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# EFC2J004NUZ

## Power MOSFET for 1-Cell Lithium-ion Battery Protection 12 V, 7.1 mΩ, 14 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
- 2 kV ESD HBM
- 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 (Notes 1, 2)

Parameter	Symbol	Value	Unit
Source to Source Voltage	V <sub>SSS</sub>	12	V
Gate to Source Voltage	V <sub>GSS</sub>	±8	V
Source Current (DC)	I <sub>S</sub>	14	A
Source Current (Pulse) PW ≤ 10μs, duty cycle ≤ 1%	I <sub>SP</sub>	60	A
Total Dissipation (Note 2)	P <sub>T</sub>	1.5	W
Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-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.

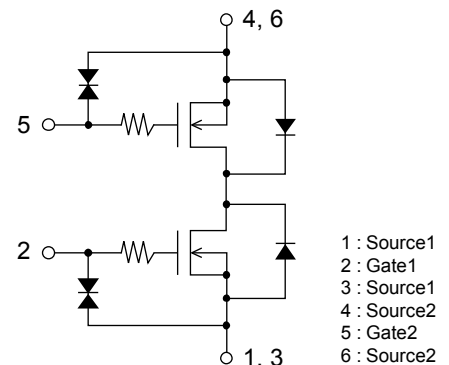
### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient (Note 2)	R <sub>θJA</sub>	83	°C/W

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

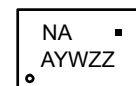
V <sub>SSS</sub>	R <sub>SS(on)</sub> Max	I <sub>S</sub> Max
12 V	7.1 mΩ @ 4.5 V	14 A
	7.7 mΩ @ 3.8 V	
	9.5 mΩ @ 3.1 V	
	12.4mΩ @ 2.5 V	

### ELECTRICAL CONNECTION N-Channel



WLCSP6, 2.11x1.18x0.10

### GENERIC MARKING DIAGRAM



- NA = 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 6 of this data sheet.

# EFC2J004NUZ

## ELECTRICAL CHARACTERISTICS at Ta = 25°C (Notes 3, 4)

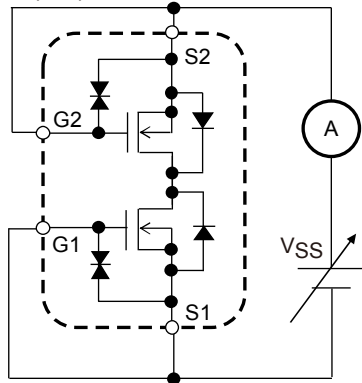
Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Source to Source Breakdown Voltage	V(BR)SSS	IS = 1 mA, VGS = 0 V Test Circuit 1	12			V
Zero-Gate Voltage Source Current	ISSS	VSS = 10 V, VGS = 0 V Test Circuit 1			1	μA
Gate to Source Leakage Current	IGSS	VGS = ±8 V, VSS = 0 V Test Circuit 2			±1	μA
Gate Threshold Voltage	VGS(th)	VSS = 6 V, IS = 1 mA Test Circuit 3	0.4		1.3	V
Static Source to Source On-State Resistance (Note 4)	RSS(on)	IS = 5 A, VGS = 4.5 V Test Circuit 4	3.7	5.4	7.1	mΩ
		IS = 5 A, VGS = 3.8 V Test Circuit 4	4.1	5.9	7.7	mΩ
		IS = 5 A, VGS = 3.1 V Test Circuit 4	4.6	6.7	9.5	mΩ
		IS = 5 A, VGS = 2.5 V Test Circuit 4	5.8	8.4	12.4	mΩ
Turn-ON Delay Time	td(on)	VSS = 5 V, VGS = 3.8 V, IS = 5 A Rg = 10 kΩ Test Circuit 5		15		μs
Rise Time	tr			35		μs
Turn-OFF Delay Time	td(off)			100		μs
Fall Time	tf			75		μs
Total Gate Charge	Qg		VSS = 6 V, VGS = 4.5 V, IS = 14 A Test Circuit 6		36	
Forward Source to Source Voltage	VF(S-S)	IS = 3 A, VGS = 0 V Test Circuit 7		0.76		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.

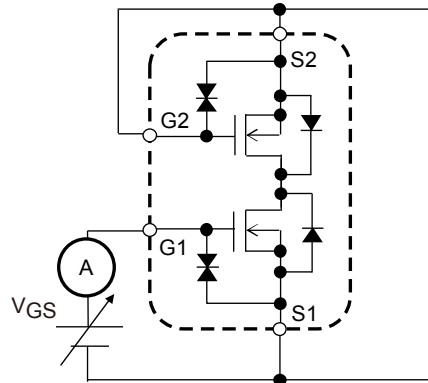
Note 4 : Mounted on ON Semiconductor board.

Test circuits are example of measuring FET1 side

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

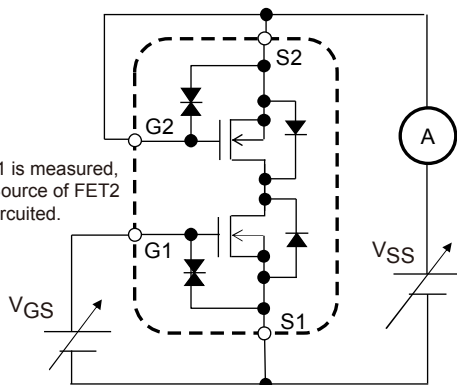


Test Circuit 2  
 $I_{GSS}$



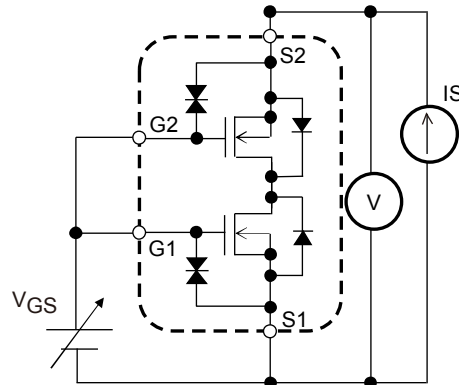
When FET1 is measured, Gate and Source of FET2 are short-circuited.

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

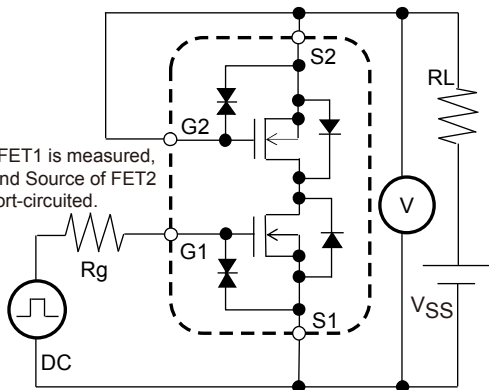


When FET1 is measured, Gate and Source of FET2 are short-circuited.

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

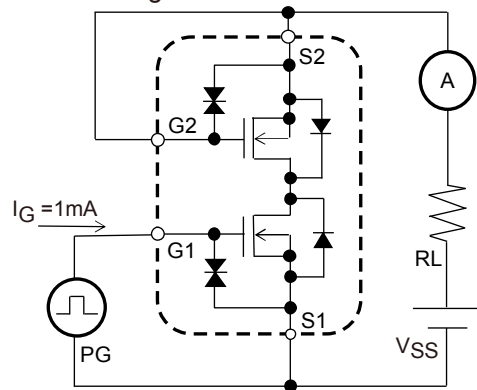


Test Circuit 5  
 $t_{d(on)}, t_r, t_d(off), t_f$



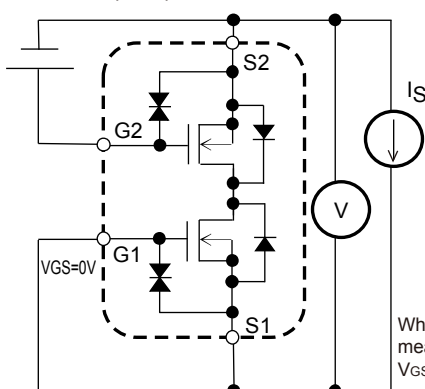
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 6  
 $Q_g$



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

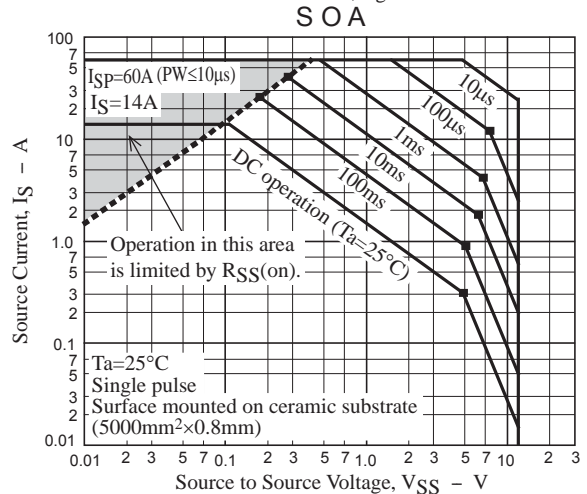
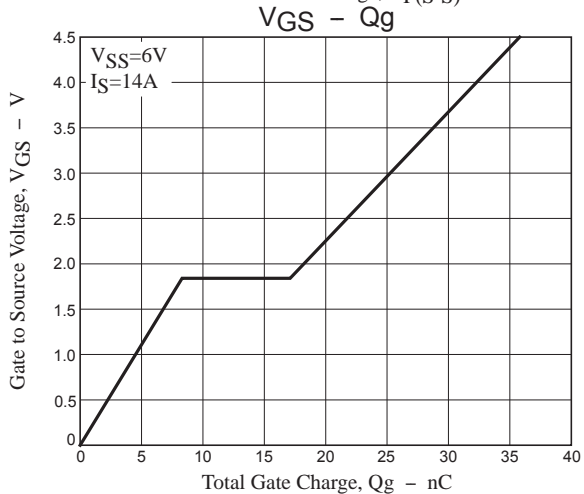
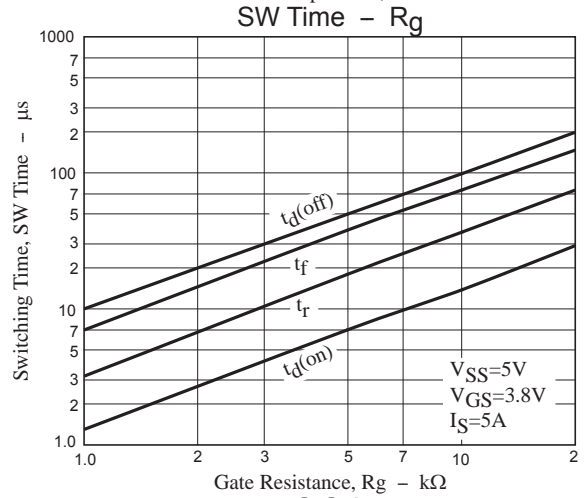
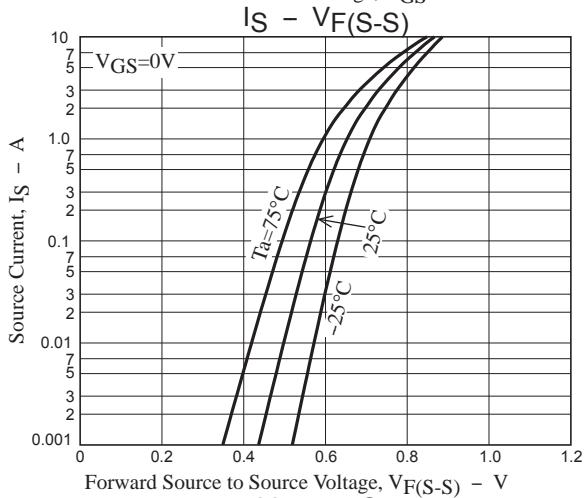
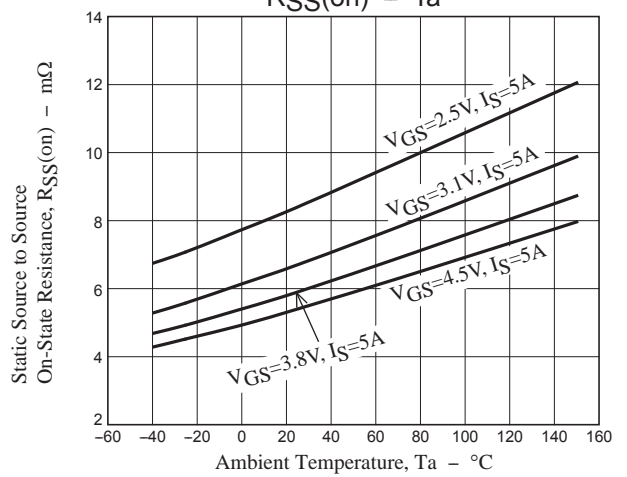
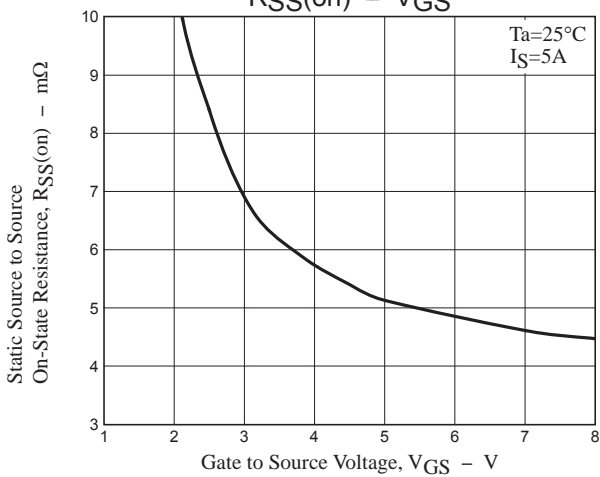
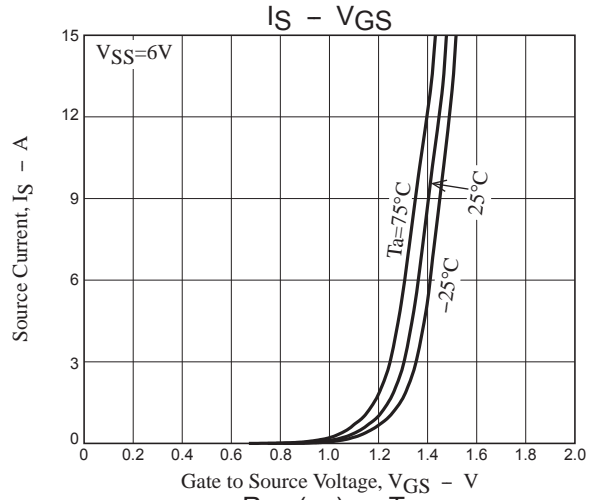
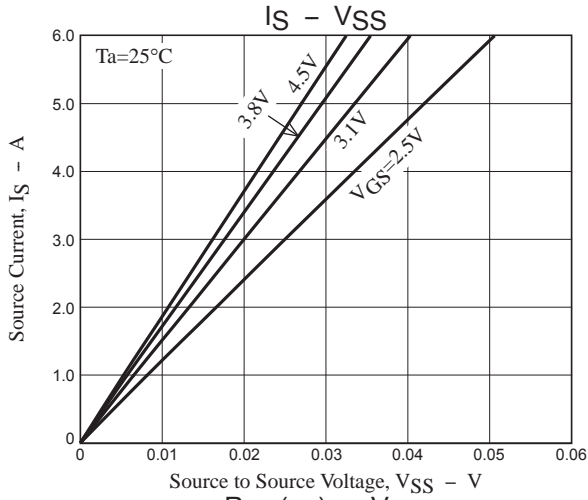
Test Circuit 7  
 $V_{F(S-S)}$



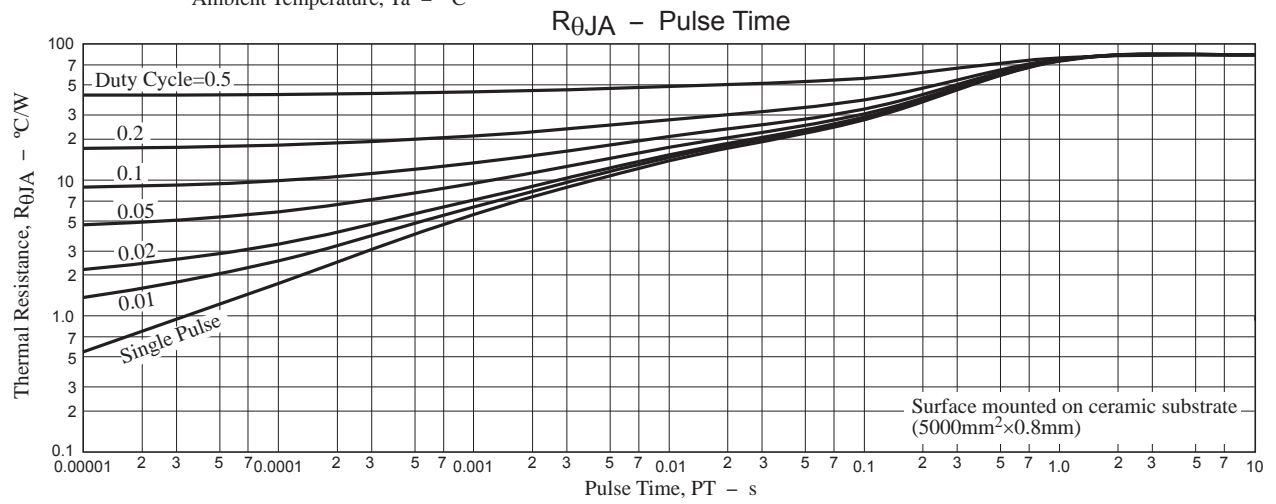
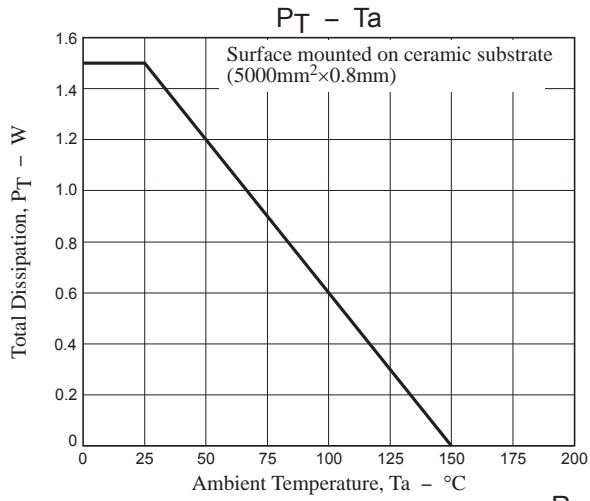
When FET1 is measured, +4.5V is added to  $V_{GS}$  of FET2.

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

# EFC2J004NUZ



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