EFC2K102NUZ

Power MOSFET for 1-Cell Lithium-ion Battery Protection 12 V, 2.65 mΩ, 33 A, Dual N-Channel

ON Semiconductor®

www.onsemi.com

V_{SSS}	$R_{SS(ON)}$ Max	I_S Max
12 V	2.65 mΩ @ 4.5 V	33 A
	2.75 mΩ @ 3.8 V	
	3.75 mΩ @ 3.1 V	
	6.0 mΩ @ 2.5 V	

Overview

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−cell lithium−ion battery applications.

Features

- 2.5 V drive
- Common−Drain type
- ESD Diode−Protected Gate
- Pb−Free, Halogen Free and RoHS Compliance

Applications

- 1−Cell Lithium−ion Battery Charging and Discharging Switch

Specifications

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Parameter	Symbol	Value	Unit
Source to Source Voltage	V_{SSS}	12	V
Gate to Source Voltage	V_{GSS}	±8	V
Source Current (DC)	I_S	33	A
Source Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1%	I_{SP}	135	A
Total Dissipation (Note 1)	P_T	3.1	W
Junction Temperature	Tj	150	°C
Storage Temperature	Tstg	−55 to +150	°C

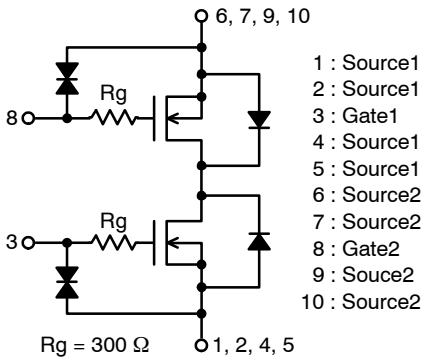
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

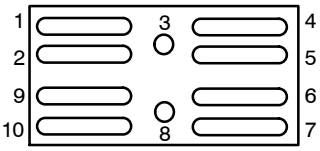
Parameter	Symbol	Value	Unit
Junction to Ambient (Note 1)	$R_{\theta JA}$	40.3	°C/W

1. Surface mounted on ceramic substrate (5000 $mm^2 \times 0.8$ mm).

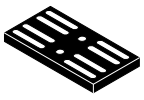
ELECTRICAL CONNECTION
N−Channel



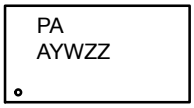
PIN ASSIGNMENT



MARKING DIAGRAM



WLCSP10
2.98x1.49x0.140
CASE 567XC



PA	= Specific Device Code
A	= Assembly Location
Y	= Year
W	= Work Week
ZZ	= Assembly Lot

ORDERING INFORMATION

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

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Source to Source Breakdown Voltage	$V_{(BR)SSS}$	I_S = 1 mA, V_{GS} = 0 V Test Circuit 1	12	–	–	V
Zero−Gate Voltage Source Current	I_{SSS}	V_{SS} = 10 V, V_{GS} = 0 V Test Circuit 1	–	–	1	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±8 V, V_{SS} = 0 V Test Circuit 2	–	–	±1	μA
Gate Threshold Voltage	V_{GS}(th)	V_{SS} = 6 V, I_S = 1 mA Test Circuit 3	0.4	–	1.3	V
Static Source to Source On−State Resistance	R_{SS}(on)	I_S = 5 A, V_{GS} = 4.5 V Test Circuit 4	1.30	2.00	2.65	mΩ
		I_S = 5 A, V_{GS} = 3.8 V Test Circuit 4	1.40	2.10	2.75	mΩ
		I_S = 5 A, V_{GS} = 3.1 V Test Circuit 4	1.50	2.30	3.75	mΩ
		I_S = 5 A, V_{GS} = 2.5 V Test Circuit 4	1.85	3.00	6.00	mΩ
Turn−ON Delay Time	t_d(on)	V_{SS} = 6 V, V_{GS} = 3.8 V, I_S = 5 A, R_g = 10 kΩ Test Circuit 5	–	20	–	μs
Rise Time	t_r		–	58	–	μs
Turn−OFF Delay Time	t_d(off)		–	115	–	μs
Fall Time	t_f		–	94	–	μs
Total Gate Charge	Qg	V_{SS} = 6 V,V_{GS} = 3.8 V, I_S = 5 A	–	42	–	nC
Forward Source to Source Voltage	$V_{F(S-S)}$	I_S = 3 A, V_{GS} = 0 V Test Circuit 7	–	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.

TYPICAL CHARACTERISTICS

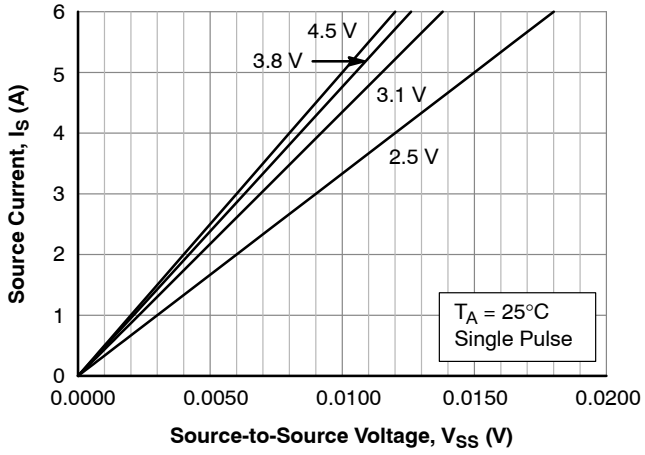


Figure 1. I_S – V_{SS}

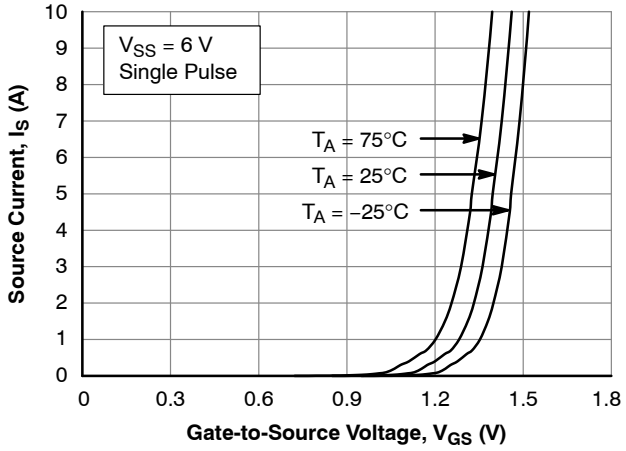


Figure 2. I_S – V_{GS}

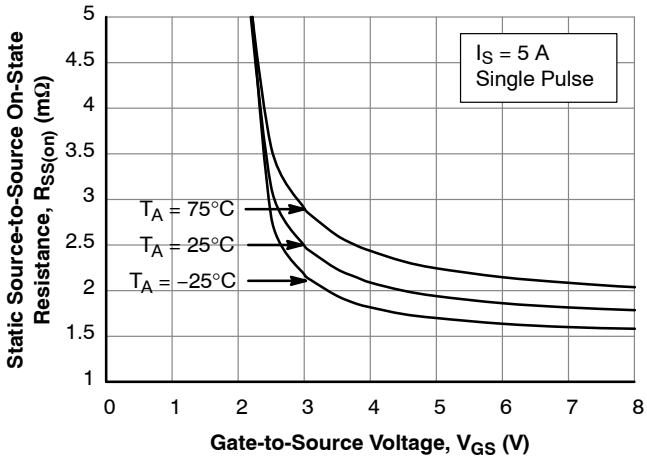


Figure 3. $R_{SS(on)}$ – V_{GS}

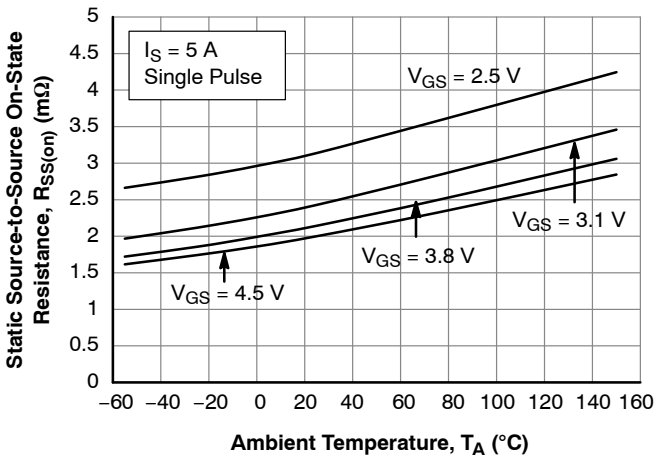


Figure 4. $R_{SS(on)}$ – T_A

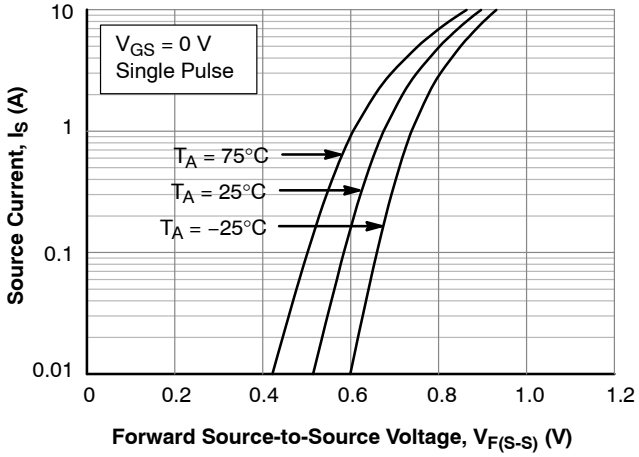


Figure 5. I_S – $V_{F(S-S)}$

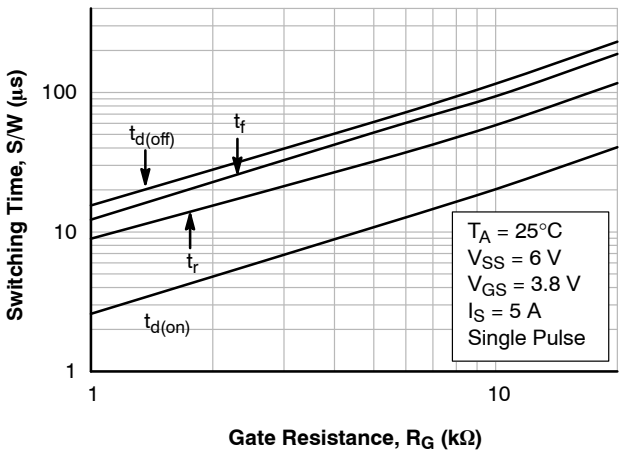


Figure 6. SW Time – R_G

TYPICAL CHARACTERISTICS (Continued)

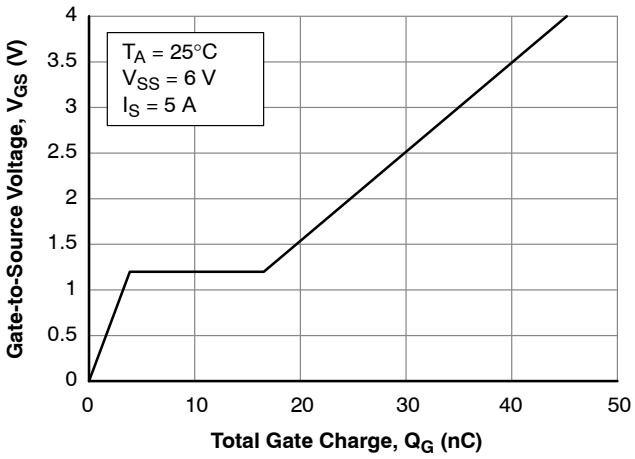


Figure 7. V_{GS} – Q_G

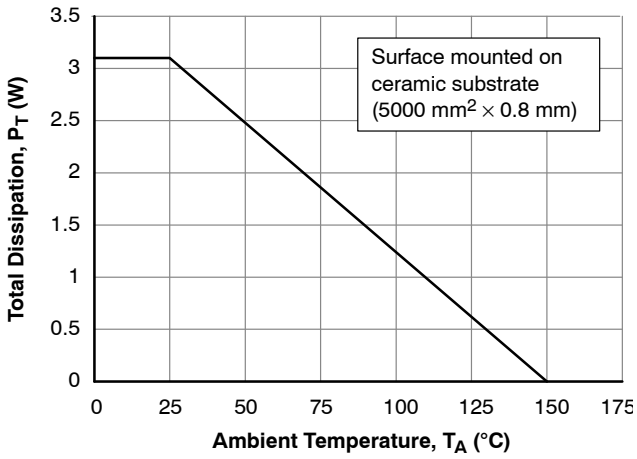


Figure 8. P_T – T_A

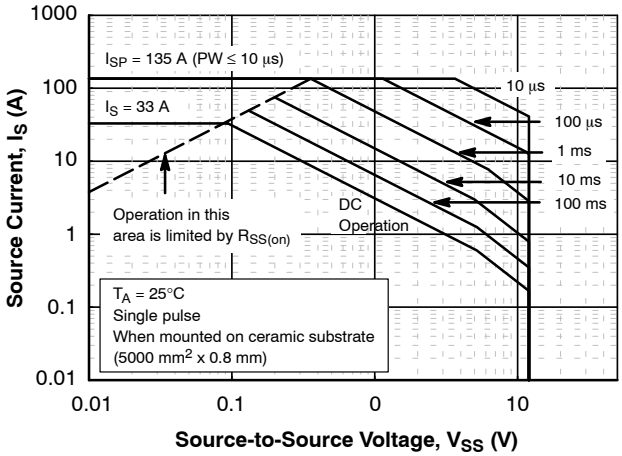


Figure 9. Safe Operating Area

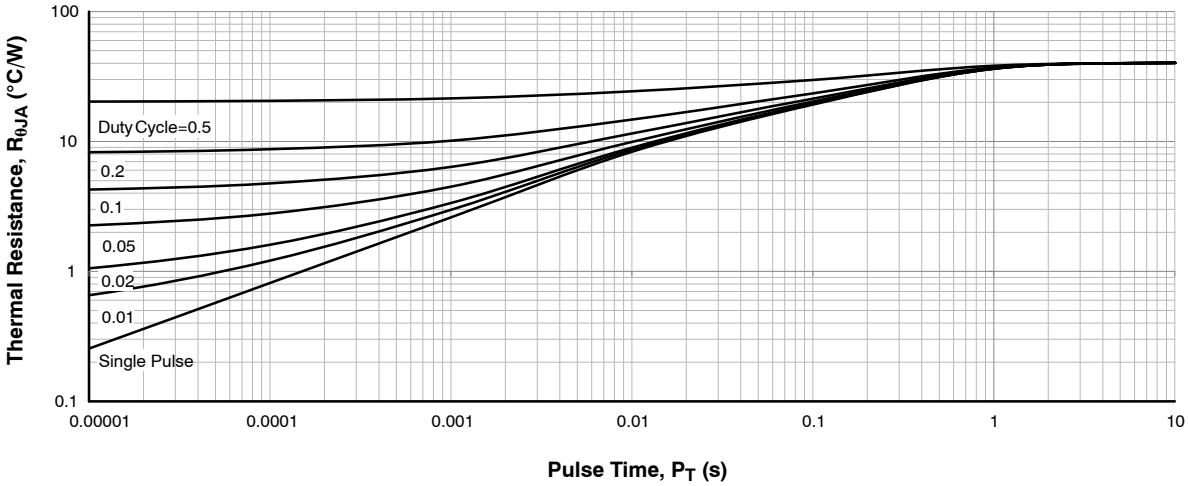
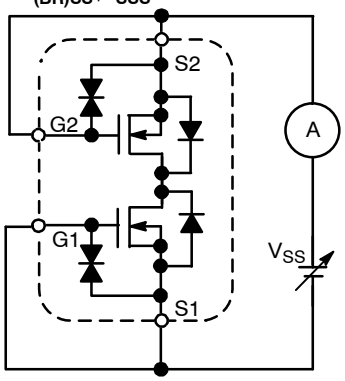


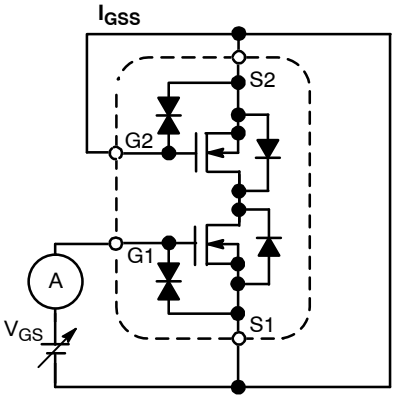
Figure 10. Thermal Response

Test Circuits are Example of Measuring FET1 Side

Test Circuit 1
$V_{(BR)SS}$ / I_{SSS}

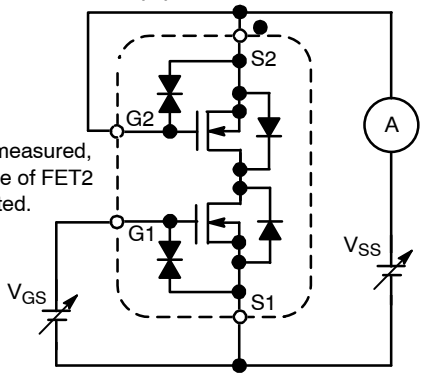


Test Circuit 2
I_{GSS}



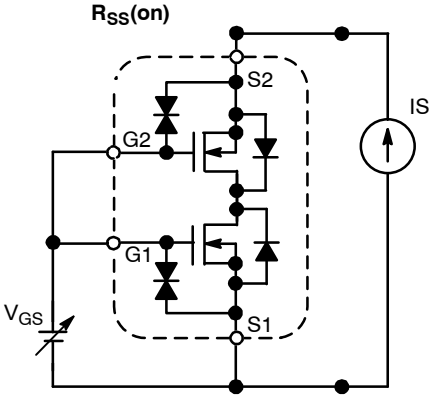
When FET1 is measured, Gate and Source of FET2 are short−circuited.

Test Circuit 3
$V_{GS(th)}$

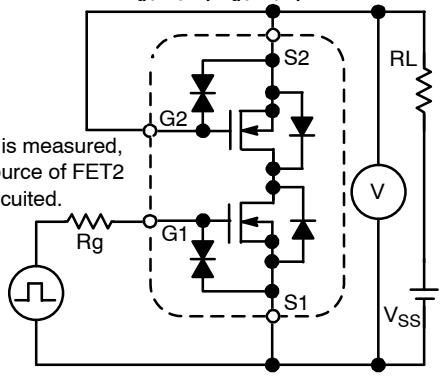


When FET1 is measured, Gate and Source of FET2 are short−circuited.

Test Circuit 4
$R_{SS(on)}$

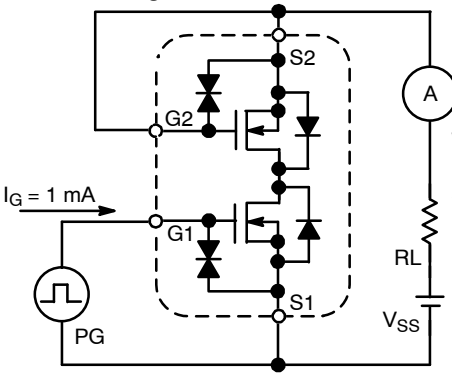


Test Circuit 5
$t_{d(on)}$, t_r, $t_{d(off)}$ t_f



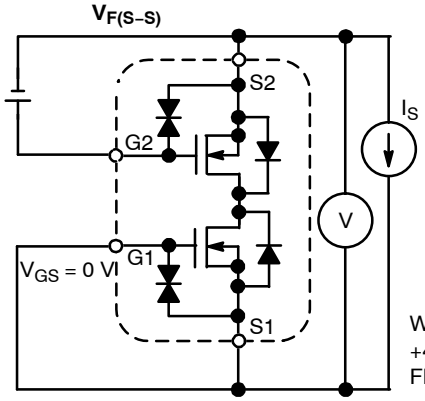
When FET1 is measured, Gate and Source of FET2 are short−circuited.

Test Circuit 6
Rg



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

Test Circuit 7
$V_{F(S-S)}$



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

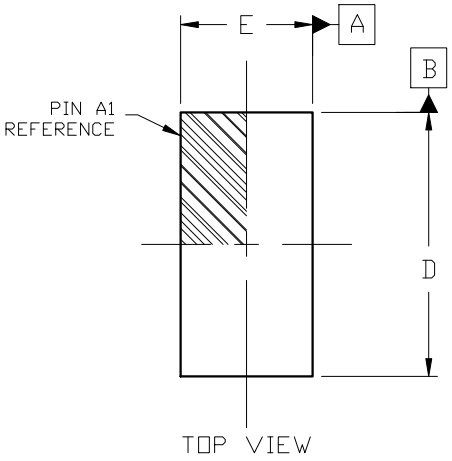
ORDERING INFORMATION

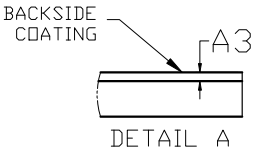
Device	Marking	Package	Shipping (Qty / Packing)†
EFC2K102NUZTDG	PA	WLCSP10, 2.98x1.49x0.140 (Pb−Free / Halogen Free)	5,000 / Tape & Reel

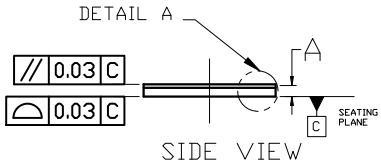
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

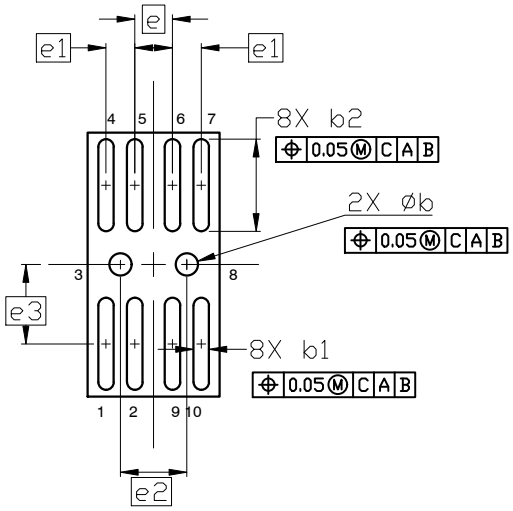
PACKAGE DIMENSIONS

WLCSP10, 2.98x1.49x0.14
CASE 567XC
ISSUE O





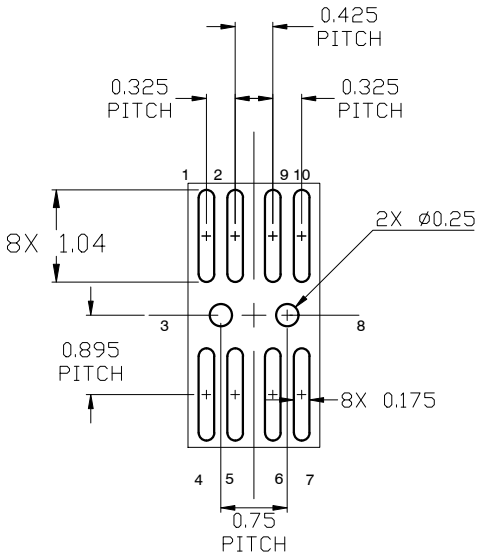




NOTES:

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

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.11	0.14	0.17
A3		0.04 REF	
b	0.22	0.25	0.28
b1	0.145	0.175	0.205
b2	1.01	1.04	1.07
D	2.95	2.98	3.01
E	1.46	1.49	1.52
e	0.425 BSC		
e1	0.325 BSC		
e2	0.75 BSC		
e3	0.895 BSC		



RECOMMENDED
MOUNTING 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.

NOTE: Since the EFC2K102NUZ 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.

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