

# EFC4K105NUZ

## Power MOSFET for 1-2 Cells Lithium-ion Battery Protection

22 V, 3.55 mΩ, 25 A, Dual N-Channel

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 1-2 cells lithium-ion battery applications.

### Features

- 2.5 V Drive
- Common-Drain Type
- ESD Diode-Protected Gate
- This device is Pb-Free, Halogen Free and RoHS Compliance

### Applications

- 1-2 Cells Lithium-ion Battery Charging and Discharging Switch

### Specifications

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)

Parameter	Symbol	Value	Unit
Source to Source Voltage	V <sub>SSS</sub>	22	V
Gate to Source Voltage	V <sub>GSS</sub>	±12	V
Source Current (DC)	I <sub>S</sub>	25	A
Source Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1%	I <sub>SP</sub>	100	A
Total Dissipation (Note 1)	P <sub>T</sub>	2.5	W
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-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 <sub>θJA</sub>	50	°C/W

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

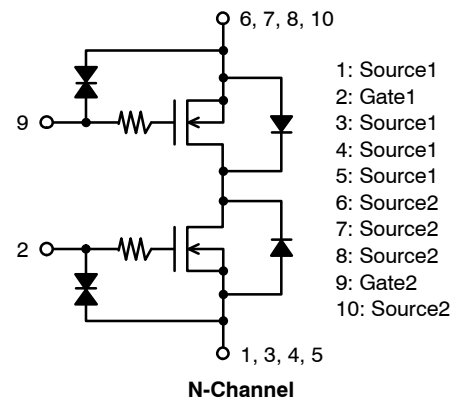


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V <sub>SSS</sub>	R <sub>SS(ON)</sub> MAX	I <sub>S</sub> MAX
22 V	3.55 mΩ @ 4.5 V	25 A
	3.65 mΩ @ 3.8 V	
	5.3 mΩ @ 3.1 V	
	7.2 mΩ @ 2.5 V	

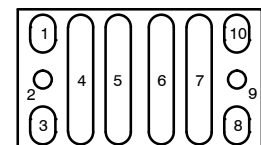
### ELECTRICAL CONNECTION



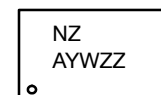
### PIN ASSIGNMENT



WLCSP10  
(3.40 x 1.96 x 0.10)  
CASE 567PL



### MARKING DIAGRAM



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

### ORDERING INFORMATION

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

# EFC4K105NUZ

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)SSS}$	Source to Source Breakdown Voltage	$I_S = 1 \text{ mA}, V_{GS} = 0 \text{ V}$	22			V
$I_{SSS}$	Zero-Gate Voltage Source Current	$V_{SS} = 17.6 \text{ V}, V_{GS} = 0 \text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 8 \text{ V}, V_{SS} = 0 \text{ V}$			$\pm 1$	$\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{SS} = 10 \text{ V}, I_S = 1 \text{ mA}$	0.4		1.3	V
$R_{SS(on)}$	Static Source to Source On-State Resistance	$I_S = 5 \text{ A}, V_{GS} = 4.5 \text{ V}$	1.8	2.7	3.55	$\text{m}\Omega$
		$I_S = 5 \text{ A}, V_{GS} = 3.8 \text{ V}$	1.9	2.8	3.65	$\text{m}\Omega$
		$I_S = 5 \text{ A}, V_{GS} = 3.1 \text{ V}$	2.0	3.3	5.3	$\text{m}\Omega$
		$I_S = 5 \text{ A}, V_{GS} = 2.5 \text{ V}$	2.2	4.0	7.2	$\text{m}\Omega$
$t_d(on)$	Turn-ON Delay Time	$V_{SS} = 10 \text{ V}, V_{GS} = 3.8 \text{ V}, I_S = 5 \text{ A}$ $R_g = 10 \text{ k}\Omega$ Switching Test Circuit		13		$\mu\text{s}$
$t_r$	Rise Time			35		$\mu\text{s}$
$t_d(off)$	Turn-OFF Delay Time			185		$\mu\text{s}$
$t_f$	Fall Time			78		$\mu\text{s}$
Qg	Total Gate Charge	$V_{SS} = 10 \text{ V}, V_{GS} = 3.8 \text{ V}, I_S = 5 \text{ A}$		43		nC
$V_{F(S-S)}$	Forward Source to Source Voltage	$I_S = 3 \text{ A}, V_{GS} = 0 \text{ V}$		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.

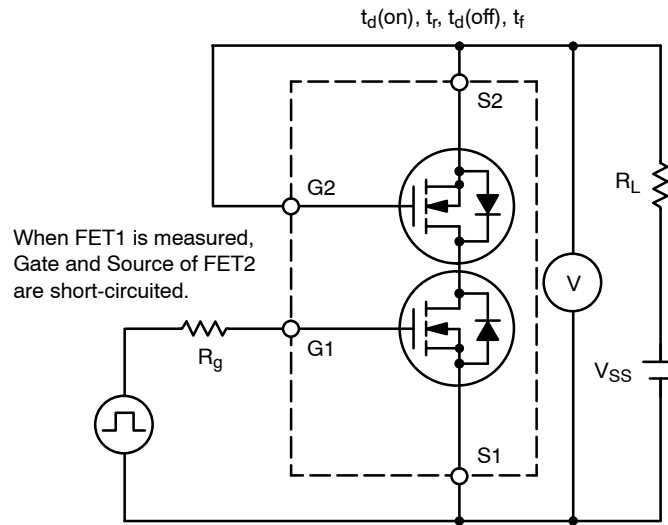


Figure 1. Switching Test Circuit

## ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup> (Qty / Packing)
EFC4K105NUZTDG	NZ	WLCSOP10, 3.40 x 1.96 x 0.10 (Pb-Free / Halogen Free)	5,000 / Tape & Reel

<sup>†</sup>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](#).

# EFC4K105NUZ

## TYPICAL CHARACTERISTICS

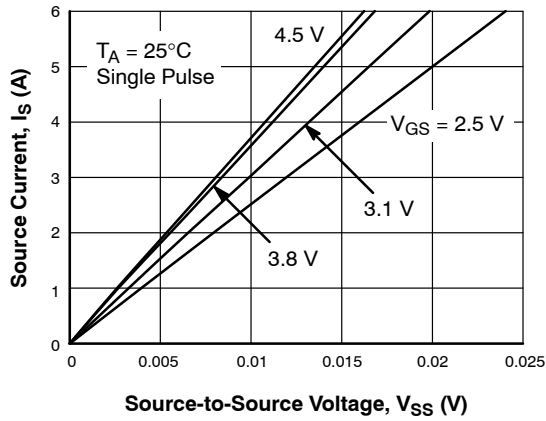


Figure 2. On-Region Characteristics

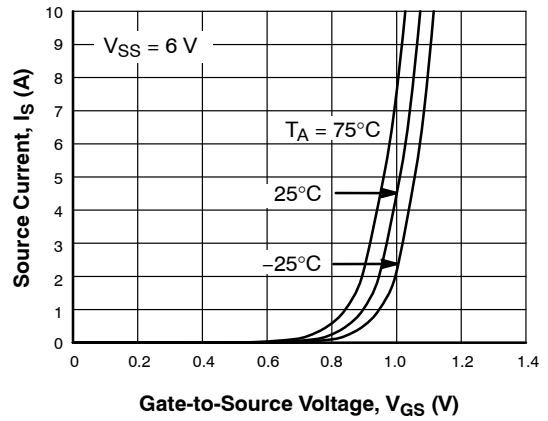


Figure 3. Transfer Characteristics

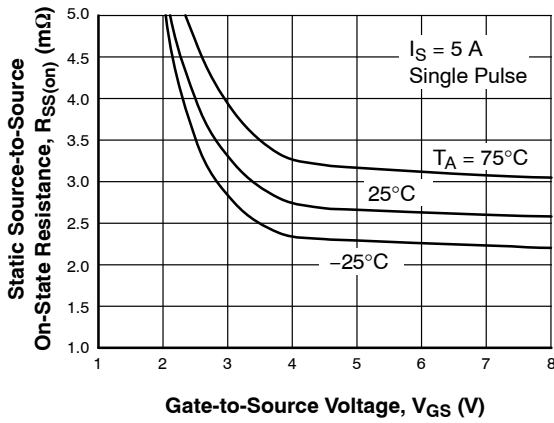


Figure 4. On-Resistance vs. Gate-to-Source Voltage

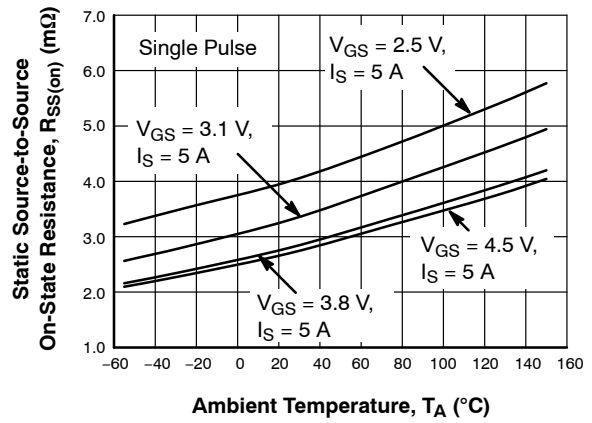


Figure 5. On-Resistance vs. Temperature

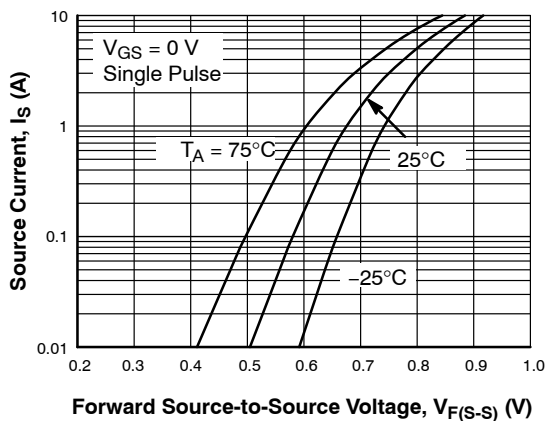


Figure 6. Forward Source-to-Source Voltage vs. Current

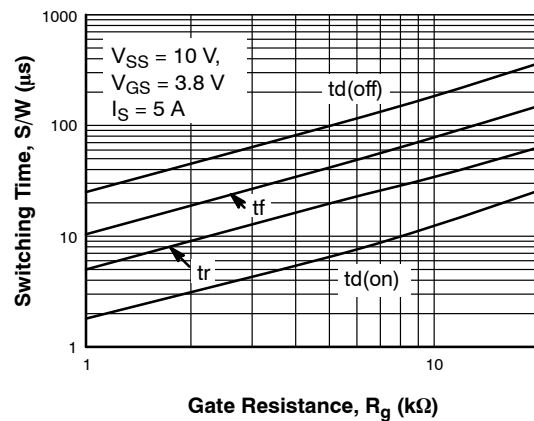


Figure 7. Switching Time vs. Gate Resistance

# EFC4K105NUZ

## TYPICAL CHARACTERISTICS

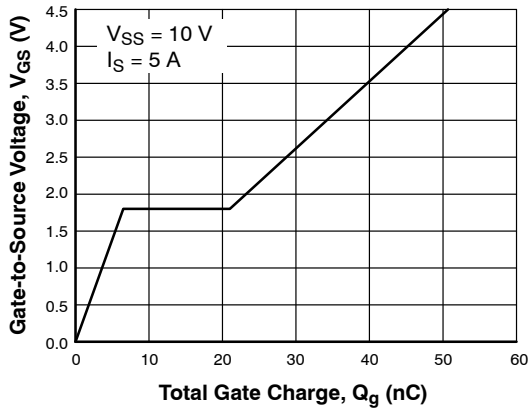


Figure 8. Gate-to-Source Voltage vs. Total Charge

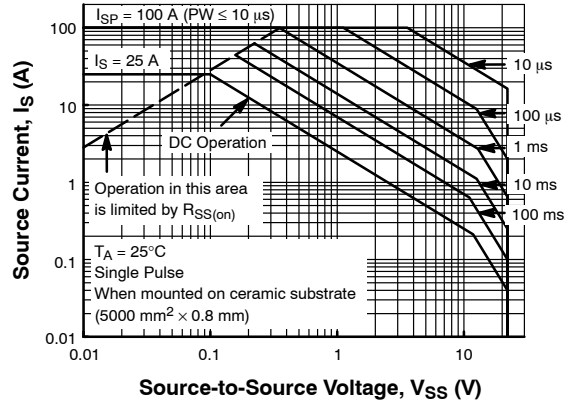


Figure 9. Safe Operating Area

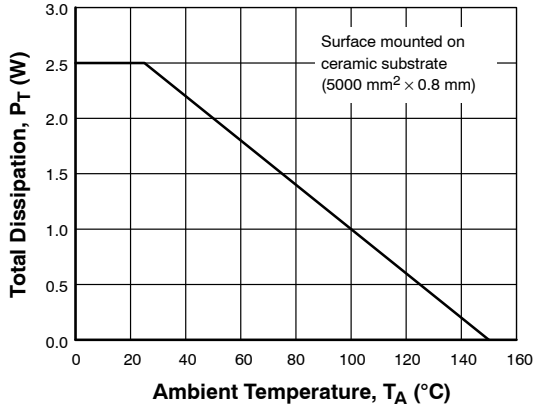


Figure 10. Total Dissipation vs. Temperature

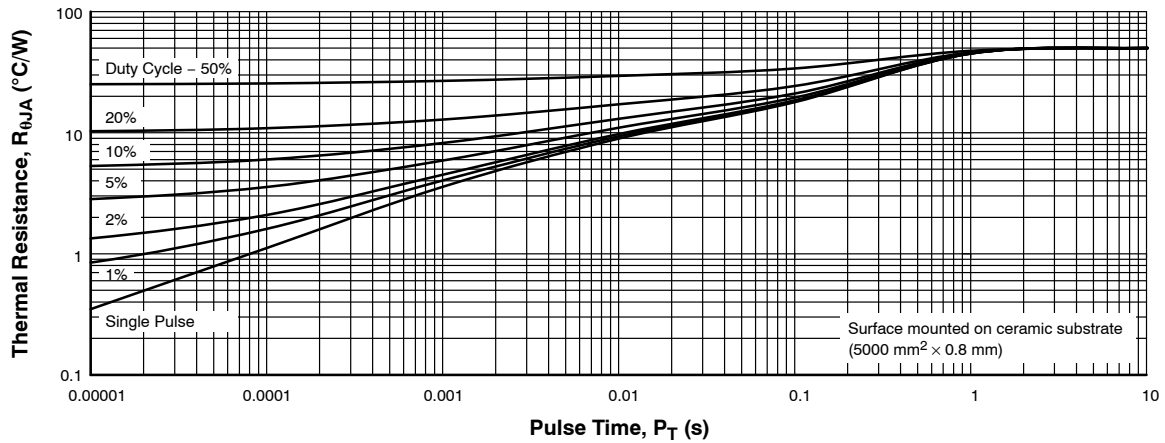


Figure 11. Thermal Response

Note on Usage: Since the EFC4K105NUZ is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

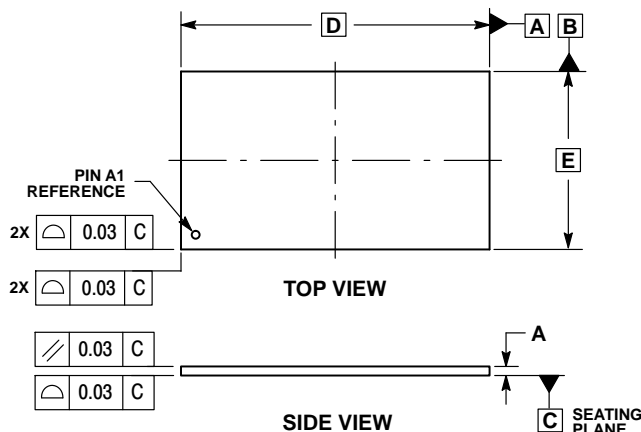
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**WLCSP10 3.40x1.96x0.10**  
CASE 567PL  
ISSUE C

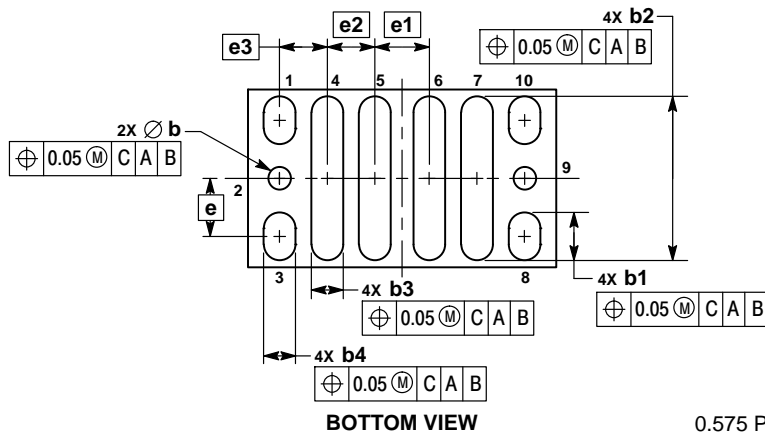
SCALE 4:1

DATE 14 MAR 2018

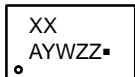


NOTES:  
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.  
2. CONTROLLING DIMENSION: MILLIMETERS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.08	0.10	0.12
b	0.22	0.25	0.28
b1	0.50	0.53	0.56
b2	1.78	1.81	1.84
b3	0.32	0.35	0.38
b4	0.32	0.35	0.38
D	3.40 BSC		
E	1.96 BSC		
e	0.64 BSC		
e1	0.60 BSC		
e2	0.525 BSC		
e3	0.525 BSC		



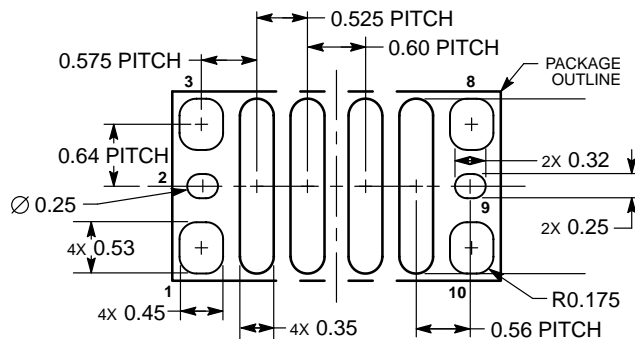
### GENERIC MARKING DIAGRAM\*



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\*



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.

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<b>DESCRIPTION:</b>	<b>WLCSP10 3.40x1.96x0.10</b>	<b>PAGE 1 OF 1</b>

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