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# EFC2J022NUZ

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



ON Semiconductor®

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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 at Ta = 25°C (Note 1)

Parameter	Symbol	Value	Unit
Source to Source Voltage	VSSS	12	V
Gate to Source Voltage	VGSS	±8	V
Source Current (DC)	IS	18	A
Source Current (Pulse) PW ≤ 100 μs, duty cycle ≤ 1%	ISP	76	A
Total Dissipation (Note 2)	PT	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.

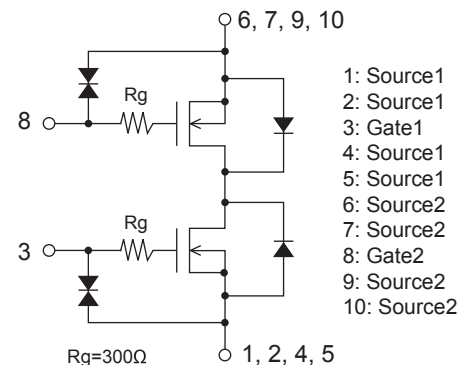
#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient (Note 2)	RθJA	69	°C/W

Note 2 : Surface mounted on ceramic substrate (5000 mm<sup>2</sup> × 0.8 mm).

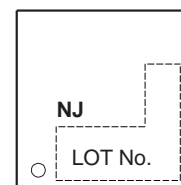
VSSS	RSS(on) Max	IS Max
12 V	3.55 mΩ @ 4.5 V	18 A
	3.75 mΩ @ 3.8 V	
	4.8 mΩ @ 3.1 V	
	6.9 mΩ @ 2.5 V	

### ELECTRICAL CONNECTION N-Channel



WLCSP10  
1.84x1.96x0.10

### MARKING



### ORDERING INFORMATION

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

# EFC2J022NUZ

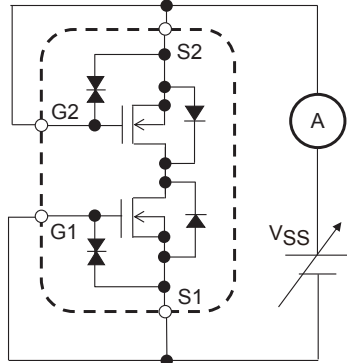
## ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 3)

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Source to Source Breakdown Voltage	V(BR)SSS	IS = 1 mA, VGS = 0 V Test Circuit 1	12			V
Zero-Gate Voltage Source Current	ISSS	VSS = 10 V, VGS = 0 V Test Circuit 1			1	μA
Gate to Source Leakage Current	IGSS	VGS = ±8 V, VSS = 0 V Test Circuit 2			±10	μA
Gate Threshold Voltage	VGS(th)	VSS = 6 V, IS = 1 mA Test Circuit 3	0.3		1.3	V
Static Source to Source On-State Resistance	RSS(on)	IS = 5 A, VGS = 4.5 V Test Circuit 4	1.9	2.75	3.55	mΩ
		IS = 5 A, VGS = 3.8 V Test Circuit 4	2.0	2.9	3.75	mΩ
		IS = 5 A, VGS = 3.1 V Test Circuit 4	2.25	3.1	4.8	mΩ
		IS = 5 A, VGS = 2.5 V Test Circuit 4	2.5	3.5	6.9	mΩ
Turn-ON Delay Time	td(on)	VSS = 6 V, VGS = 4.5 V IS = 3 A, Rg = 10 kΩ Test Circuit 5		10		μs
Rise Time	tr			26		μs
Turn-OFF Delay Time	td(off)			195		μs
Fall Time	tf			111		μs
Total Gate Charge	Qg	VSS = 6 V, VGS = 4.5 V IS = 18 A Test Circuit 6		46		nC
Forward Source to Source Voltage	VF(S-S)	IS = 3 A, VGS = 0 V Test Circuit 7		0.75	1.2	V

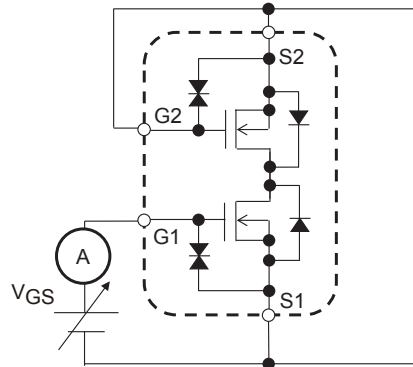
Note 3 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Test circuits are example of measuring FET1 side

Test Circuit 1  
V<sub>(BR)SSS</sub> / I<sub>SSS</sub>

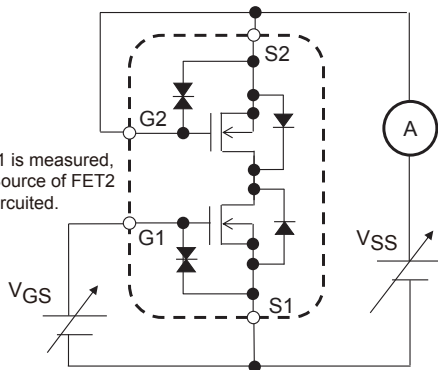


Test Circuit 2  
I<sub>GSS</sub>



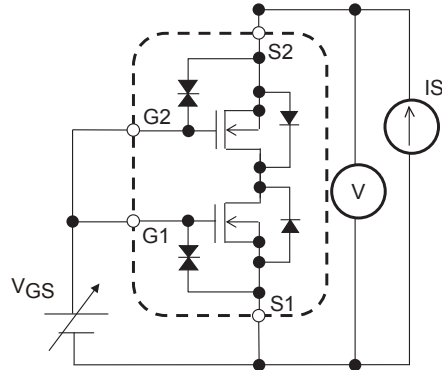
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 3  
V<sub>GS(th)</sub>

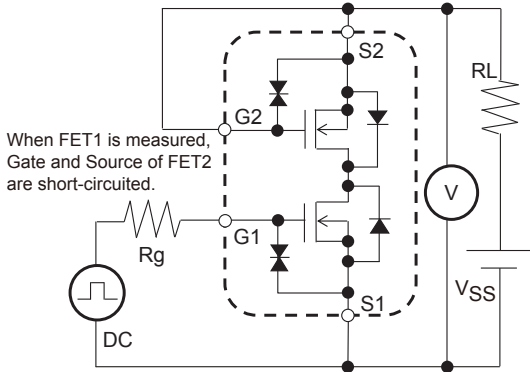


When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 4  
R<sub>SS(on)</sub>

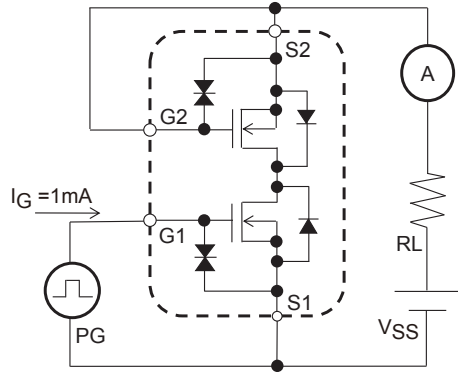


Test Circuit 5  
t<sub>d(on)</sub>, t<sub>r</sub>, t<sub>d(off)</sub>, t<sub>f</sub>



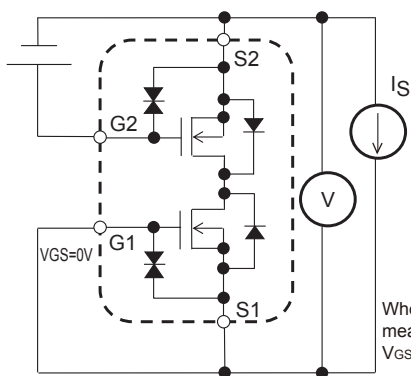
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 6  
Q<sub>g</sub>



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

Test Circuit 7  
V<sub>F(S-S)</sub>



When FET1 is measured, +4.5V is added to V<sub>GS</sub> of FET2.

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

TYPICAL CHARACTERISTICS

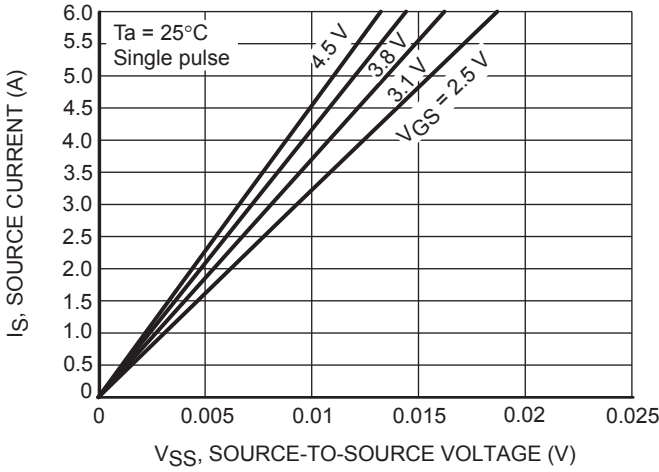


Figure 1. On-Region Characteristics

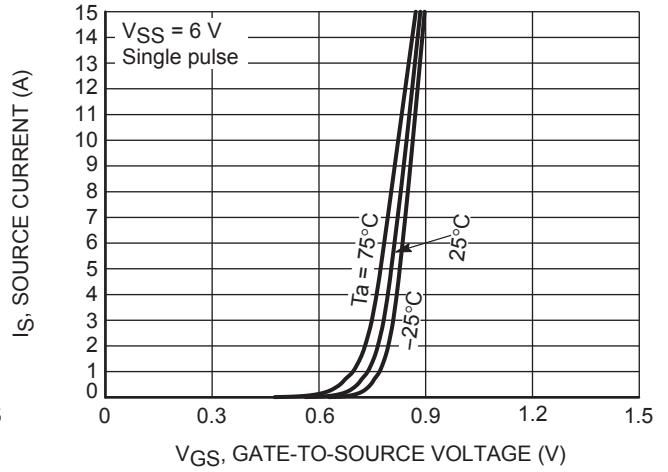


Figure 2. Transfer Characteristics

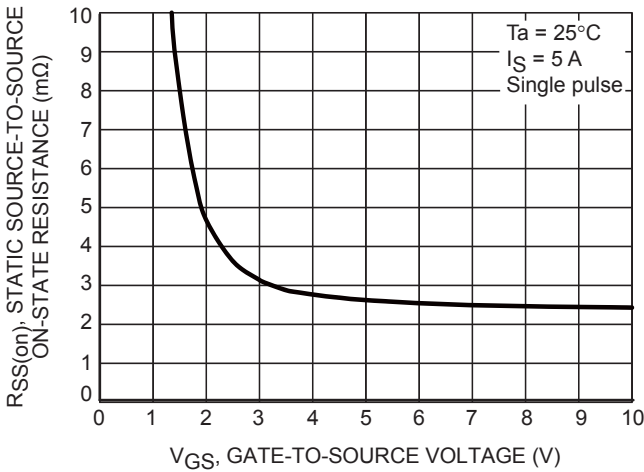


Figure 3. On-Resistance vs. Gate-to-Source Voltage

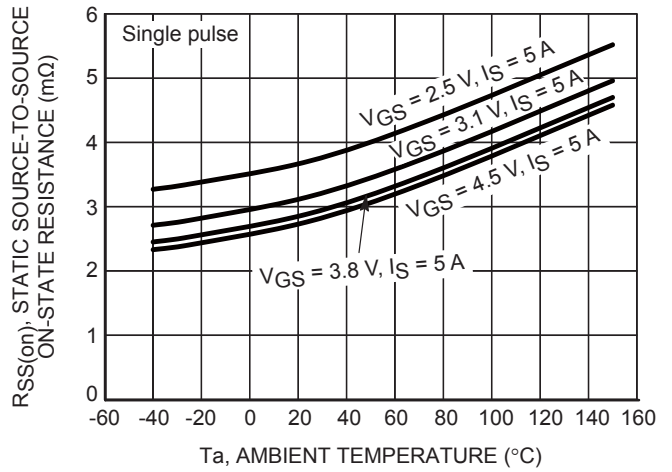


Figure 4. On-Resistance vs. Temperature

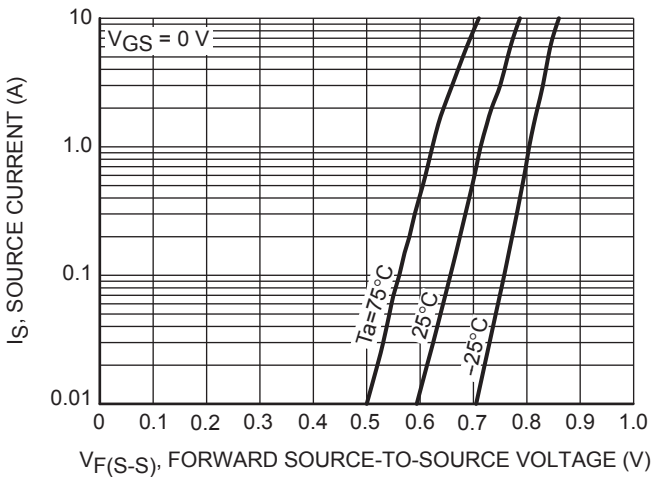


Figure 5. Forward Source-to-Source Voltage vs. Current

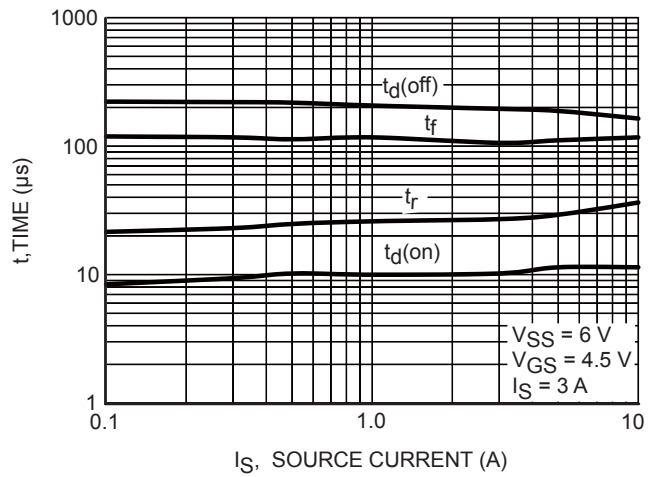


Figure 6. Switching Time vs. Source Current

TYPICAL CHARACTERISTICS

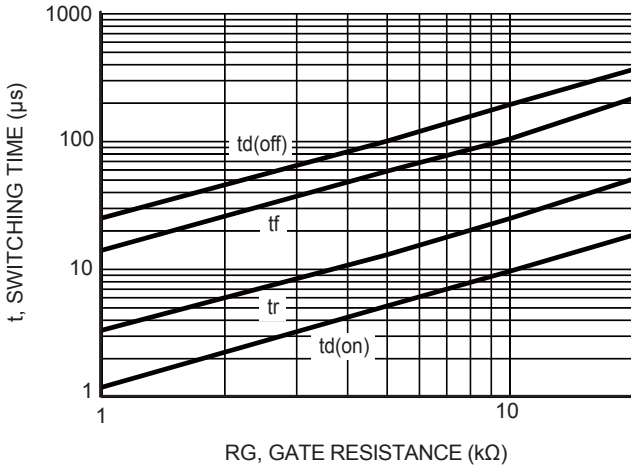


Figure 7. Switching Time vs. Gate Resistance

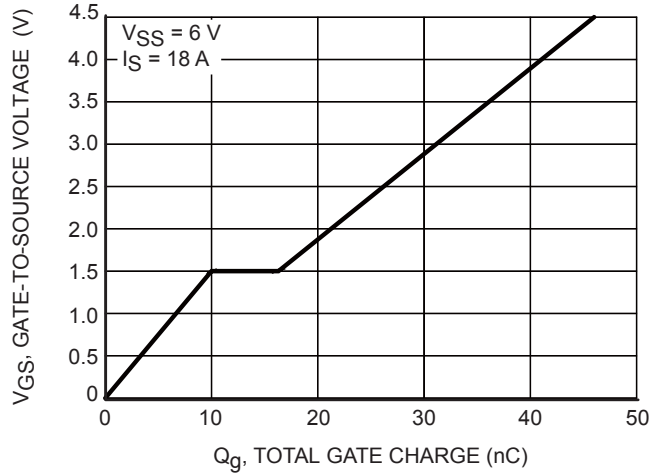


Figure 8. Gate-To-Source Voltage vs. Total Charge

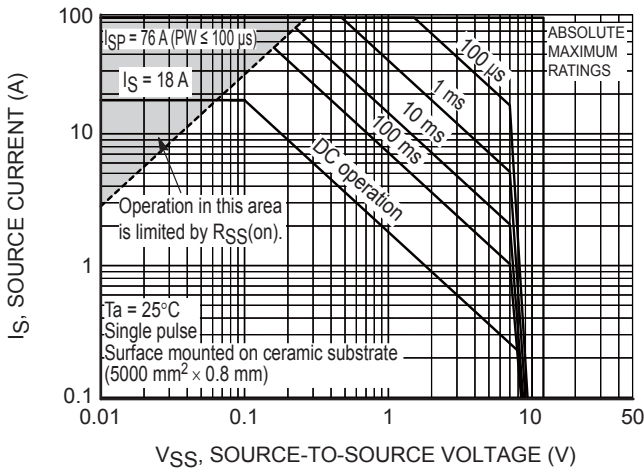


Figure 9. Safe Operating Area

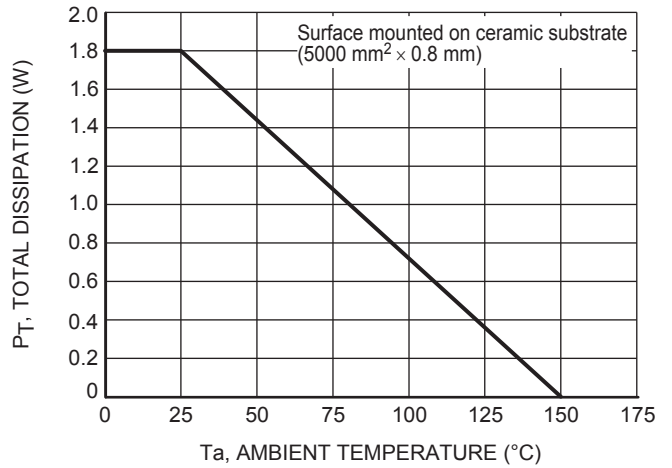


Figure 10. Total Dissipation vs. Temperature

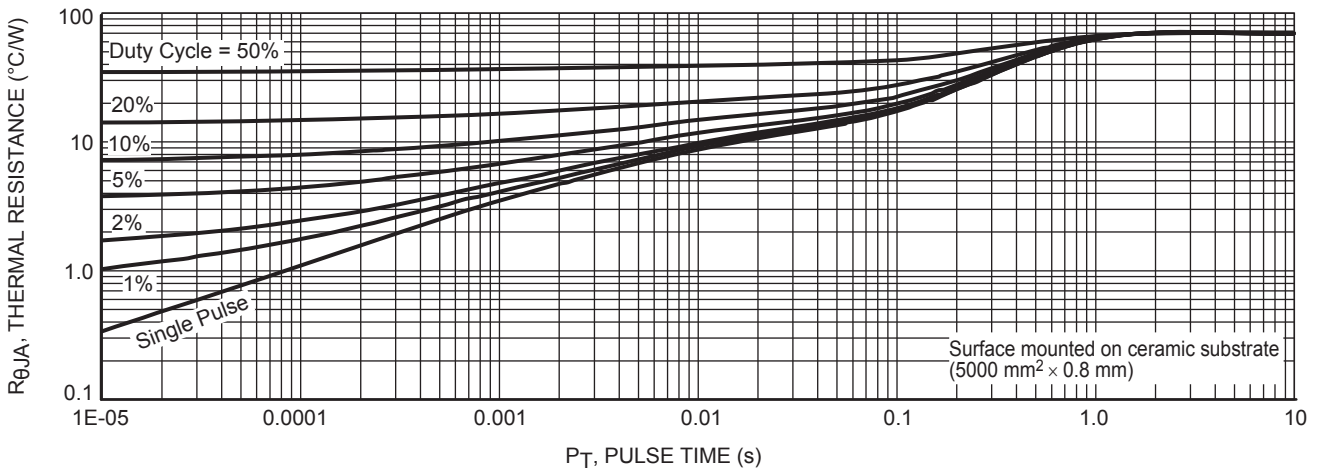


Figure 11. Thermal Response

# EFC2J022NUZ

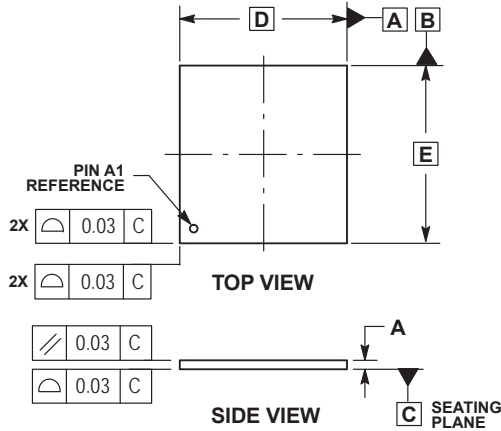
## PACKAGE DIMENSIONS

unit : mm

### WLCSP10 1.84x1.96x0.10

CASE 567PH

ISSUE A



1 : Source1

2 : Source1

3 : Gate1

4 : Source1

5 : Source1

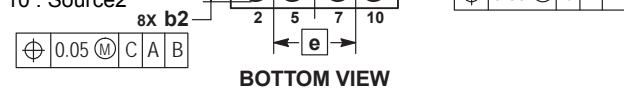
6 : Source2

7 : Source2

8 : Gate2

9 : Source2

10 : Source2

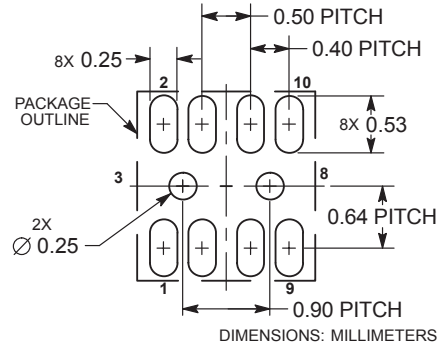


#### NOTES:

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	0.22	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\*



\*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](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.

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