EFC2J022NUZ

Power MOSFET
for 1-Cell Lithium-ion Battery Protection
12 V, 3.55 mΩ, 18 A, Dual N-Channel

ON Semiconductor®

www.onsemi.com

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.

V_{SSS}	R_{SS}(on) Max	I_S Max
12 V	3.55 mΩ @ 4.5 V	18 A
	3.75 mΩ @ 3.8 V	
	4.8 mΩ @ 3.1 V	
	6.9 mΩ @ 2.5 V	

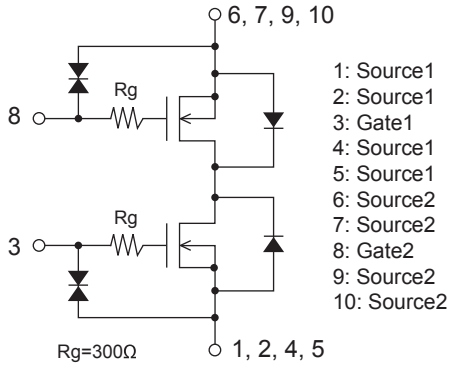
Features

- 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

ELECTRICAL CONNECTION
N-Channel



SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS at Ta = 25°C (Note 1)

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	18	A
Source Current (Pulse) PW ≤ 100 μs, duty cycle ≤ 1%	I_{SP}	76	A
Total Dissipation (Note 2)	P_T	1.8	W
Junction Temperature	Tj	150	°C
Storage Temperature	Tstg	−55 to +150	°C

Note 1 : 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.

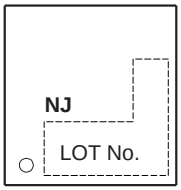
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient (Note 2)	$R_{\theta JA}$	69	°C/W

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

WLCSP10
1.84x1.96x0.10

MARKING



ORDERING INFORMATION

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

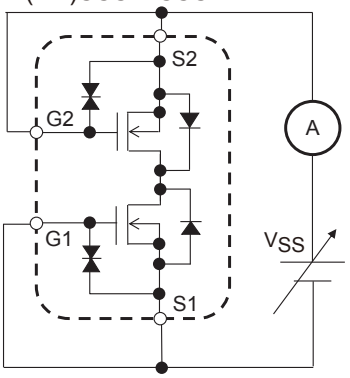
ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 3)

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			±10	μA
Gate Threshold Voltage	$V_{GS}(th)$	V_{SS} = 6 V, I_S = 1 mA Test Circuit 3	0.3		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	1.9	2.75	3.55	mΩ
		I_S = 5 A, V_{GS} = 3.8 V Test Circuit 4	2.0	2.9	3.75	mΩ
		I_S = 5 A, V_{GS} = 3.1 V Test Circuit 4	2.25	3.1	4.8	mΩ
		I_S = 5 A, V_{GS} = 2.5 V Test Circuit 4	2.5	3.5	6.9	mΩ
Turn-ON Delay Time	$t_d(on)$	V_{SS} = 6 V, V_{GS} = 4.5 V, I_S = 3 A, Rg = 10 kΩ Test Circuit 5		10		μs
Rise Time	t_r			26		μs
Turn-OFF Delay Time	$t_d(off)$			195		μs
Fall Time	t_f			111		μs
Total Gate Charge	Qg	V_{SS} = 6 V, V_{GS} = 4.5 V, I_S = 18 A Test Circuit 6		46		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

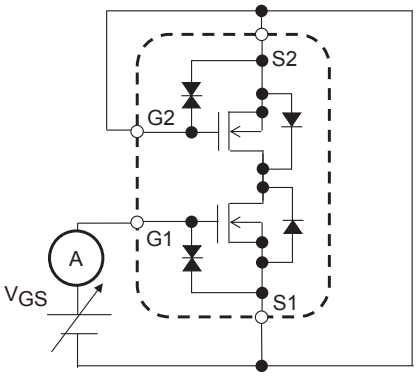
Note 3 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Test circuits are example of measuring FET1 side

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

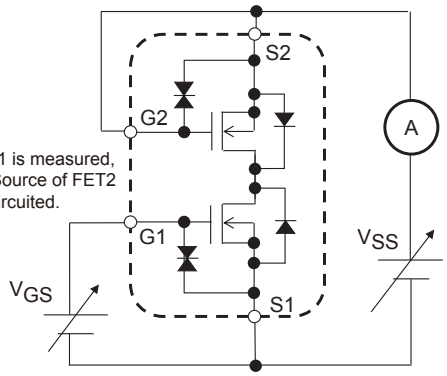


Test Circuit 2
I_{GSS}



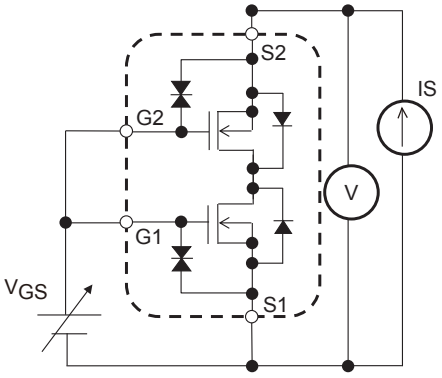
When FET1 is measured, Gate and Source of FET2 are short-circuited.

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

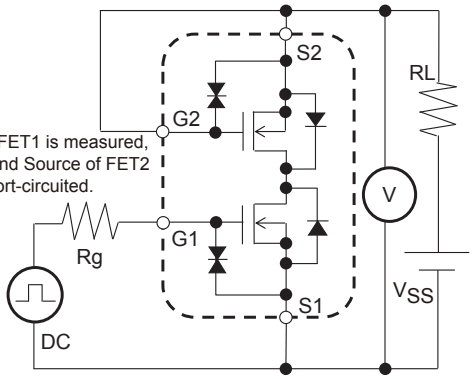


When FET1 is measured, Gate and Source of FET2 are short-circuited.

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

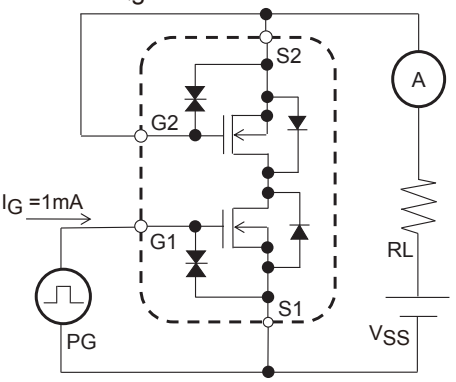


Test Circuit 5
$t_{d(on)}$, t_r, $t_{d(off)}$, t_f



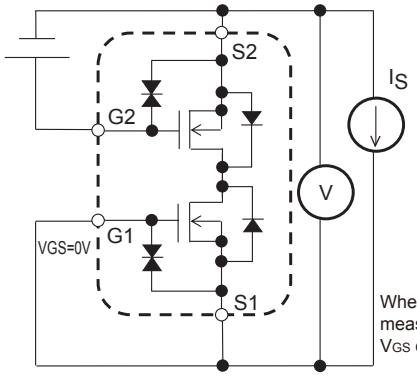
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 6
Qg



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

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



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

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

TYPICAL CHARACTERISTICS

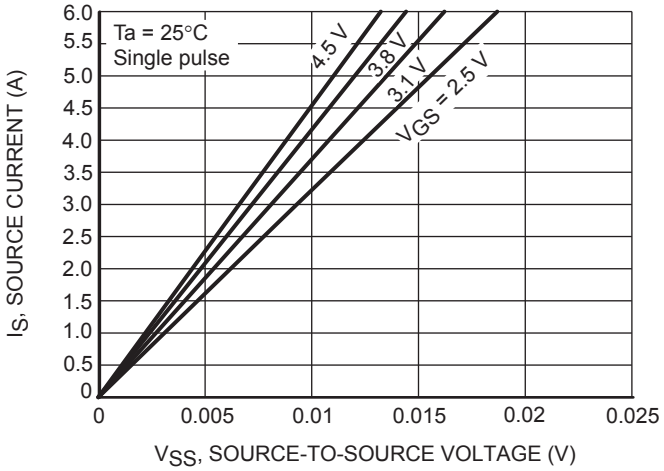


Figure 1. On-Region Characteristics

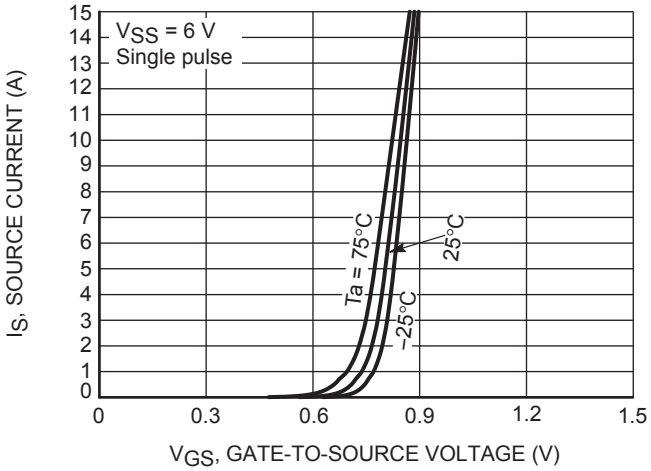


Figure 2. Transfer Characteristics

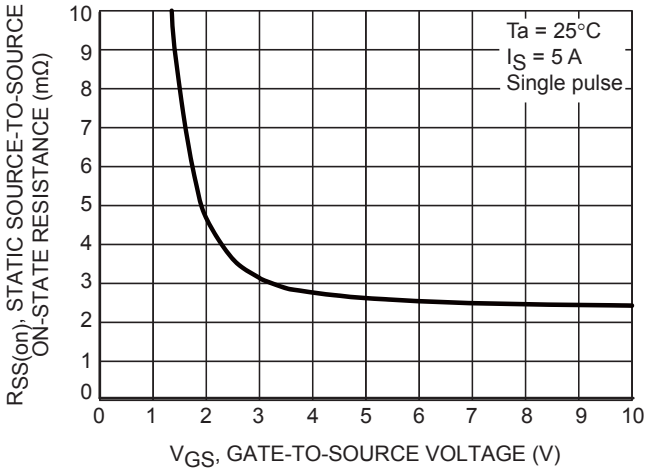


Figure 3. On-Resistance vs. Gate-to-Source Voltage

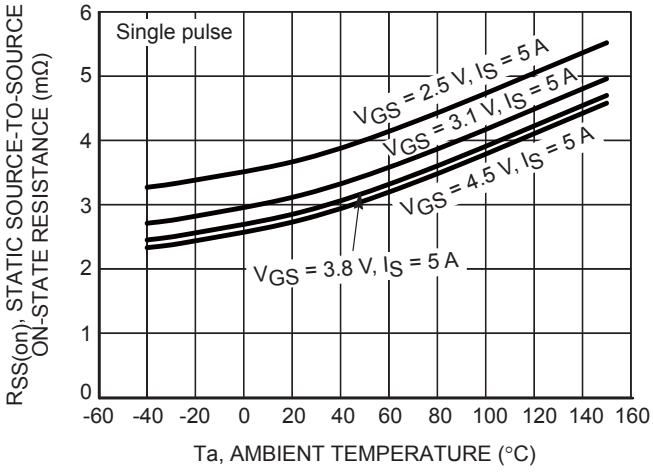


Figure 4. On-Resistance vs. Temperature

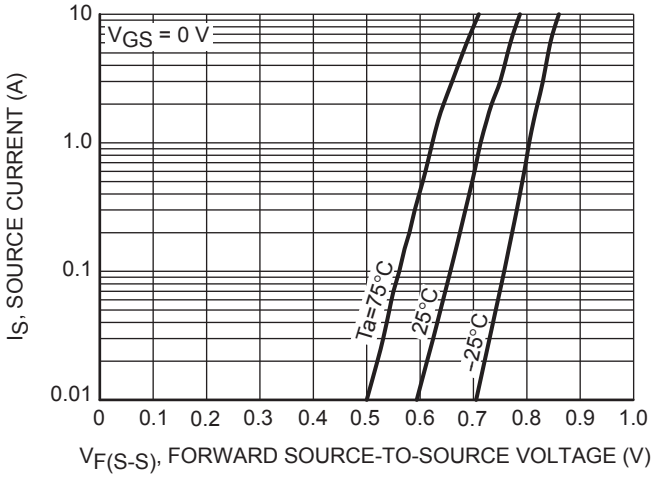


Figure 5. Forward Source-to-Source Voltage vs. Current

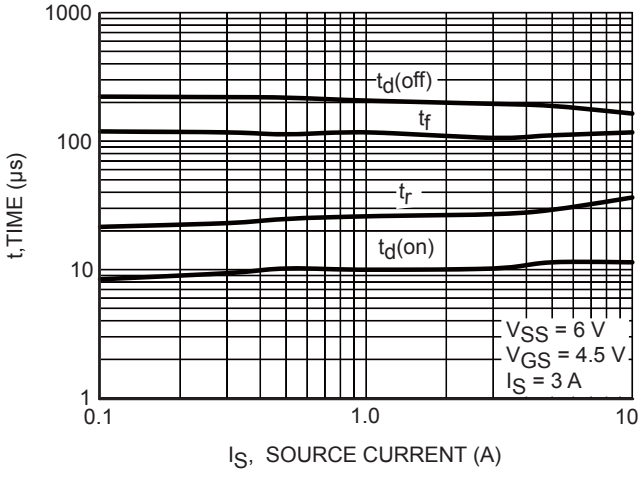


Figure 6. Switching Time vs. Source Current

TYPICAL CHARACTERISTICS

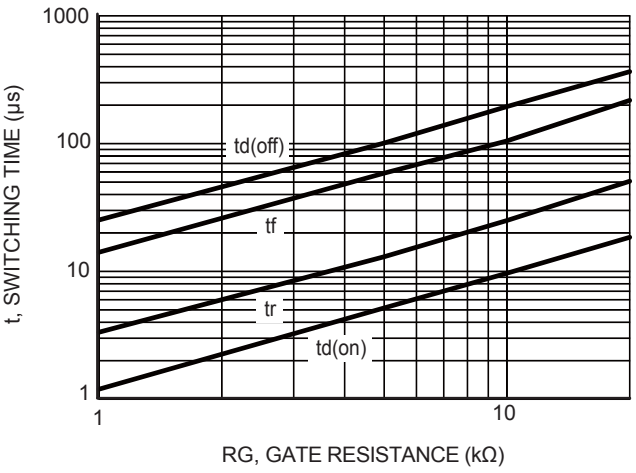


Figure 7. Switching Time vs. Gate Resostance

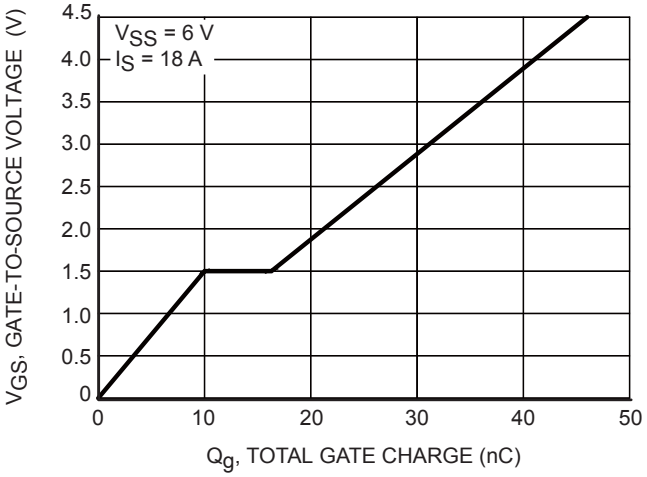


Figure 8. Gate-To-Source Voltage vs. Total Charge

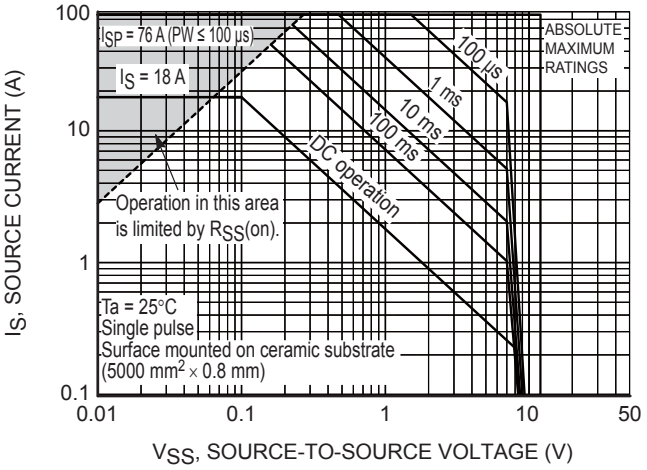


Figure 9. Safe Operating Area

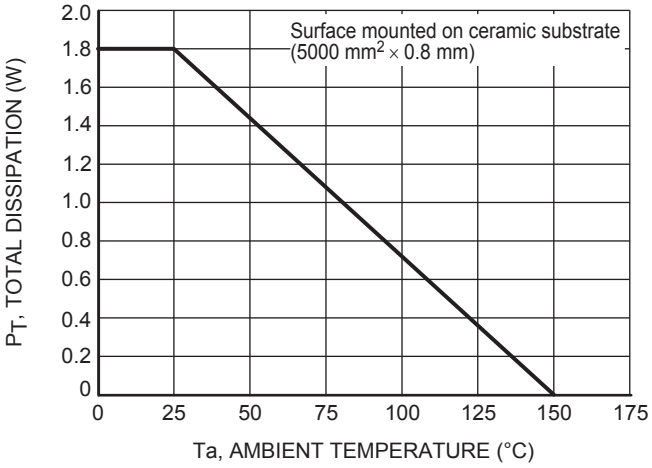


Figure 10. Total Dissipation vs. Temperature

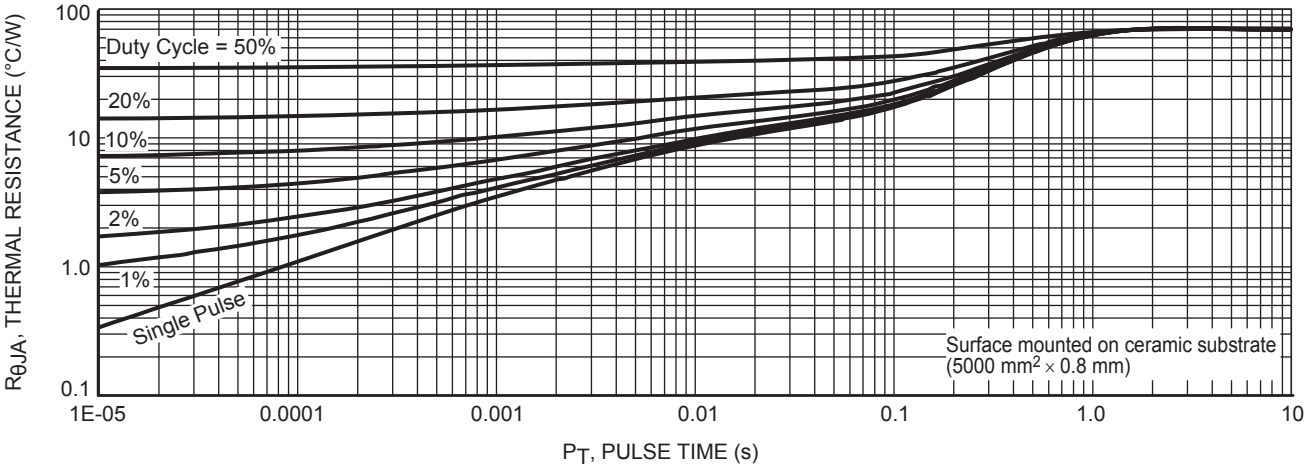
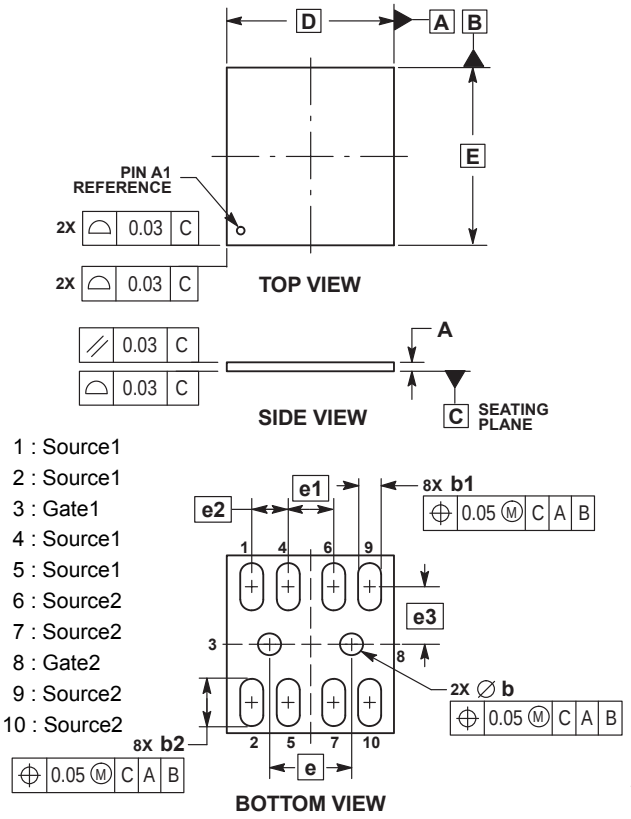


Figure 11. Thermal Response

PACKAGE DIMENSIONS

unit : mm

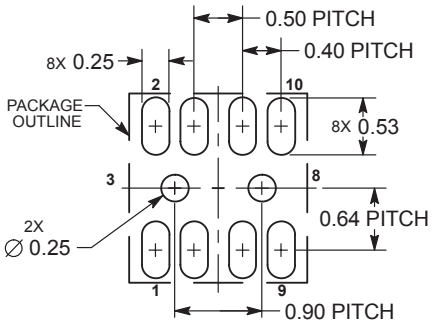
WLCSP10 1.84x1.96x0.10
CASE 567PH
ISSUE A



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

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.08	0.10	0.12
b	0.22	0.25	0.28
b1	0.22	0.25	0.28
b2	0.50	0.53	0.56
D		1.84 BSC	
E		1.96 BSC	
e		0.90 BSC	
e1		0.50 BSC	
e2		0.40 BSC	
e3		0.64 BSC	

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.

ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing)
EFC2J022NUZTCG	NJ	WLCSP10 1.84x1.96x0.10 (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. http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF

Note on usage : Since the EFC2J022NUZ 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.