MOSFET – Power, for 1-Cell Lithium-ion Battery Protection

12 V, 5.8 mΩ, 17 A, Dual N-Channel

EFC2J013NUZ

V_{SSS}	$R_{SS(ON)}$ MAX	I_S MAX
12 V	5.8 mΩ @ 4.5 V	17 A
	6.2 mΩ @ 3.8 V	
	7.5 mΩ @ 3.1 V	
	9.0 mΩ @ 2.5 V	

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
- 2 kV ESD HBM
- Common-Drain Type
- ESD Diode-Protected Gate
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

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	17	A
Source Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1%	I_{SP}	68	A
Total Dissipation (Note 1)	P_T	1.8	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	−55 to +150	°C

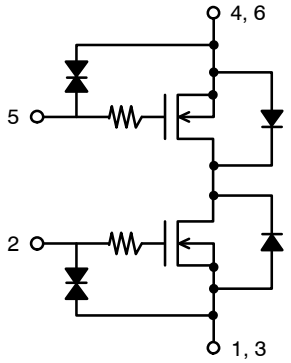
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient (Note 1)	$R_{\theta JA}$	69.4	°C/W

1. Surface mounted on ceramic substrate (5000 mm^2 × 0.8 mm).

ELECTRICAL CONNECTION

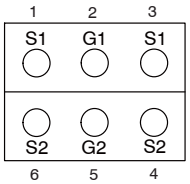


1: Source1
2: Gate1
3: Source1
4: Source2
5: Gate2
6: Source2

N-Channel

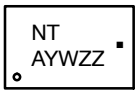
PIN ASSIGNMENT

WLCSP6
(2.00 x 1.49 x 0.10)
CASE 567UF



Bottom View

MARKING DIAGRAM



NT = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Assembly Lot
▪ = Pb−Free Package

ORDERING INFORMATION

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

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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)SSS}$	Source to Source Breakdown Voltage	I_S = 1 mA, V_{GS} = 0 V, V_{SSS} Test Circuit	12			V
I_{SSS}	Zero-Gate Voltage Source Current	V_{SS} = 10 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±8 V, V_{SS} = 0 V			±1	μA
V_{GS}(th)	Gate Threshold Voltage	V_{SS} = 6 V, I_S = 1 mA	0.4		1.3	V
R_{SS}(on)	Static Source to Source On-State Resistance	I_S = 5 A, V_{GS} = 4.5 V	3.0	4.35	5.8	mΩ
		I_S = 5 A, V_{GS} = 3.8 V	3.2	4.6	6.2	mΩ
		I_S = 5 A, V_{GS} = 3.1 V	3.4	5.0	7.5	mΩ
		I_S = 5 A, V_{GS} = 2.5 V	3.8	5.6	9.0	mΩ
t_d(on)	Turn-ON Delay Time	V_{SS} = 5 V, V_{GS} = 3.8 V, I_S = 5 A Rg = 10 kΩ Switching Test Circuit		11		μs
t_r	Rise Time			26		μs
t_d(off)	Turn-OFF Delay Time			130		μs
t_f	Fall Time			73		μs
Qg	Total Gate Charge	V_{SS} = 5 V, V_{GS} = 4.5 V, I_S = 5 A		37		nC
$V_{F(S-S)}$	Forward Source to Source Voltage	I_S = 3 A, V_{GS} = 0 V		0.76	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.

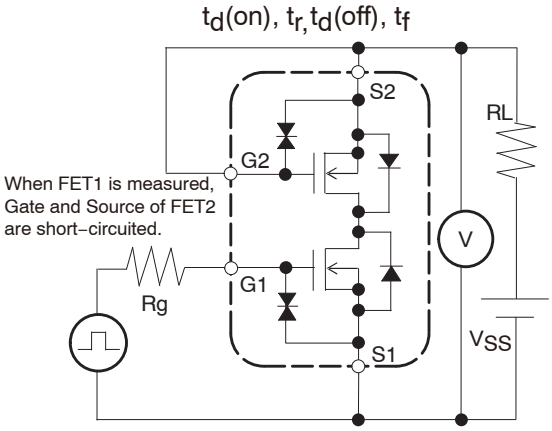


Figure 1. Switching Test Circuit

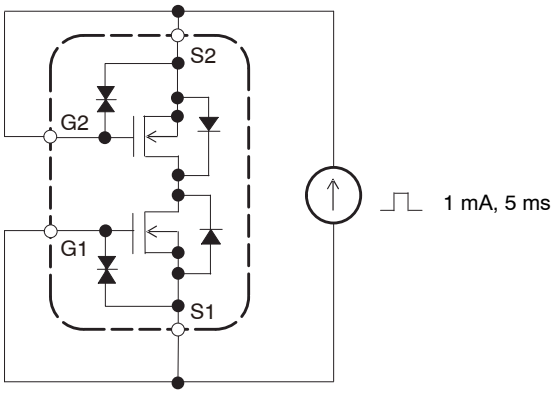


Figure 2. V_{SSS} Test Circuit

ORDERING INFORMATION

Device	Marking	Package	Shipping† (Qty / Packing)
EFC2J013NUZTDG	NT	WLCSP6, 2.00 x 1.49 x 0.10 (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.

TYPICAL CHARACTERISTICS

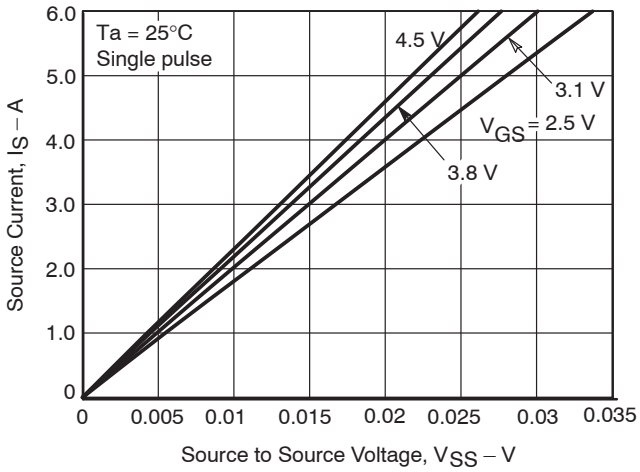


Figure 3. On-Region Characteristics

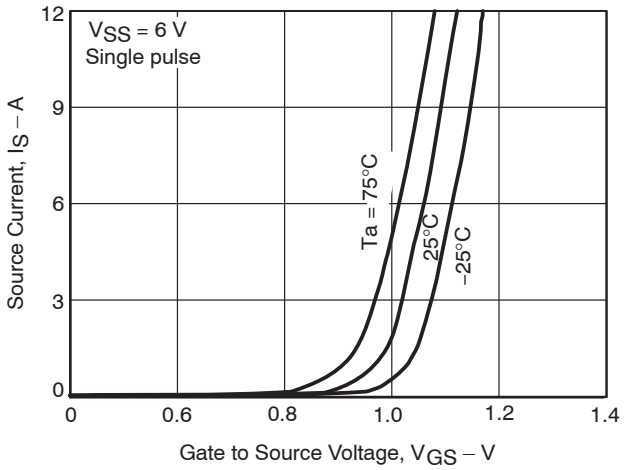


Figure 4. Transfer Characteristics

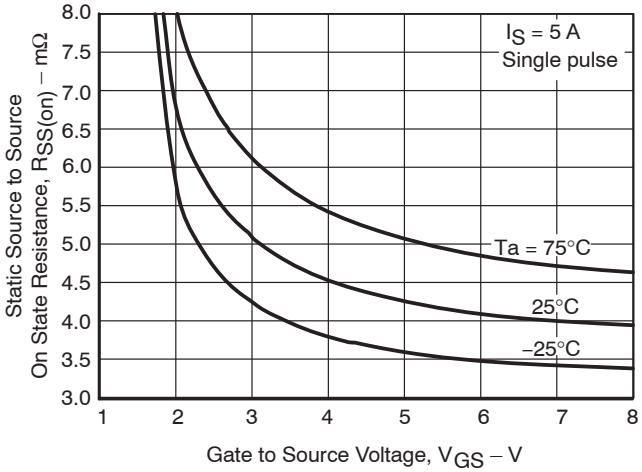


Figure 5. On-Resistance vs. Gate-to-Source Voltage

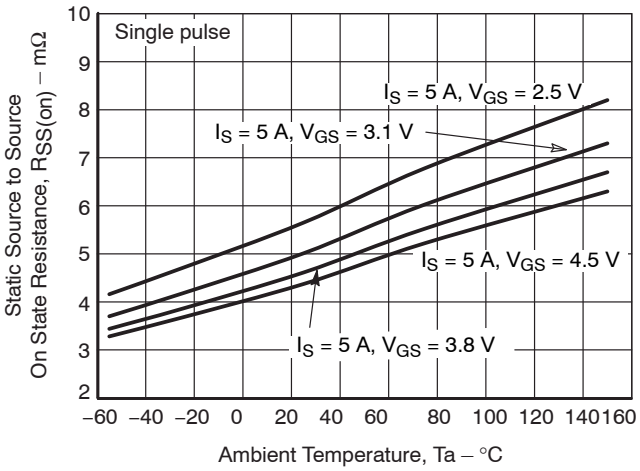


Figure 6. On-Resistance vs. Temperature

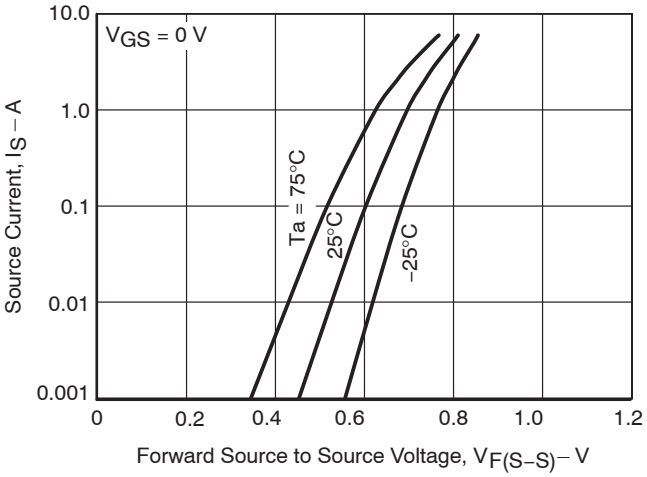


Figure 7. Forward Source-to-Source Voltage vs. Current

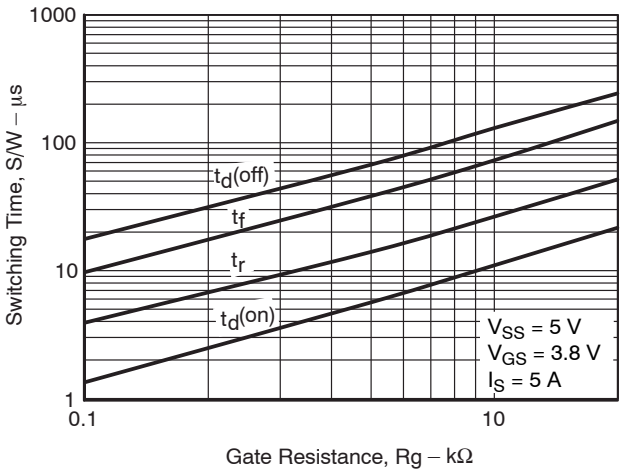


Figure 8. Switching Time vs. Gate Resistance

TYPICAL CHARACTERISTICS

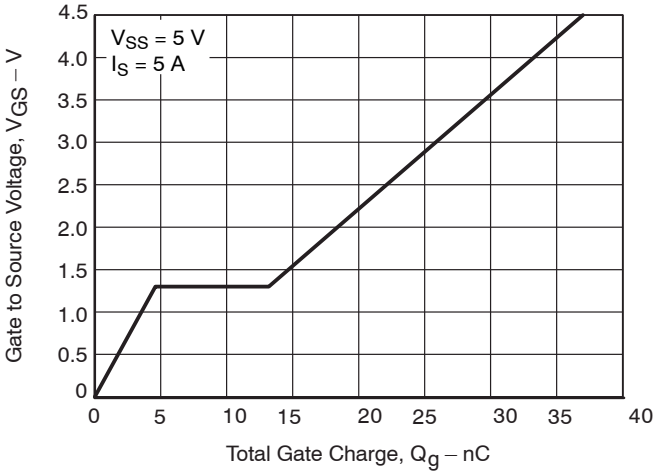


Figure 9. Gate-to-Source Voltage vs. Total Charge

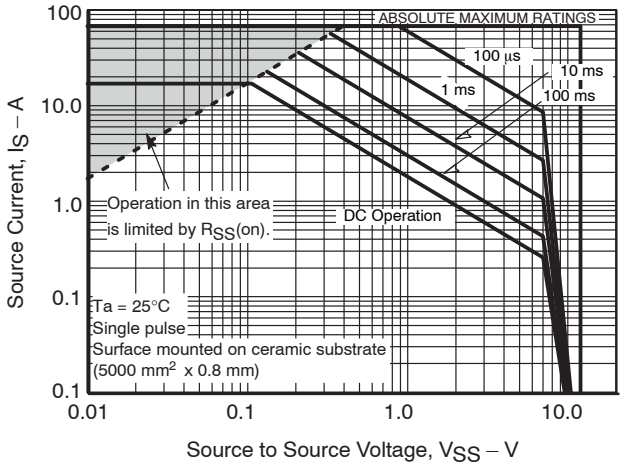


Figure 10. Safe Operating Area

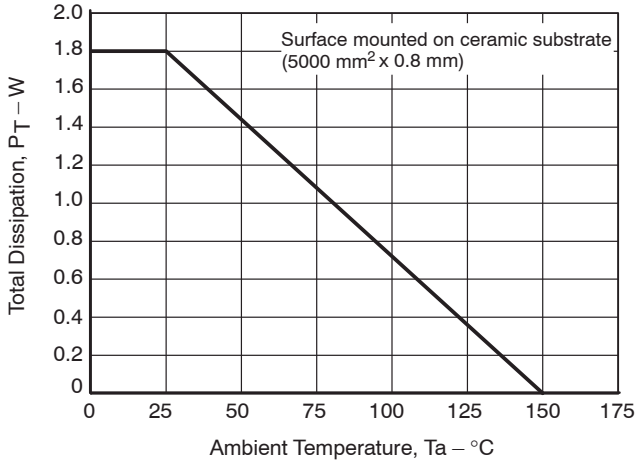


Figure 11. Total Dissipation vs. Temperature

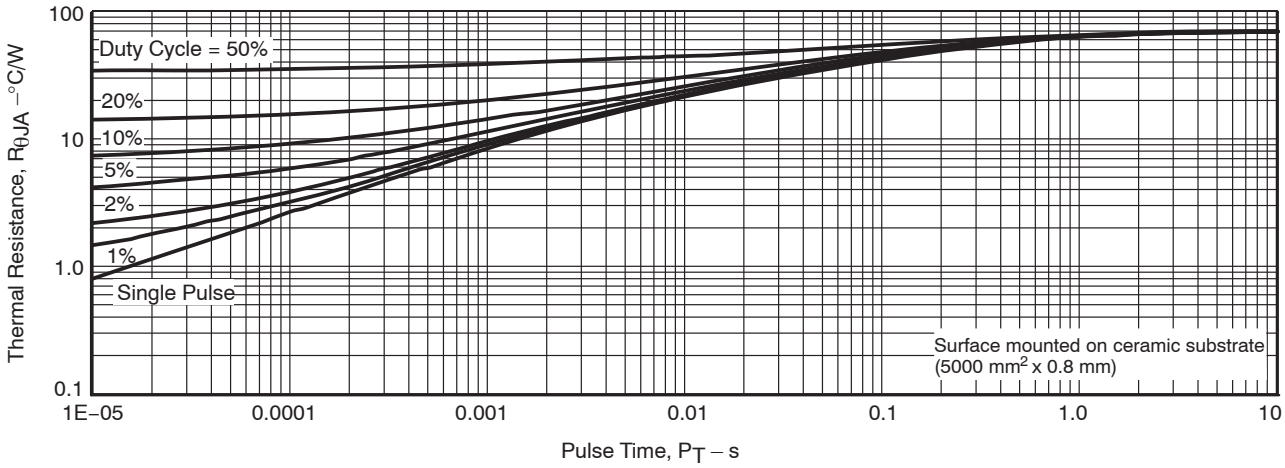


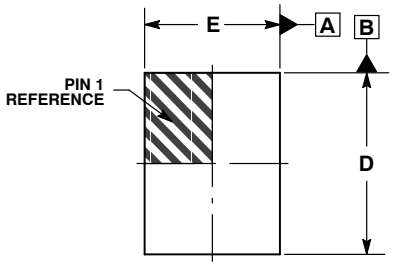
Figure 12. Thermal Response

Note on Usage: Since the EFC2J013NUZ 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.

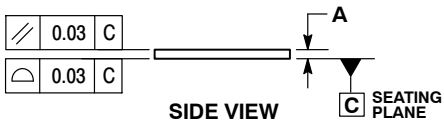
WLCSP6 2.00x1.49x0.10
CASE 567UF
ISSUE O

SCALE 4:1

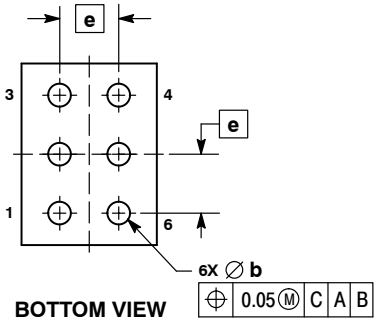
DATE 21 APR 2017



TOP VIEW



SIDE VIEW



BOTTOM VIEW

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

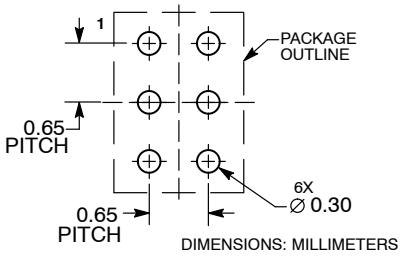
DIM	MILLIMETERS MIN	NOM	MAX
A	0.08	0.10	0.12
b	0.27	0.30	0.33
D	1.95	2.00	2.05
E	1.44	1.49	1.54
e	0.65 BSC		

GENERIC MARKING DIAGRAM*

XXX = Specific Device Code
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*



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

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DESCRIPTION:	WLCSP6 2.00x1.49x0.10	PAGE 1 OF 1

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