

MOSFET – Power, Dual, N-Channel, for 3-Cells Lithium-ion Battery Protection, WLCSP8

30 V, 2.6 mΩ, 30 A

EFC4C002NL

This N-Channel Power MOSFET is produced using onsemi trench technology, which is specifically designed to minimize gate charge and ultra low on resistance.

This device is suitable for applications of Drone or Notebook PC.

Features

- Ultra Low On-Resistance
- Low Gate Charge
- Common-Drain Type
- These Device is Pb-Free, Halogen Free and is RoHS Compliant

Applications

- 3-Cells Lithium-ion Battery Charging and Discharging Switch

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS at $T_A = 25^\circ\text{C}$ (Note 1)

Parameter	Symbol	Value	Unit
Source to Source Voltage	V_{SSS}	30	V
Gate to Source Voltage	V_{GSS}	± 20	V
Source Current (DC)	I_S	30	A
Source Current (Pulse) $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$	I_{SP}	120	A
Total Dissipation (Note 1)	P_T	2.6	W
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-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.

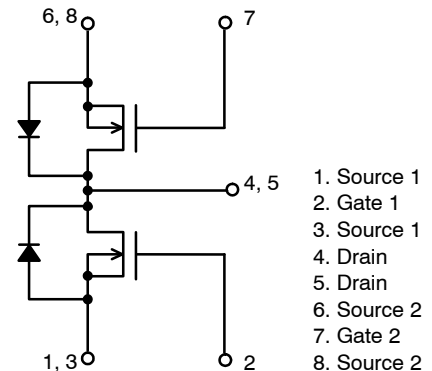
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient (Note 1)	$R_{\theta JA}$	48	$^\circ\text{C/W}$

1. Surface mounted on ceramic substrate (5000 mm² × 0.8 mm).

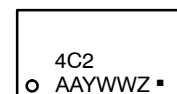
V_{SSS}	$R_{SS(on)}$ Max	I_S Max
30 V	2.6 mΩ @ 10 V	30 A
	3.3 mΩ @ 8 V	
	5.1 mΩ @ 4.5 V	

ELECTRICAL CONNECTION N-Channel



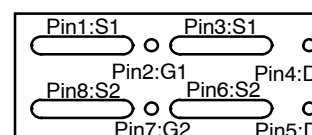
WLCSP8
CASE 567MC

MARKING DIAGRAM



4C2 = Specific Device Code
AA = Assembly Location
Y = Year
WW = Work Week
Z = Lot Traceability
■ = Pb-Free Package

PIN ASSIGNMENT



ORDERING INFORMATION

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

EFC4C002NL

ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Source to Source Breakdown Voltage	$V_{(BR)SSS}$	$I_S = 1\text{ mA}$, $V_{GS} = 0\text{ V}$ Test Circuit 1	30			V
Zero-Gate Voltage Source Current	I_{SSS}	$V_{SS} = 24\text{ V}$, $V_{GS} = 0\text{ V}$ Test Circuit 1			1	μA
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = 20\text{ V}$, $V_{SS} = 0\text{ V}$ Test Circuit 2			200	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{SS} = 10\text{ V}$, $I_S = 1\text{ mA}$ Test Circuit 3	1.3		2.2	V
Forward Transconductance	g_{FS}	$V_{SS} = 10\text{ V}$, $I_S = 10\text{ A}$ Test Circuit 4		16		S
Static Source to Source On-State Resistance	$R_{SS(on)}$	$V_{GS} = 10\text{ V}$, $I_S = 10\text{ A}$ Test Circuit 5	1.5	2.0	2.6	$\text{m}\Omega$
		$V_{GS} = 8\text{ V}$, $I_S = 10\text{ A}$ Test Circuit 5	1.6	2.1	3.3	$\text{m}\Omega$
		$V_{GS} = 4.5\text{ V}$, $I_S = 10\text{ A}$ Test Circuit 5	2.2	2.9	5.1	$\text{m}\Omega$
Static Drain to Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_S = 1\text{ A}$		10		$\text{m}\Omega$
Gate Resistance	R_G			3		Ω
Turn-ON Delay Time	$t_d(on)$	$V_{SS} = 15\text{ V}$, $V_{GS} = 10\text{ V}$ $I_S = 10\text{ A}$ Test Circuit 6		40		ns
Rise Time	t_r			750		ns
Turn-OFF Delay Time	$t_d(off)$			280		ns
Fall Time	t_f			105		ns
Input Capacitance	C_{iss}	$V_{SS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		6.200		pF
Total Gate Charge	Q_g	$V_{SS} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_S = 15\text{ A}$ Test Circuit 7		45		nC
Forward Source to Source Voltage	$V_{F(S-S)}$	$I_S = 10\text{ A}$, $V_{GS} = 0\text{ V}$ Test Circuit 8		0.75	1.2	V

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.

Test circuits are example of measuring FET1 side.

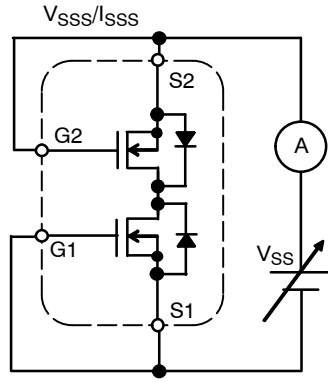


Figure 1. Test Circuit 1

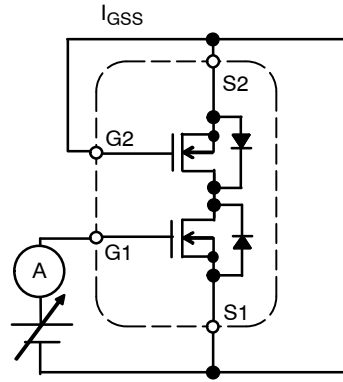
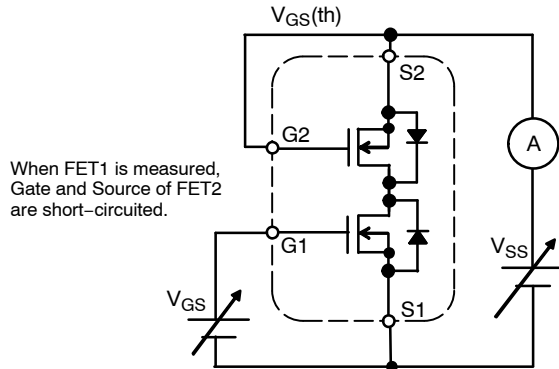


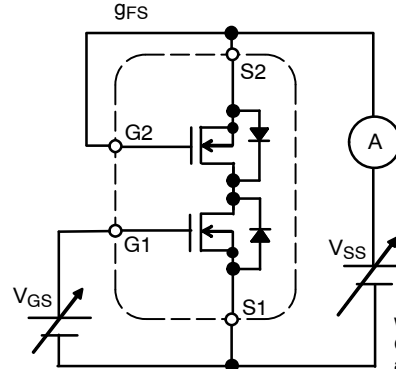
Figure 2. Test Circuit 2

When FET1 is measured, Gate and Source of FET2 are short-circuited.



When FET1 is measured, Gate and Source of FET2 are short-circuited.

Figure 3. Test Circuit 3



When FET1 is measured, Gate and Source of FET2 are short-circuited.

Figure 4. Test Circuit 4

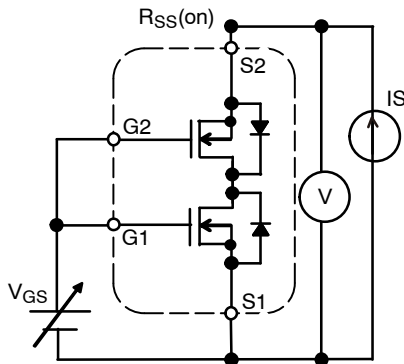
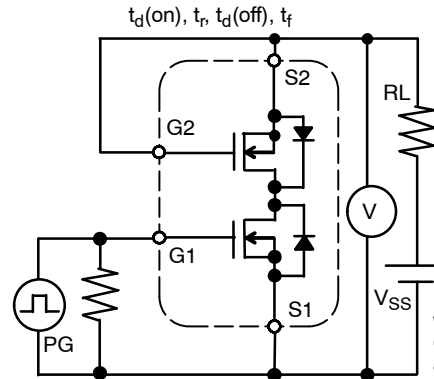
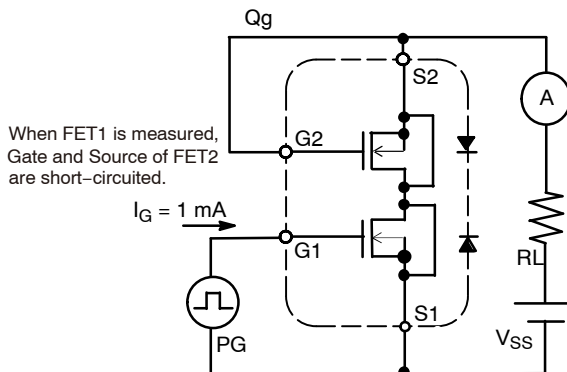


Figure 5. Test Circuit 5



When FET1 is measured, Gate and Source of FET2 are short-circuited.

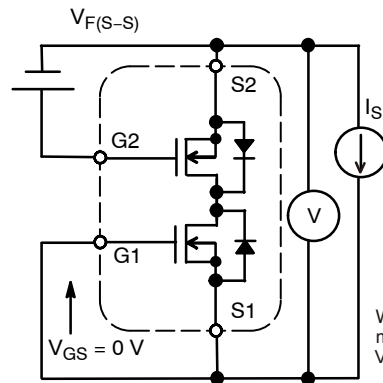
Figure 6. Test Circuit 6



When FET1 is measured, Gate and Source of FET2 are short-circuited.

$I_G = 1 \text{ mA}$

Figure 7. Test Circuit 7



When FET1 is measured, +10 V is added to V_{GS} of FET2.

Figure 8. Test Circuit 8

NOTES: When FET2 is measured, the position of FET1 and FET2 is switched.

TYPICAL CHARACTERISTICS

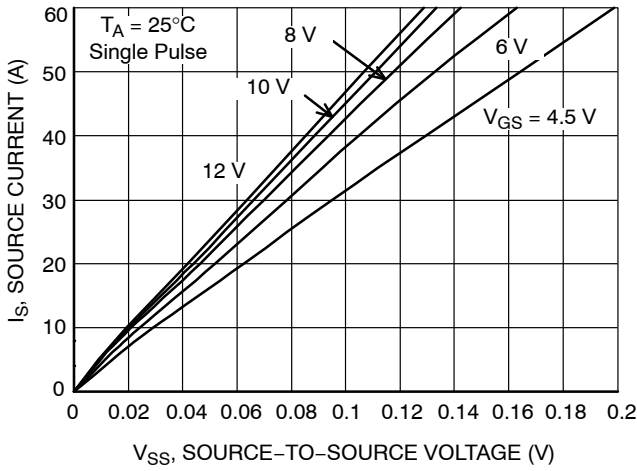


Figure 9. On-Region Characteristics

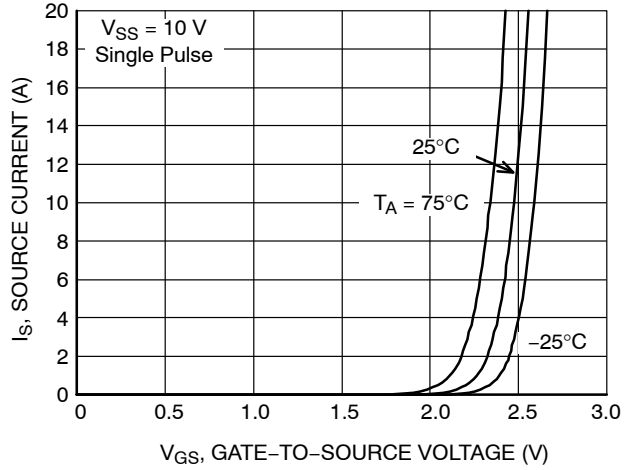


Figure 10. Transfer Characteristics

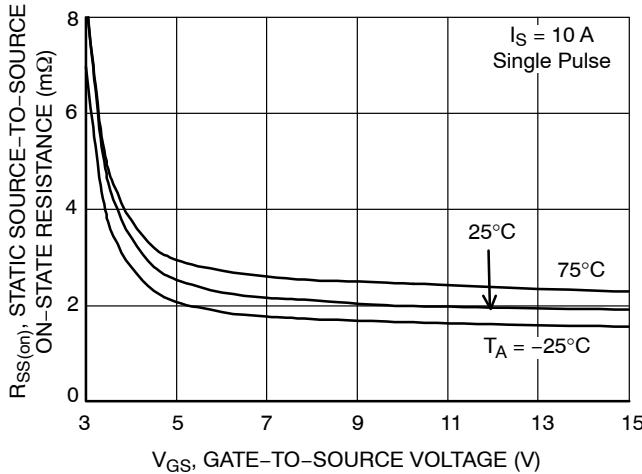


Figure 11. On-Resistance vs. Gate-to-Source Voltage

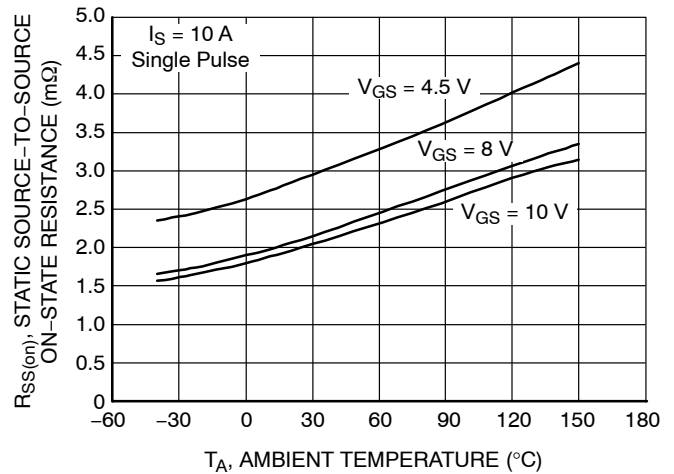


Figure 12. On-Resistance vs. Temperature

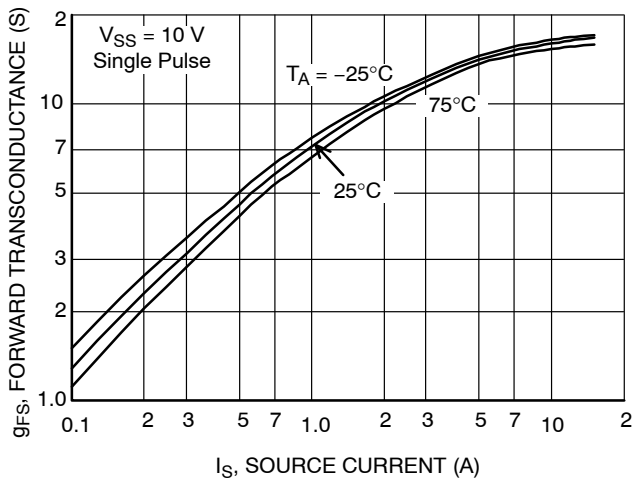


Figure 13. Forward Transconductance vs. Current

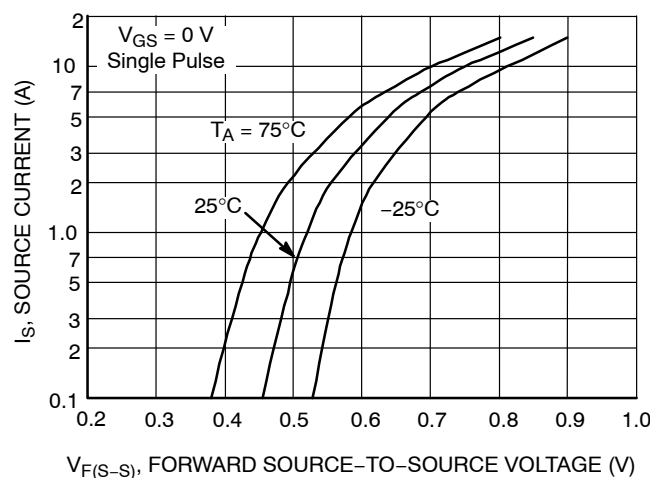


Figure 14. Forward Source-to-Source Voltage vs. Current

TYPICAL CHARACTERISTICS (continued)

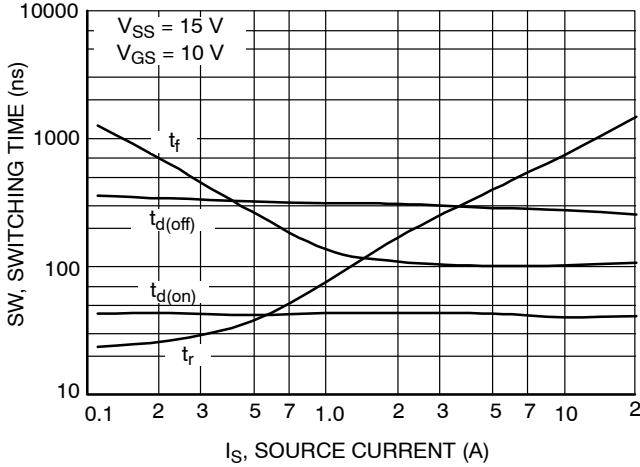


Figure 15. Switching Time vs. Current

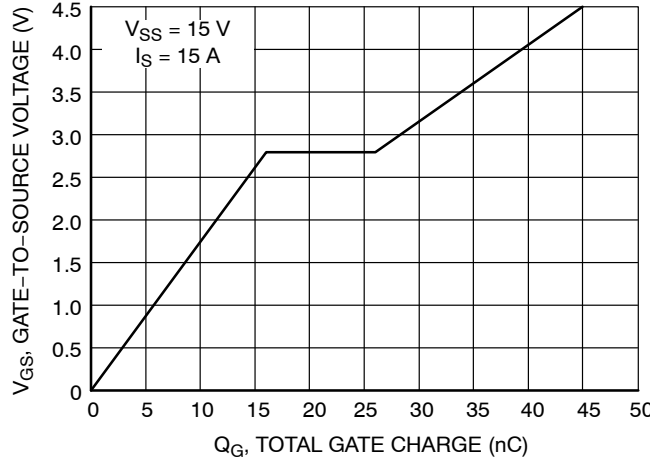


Figure 16. Gate-to-Source Voltage vs. Total Gate Charge

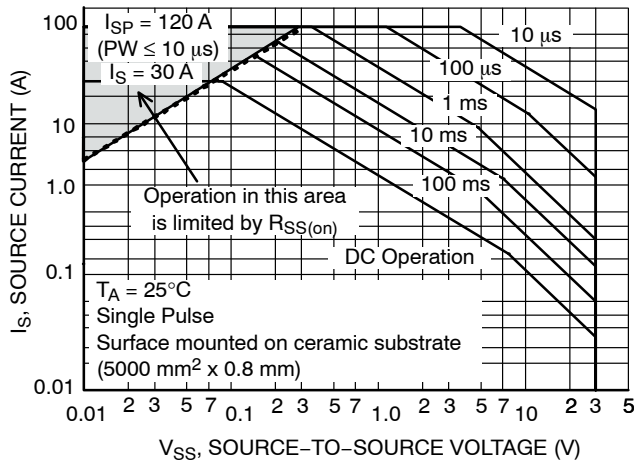


Figure 17. Safe Operating Area

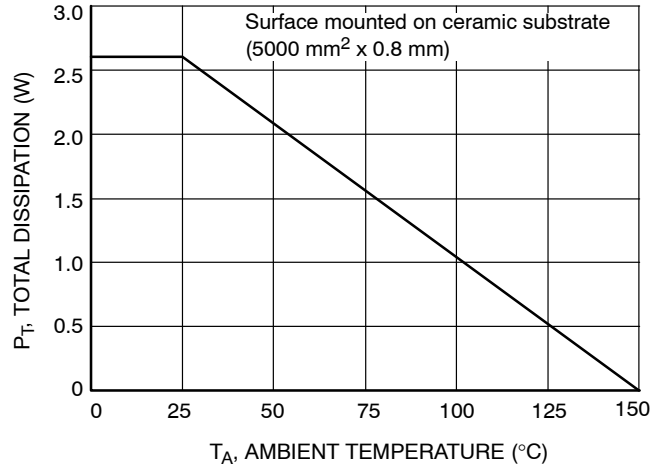


Figure 18. Total Dissipation vs. Temperature

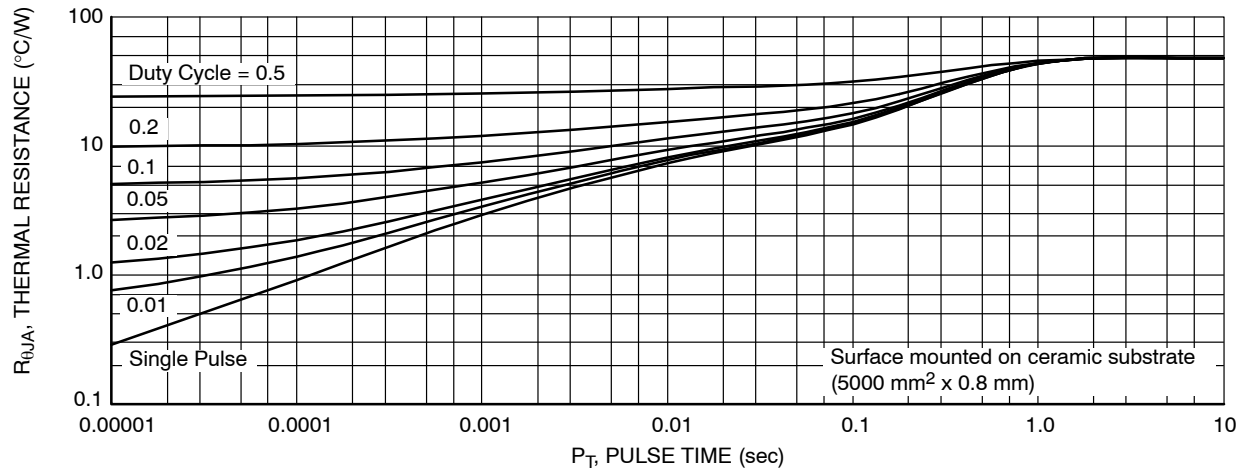


Figure 19. Thermal Response

EFC4C002NL

ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing) [†]
EFC4C002NLTDG	4C2	WLCSP8 6.00x2.50 (Pb-Free / Halogen Free)	5000 / 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

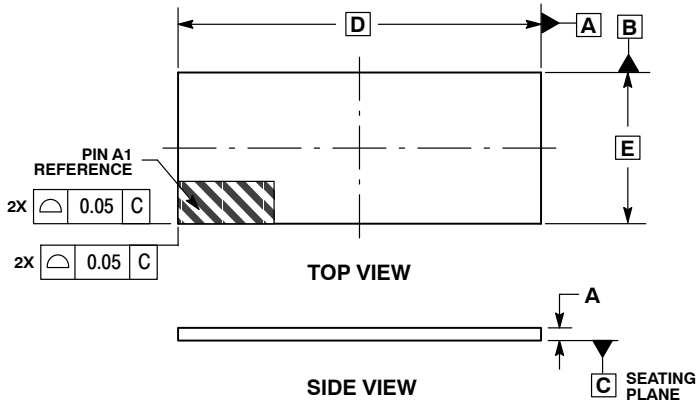
ON Semiconductor®



WLCSP8, 6.00x2.50 / EFCP6025-8EGJ-021
CASE 567MC
ISSUE O

SCALE 2:1

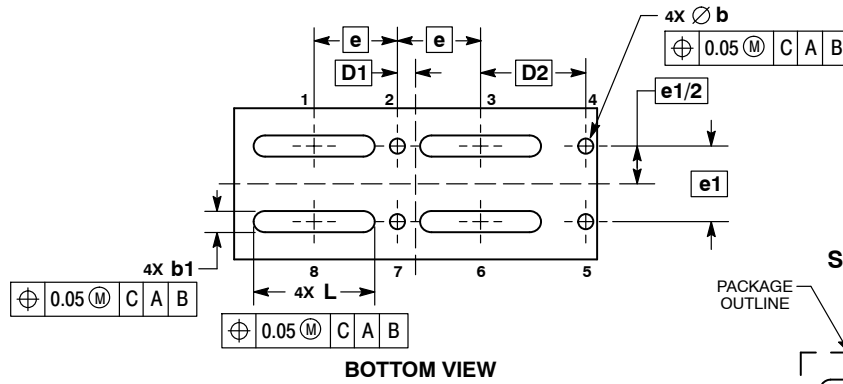
DATE 22 JUL 2015



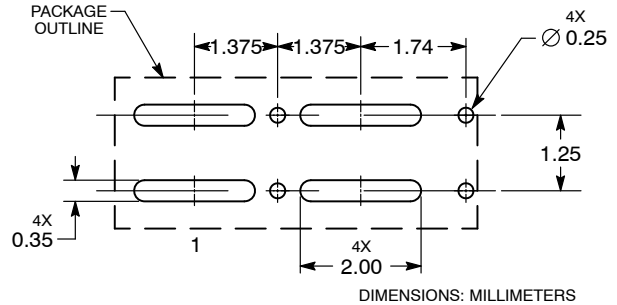
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.19	0.23
b	0.22	0.28
b1	0.32	0.38
D	5.95	6.05
D1	0.305 BSC	
D2	1.740 BSC	
E	2.45	2.55
e	1.375 BSC	
e1	1.25 BSC	
L	1.97	2.03



RECOMMENDED SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

DOCUMENT NUMBER:	98AON00386G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WLCSP8, 6.00X2.50 / EFCP6025-8EGJ-021	PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative

