

EFC3J023NUZ

Product Preview

Power MOSFET, Dual N-Channel

for 1–2 Cells Lithium–ion Battery Protection 22 V, 4.0 mΩ, 21 A

This Power MOSFET features a low on–state resistance. This device is suitable for applications such as power switches of portable machines. Best suited for 1–2 cells lithium–ion battery applications.

Features

- 2.5 V drive
- 2 kV ESD HBM
- Common–Drain Type
- ESD Diode–Protected Gate
- Pb–Free, Halogen Free and RoHS compliance

Applications

- 1–2 Cells Lithium–ion Battery Charging and Discharging Switch

ABSOLUTE MAXIMUM RATINGS at Ta = 25°C

Parameter	Symbol	Value	Unit
Source to Source Voltage	V _{SSS}	22	V
Gate to Source Voltage	V _{GSS}	±12	V
Source Current (DC)	I _S	21	A
Source Current (Pulse) PW < 100 μs, duty cycle ≤ 1%	I _{SP}	84	A
Total Dissipation (Note 1)	P _T	2.7	W
Junction Temperature	T _J	150	°C
Storage Temperature	T _{stg}	–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 RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction to Ambient (Note 1)	R _{θJA}	46	°C/W

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

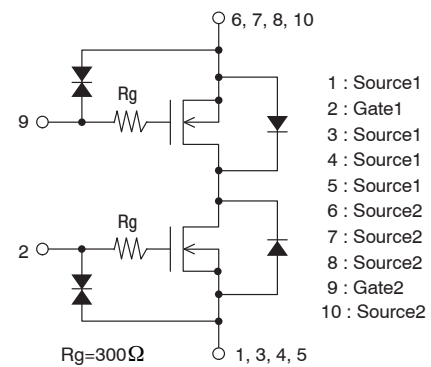


ON Semiconductor®

www.onsemi.com

V _{SSS}	R _{SS(on)} Max	I _S Max
22 V	4.0 mΩ @ 4.5 V	21 A
	4.2 mΩ @ 3.8 V	
	5.4 mΩ @ 3.1 V	
	7.3 mΩ @ 2.5 V	

ELECTRICAL CONNECTION

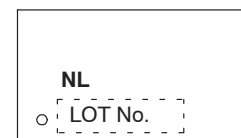


N-Channel



WLCSP10
CASE 567PL

MARKING DIAGRAM



ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

EFC3J023NUZ

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions		Value			Unit
				Min	Typ	Max	
Source to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_S = 1 \text{ mA}$, $V_{GS} = 0 \text{ V}$	Test Circuit 1	22			V
Zero – Gate Voltage Source Current	I_{SSS}	$V_{SS} = 17.6 \text{ V}$, $V_{GS} = 0 \text{ V}$	Test Circuit 1			1.0	μA
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 8 \text{ V}$, $V_{SS} = 0 \text{ V}$	Test Circuit 2			± 10	μA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{SS} = 10 \text{ V}$, $I_S = 1 \text{ mA}$	Test Circuit 3	0.3		1.3	V
Static Source to Source On – State Resistance	$R_{SS(on)}$	$I_S = 5 \text{ A}$, $V_{GS} = 4.5 \text{ V}$	Test Circuit 4	2.3	3.1	4.0	$\text{m}\Omega$
		$I_S = 5 \text{ A}$, $V_{GS} = 3.8 \text{ V}$	Test Circuit 4	2.4	3.2	4.2	$\text{m}\Omega$
		$I_S = 5 \text{ A}$, $V_{GS} = 3.1 \text{ V}$	Test Circuit 4	2.65	4.0	5.4	$\text{m}\Omega$
		$I_S = 5 \text{ A}$, $V_{GS} = 2.5 \text{ V}$	Test Circuit 4	3.05	5.2	7.3	$\text{m}\Omega$
Turn – ON Delay Time	$t_d(on)$	$V_{SS} = 10 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_S = 3 \text{ A}$, $R_g = 10 \text{ k}\Omega$	Test Circuit 5		14		μs
Rise Time	t_r				25		μs
Turn – OFF Delay Time	$t_d(off)$				300		μs
Fall Time	t_f				80		μs
Total Gate Charge	Qg	$V_{SS} = 10 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_S = 21 \text{ A}$	Test Circuit 6		66		nC
Forward Source to Source Voltage	$V_{F(S-S)}$	$I_S = 3 \text{ A}$, $V_{GS} = 0 \text{ V}$	Test Circuit 7		0.74		V

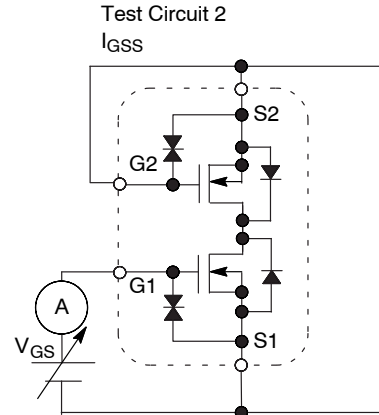
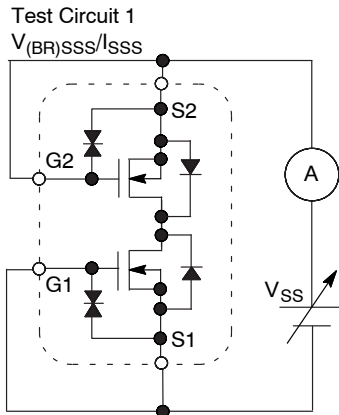
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

PACKAGE MARKING AND ORDERING INFORMATION

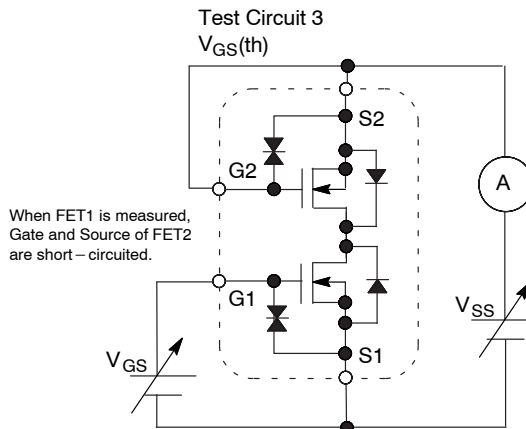
Device	Marking	Package	Shipping [†]
EFC3J023NUZTDG	NL	WLCSP10 3.40 × 1.96 × 0.10 (Pb-Free/Halogen Free)	5000 / Tape & Reel

[†]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.

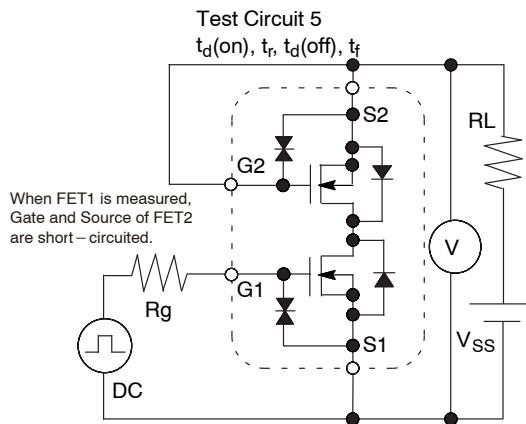
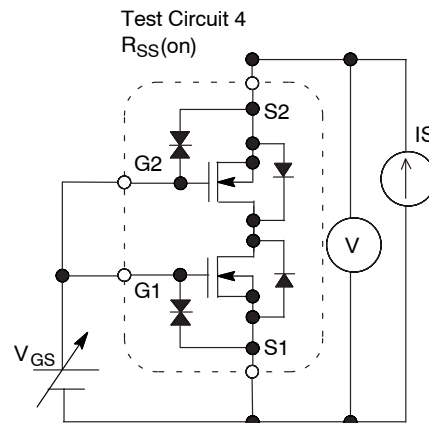
Test Circuits are Example of Measuring FET1 Side



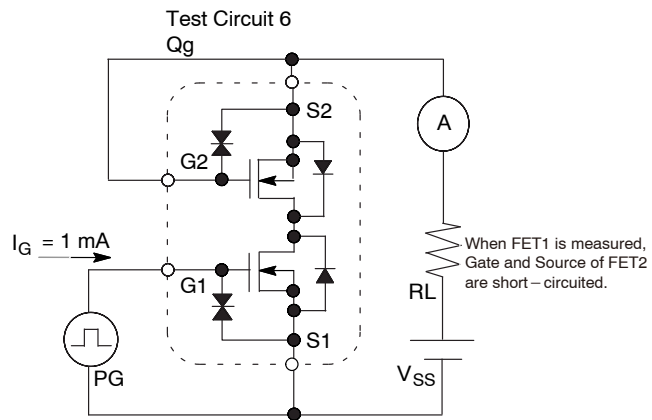
When FET1 is measured, Gate and Source of FET2 are short-circuited.



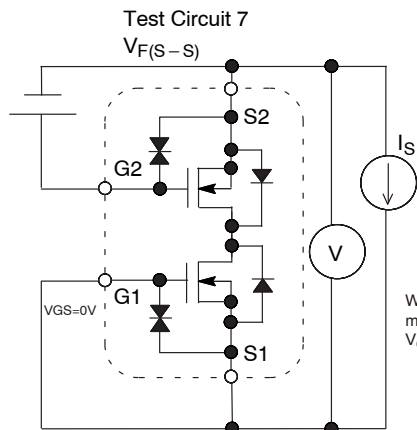
When FET1 is measured, Gate and Source of FET2 are short-circuited.



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



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



When FET1 is measured, +4.5V is added to V_{GS} of FET2.

When FET2 is measured, the positions of FET1 and FET2 are switched.

TYPICAL CHARACTERISTICS

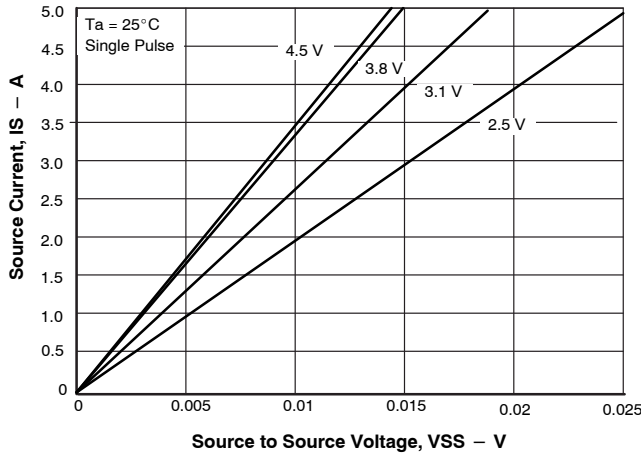


Figure 1. On – Region Characteristics

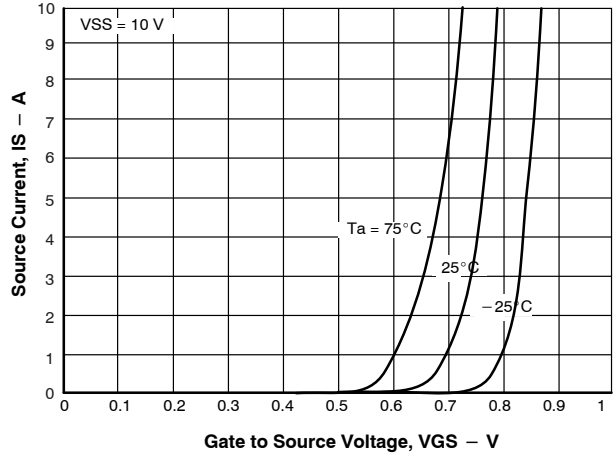


Figure 2. Transfer Characteristics

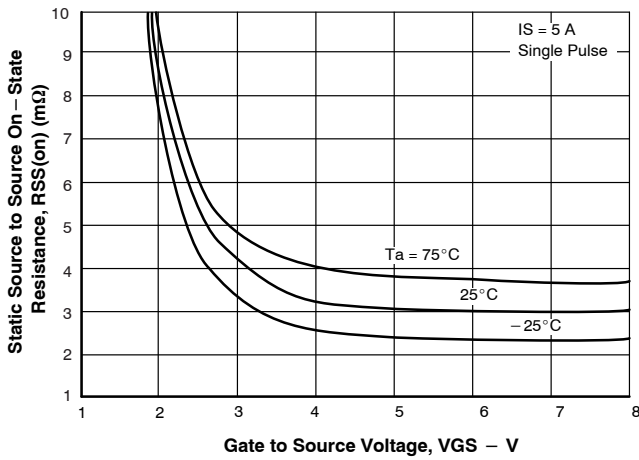


Figure 3. On-Resistance vs. Gate to Source

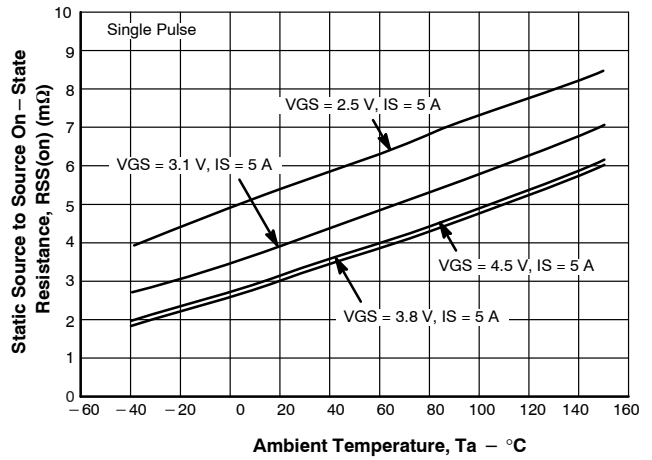


Figure 4. On – Resistance vs. Temperature

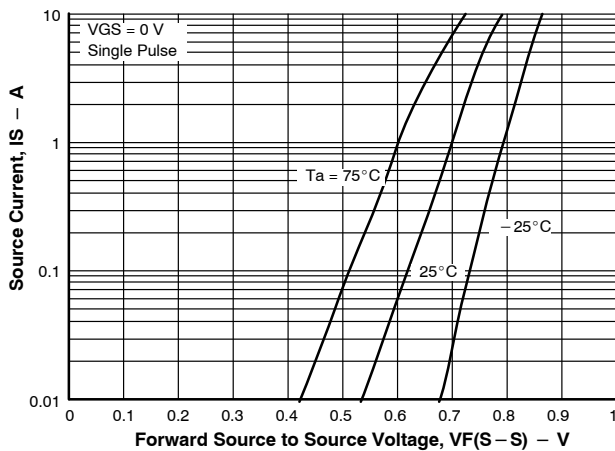


Figure 5. Forward Source – to – Source Voltage

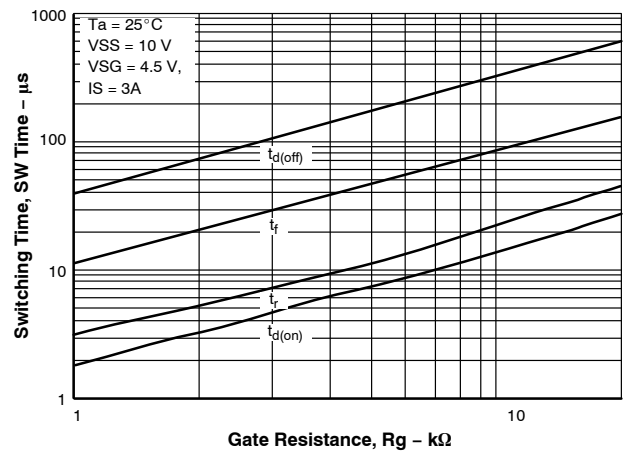


Figure 6. Switching Time vs. Gate Resistance

EFC3J023NUZ

TYPICAL CHARACTERISTICS (continued)

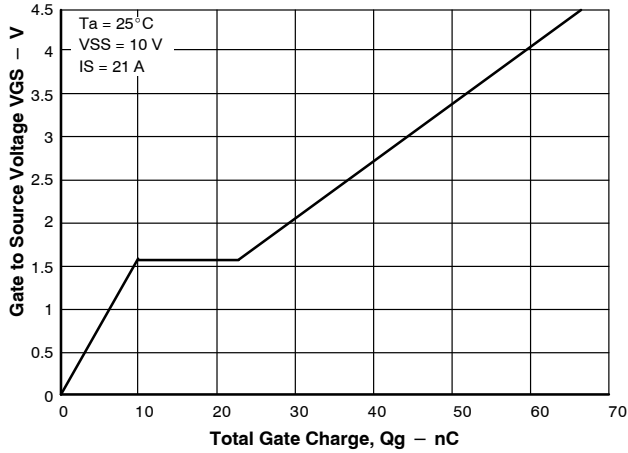


Figure 7. Gate – to – Source Voltage vs. Total Charge

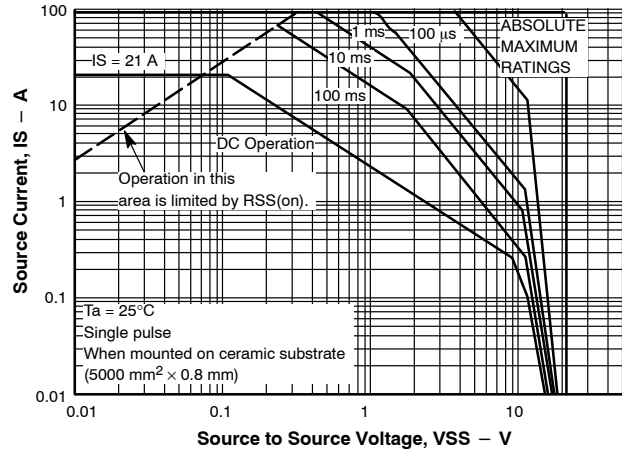


Figure 8. Safe Operating Area

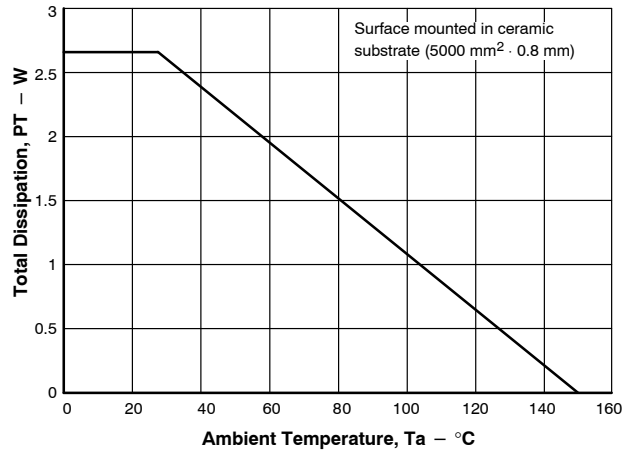


Figure 9. Total Dissipation vs. Temperature

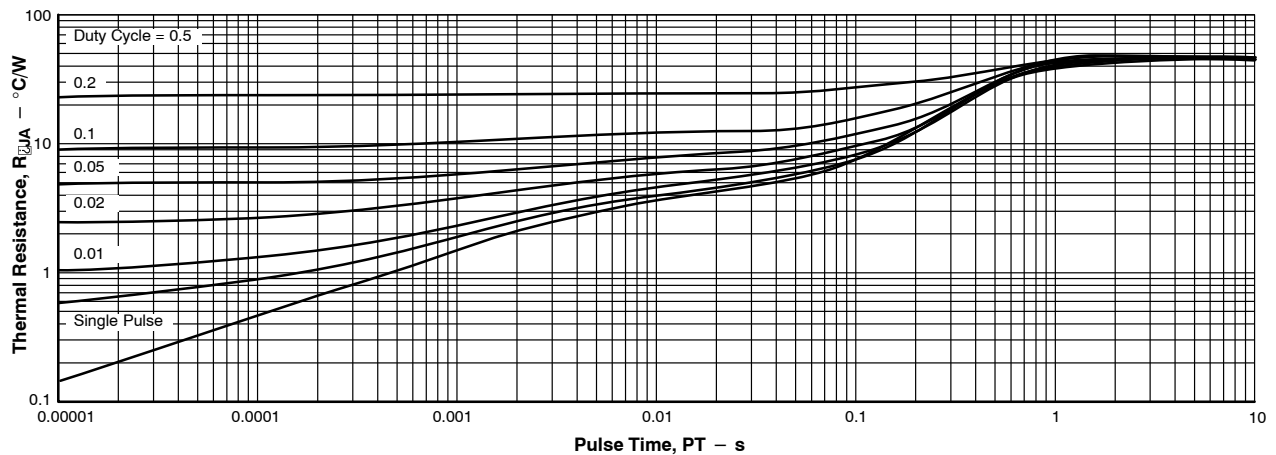


Figure 10. Thermal Response

Note on usage : Since the EFC3J023NUZ is a MOSFET product, please avoid using this device in the vicinity of highly charged objects. Please contact sales for use except the designated application.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

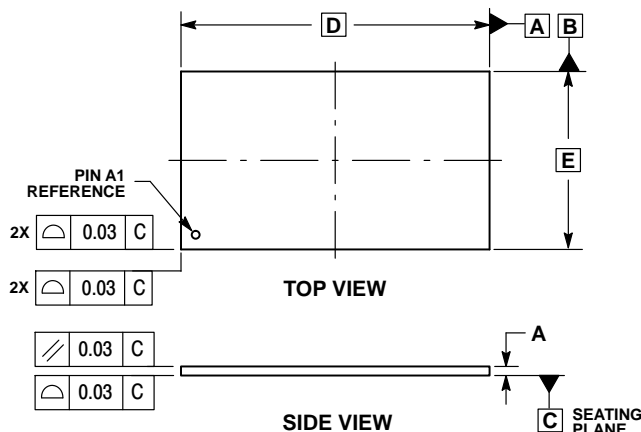
ON Semiconductor®



WLCSP10 3.40x1.96x0.10
CASE 567PL
ISSUE C

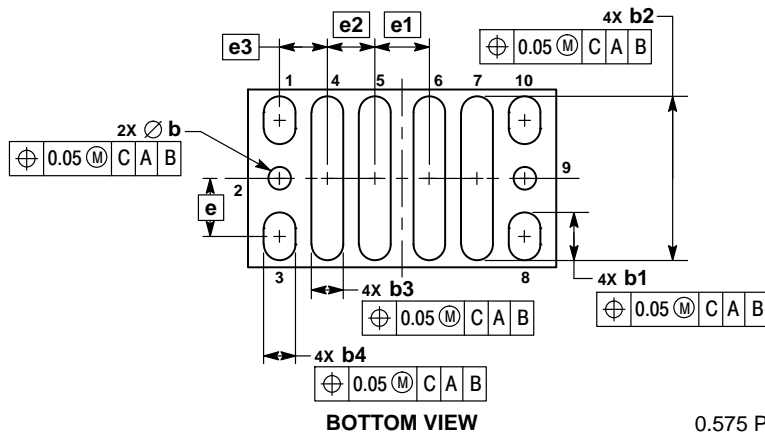
SCALE 4:1

DATE 14 MAR 2018

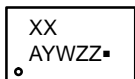


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.08	0.10	0.12
b	0.22	0.25	0.28
b1	0.50	0.53	0.56
b2	1.78	1.81	1.84
b3	0.32	0.35	0.38
b4	0.32	0.35	0.38
D	3.40 BSC		
E	1.96 BSC		
e	0.64 BSC		
e1	0.60 BSC		
e2	0.525 BSC		
e3	0.525 BSC		



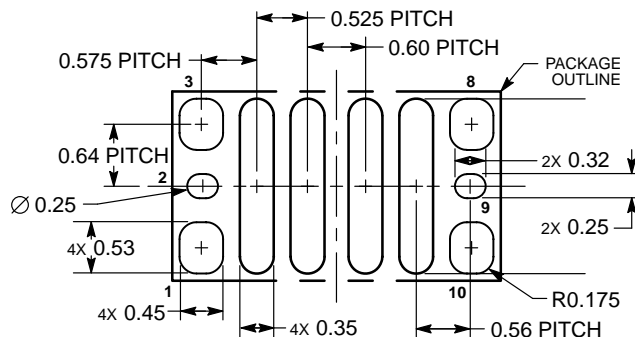
GENERIC MARKING DIAGRAM*



A = Assembly Location
Y = Year
W = Work Week
ZZ = Assembly Lot
▪ = Pb-Free Package

*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 SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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:	98AON14524G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WLCSP10 3.40x1.96x0.10	PAGE 1 OF 1

ON Semiconductor and ON 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.

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 owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. 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. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor 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 ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor 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:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative