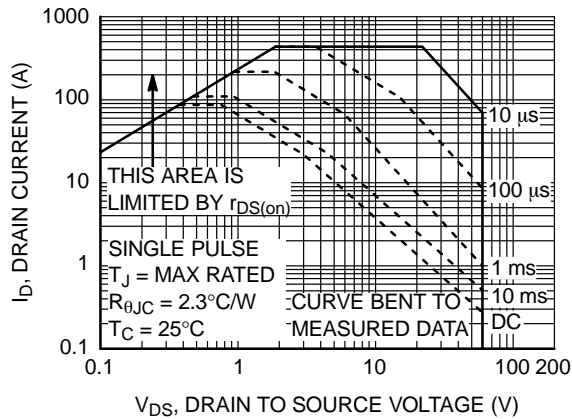


图 11. 正向偏压安全工作区

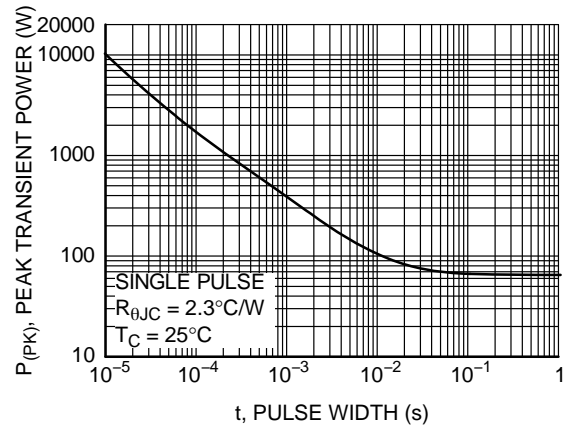


图 12. 单个脉冲最大功耗

FDMC86570LET60

典型特性 ($T_J = 25^\circ\text{C}$ 除非另有说明)

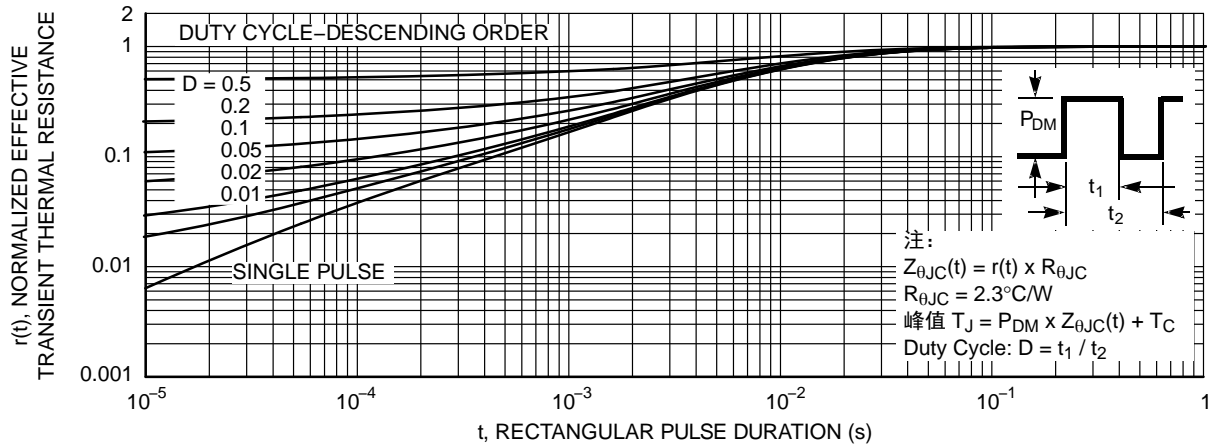


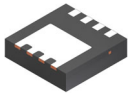
图 13. 结至外壳瞬态热响应曲线

封装标识与订购信息

器件	器件标识	封装	卷尺寸	带宽	Shipping [†]
FDMC86570LET60	FDMC86570LT	WDFN8 3.3x3.3, 0.65P Power 33	13"	12 mm	3000 / Tape & Reel

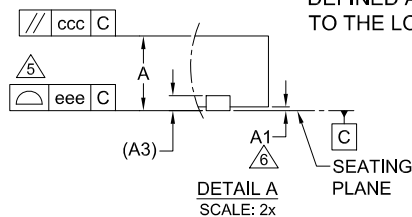
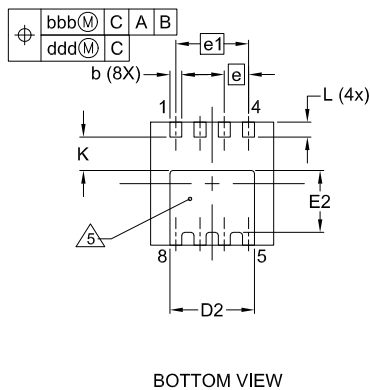
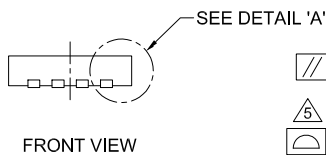
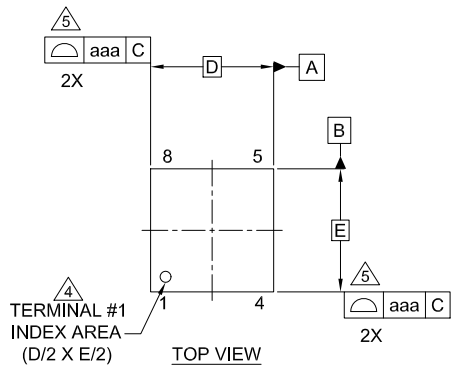
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

POWERTRENCH is registered trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

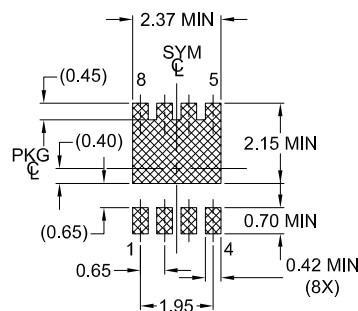


WDFN8 3.30x3.30x0.75, 0.65P
CASE 483AW
ISSUE B

DATE 22 MAR 2024



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.

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.

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. ALL 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		

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

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