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# ECH8693R

## Power MOSFET for 1-2 Cells Lithium-ion Battery Protection 24 V, 7 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 1-2 cells Lithium-ion Battery applications.

### Features

- Low On-Resistance
- 2.5 V drive
- Common-Drain Type
- ESD Diode-Protected Gate
- Built-in Gate Protection Resistor
- Pb-Free, Halogen Free and RoHS compliance

### Typical Applications

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

### SPECIFICATIONS

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

Parameter	Symbol	Value	Unit
Drain to Source Voltage	V <sub>DSS</sub>	24	V
Gate to Source Voltage	V <sub>GSS</sub>	±12.5	V
Drain Current (DC)	I <sub>D</sub>	14	A
Drain Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1%	I <sub>DP</sub>	60	A
Power Dissipation Surface mounted on ceramic substrate (900 mm <sup>2</sup> × 0.8 mm) 1 unit	P <sub>D</sub>	1.4	W
Total Dissipation Surface mounted on ceramic substrate (900 mm <sup>2</sup> × 0.8 mm)	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

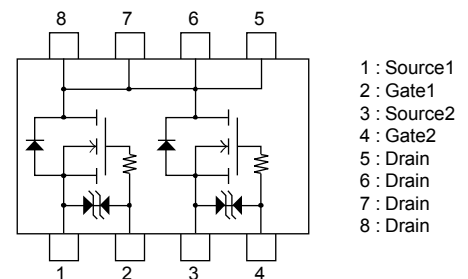
Note 1 : Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient Surface mounted on ceramic substrate (900 mm <sup>2</sup> × 0.8 mm) 1 unit	R <sub>θJA</sub>	89.2	°C/W

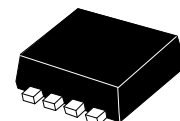
V <sub>DSS</sub>	R <sub>DS(on)</sub> Max	I <sub>D</sub> Max
24 V	7 mΩ @ 4.5 V	14 A
	7.5 mΩ @ 4.0 V	
	9.1 mΩ @ 3.1 V	
	10.5 mΩ @ 2.5 V	

### ELECTRICAL CONNECTION N-Channel

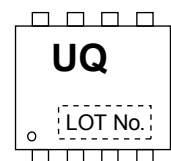


- 1 : Source1
- 2 : Gate1
- 3 : Source2
- 4 : Gate2
- 5 : Drain
- 6 : Drain
- 7 : Drain
- 8 : Drain

### MARKING



SOT-28FL / ECH8



### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# ECH8693R

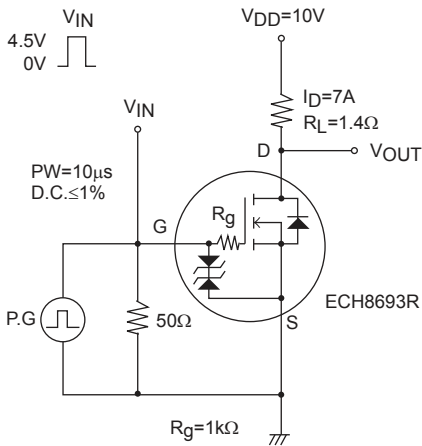
## ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 2)

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	V(BR)DSS	I <sub>D</sub> = 1 mA, V <sub>GS</sub> = 0 V	24			V
Zero-Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V			1	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0 V			±1	μA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	0.5		1.3	V
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 5 A		8		S
Static Drain to Source On-State Resistance	R <sub>DS(on)</sub>	I <sub>D</sub> = 5 A, V <sub>GS</sub> = 4.5 V	4.4	5.6	7	mΩ
		I <sub>D</sub> = 5 A, V <sub>GS</sub> = 4.0 V	4.6	5.8	7.5	mΩ
		I <sub>D</sub> = 5 A, V <sub>GS</sub> = 3.1 V	5.2	6.5	9.1	mΩ
		I <sub>D</sub> = 2.5 A, V <sub>GS</sub> = 2.5 V	6	7.5	10.5	mΩ
Turn-ON Delay Time	t <sub>d(on)</sub>	See Fig. 1 (Note 3)		545		ns
Rise Time	t <sub>r</sub>			525		ns
Turn-OFF Delay Time	t <sub>d(off)</sub>			18.65		μs
Fall Time	t <sub>f</sub>			22.2		μs
Turn-ON Delay Time	t <sub>d(on)</sub>	See Fig. 2 (Note 3)		545		ns
Rise Time	t <sub>r</sub>			525		ns
Turn-OFF Delay Time	t <sub>d(off)</sub>			1,130		μs
Fall Time	t <sub>f</sub>			410		μs
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 14 A		13		nC
Gate to Source Charge	Q <sub>gs</sub>			3		nC
Gate to Drain "Miller" Charge	Q <sub>gd</sub>			2.4		nC
Forward Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 14 A, V <sub>GS</sub> = 0 V		0.78	1.2	V

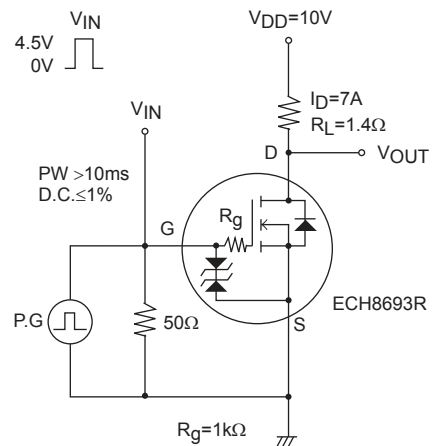
Note 2 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Note 3 : The fall switching time is dependent on the input pulse width.

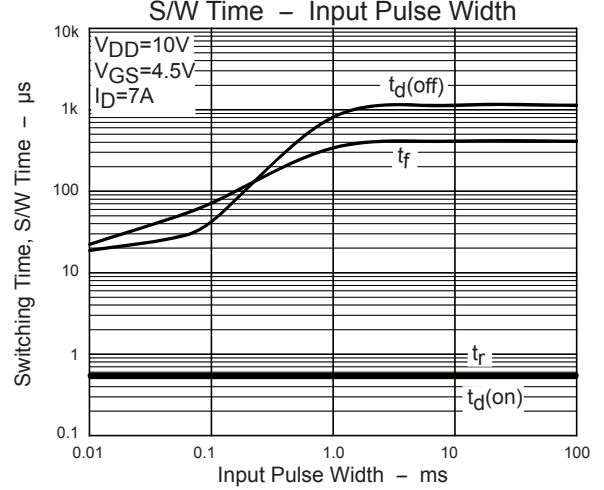
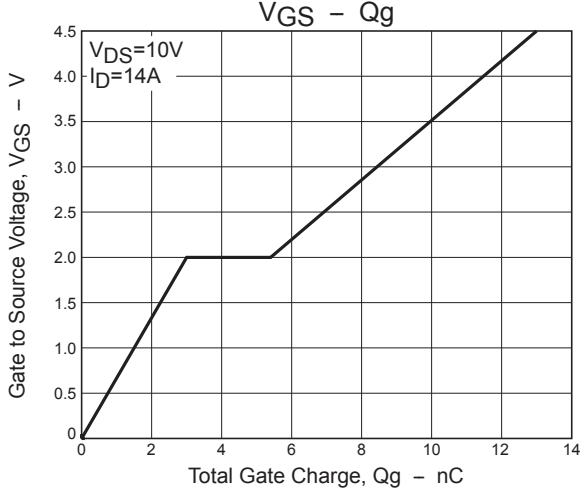
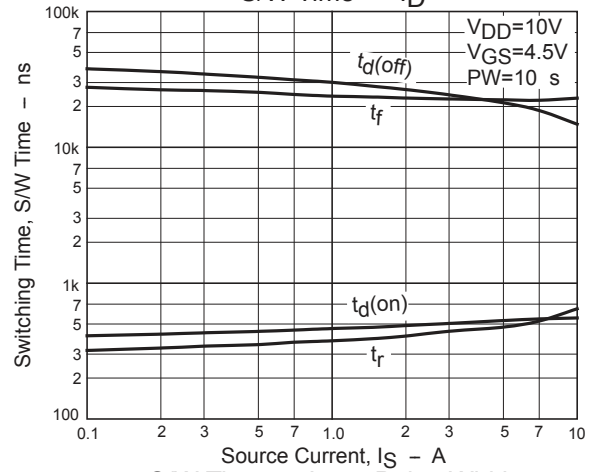
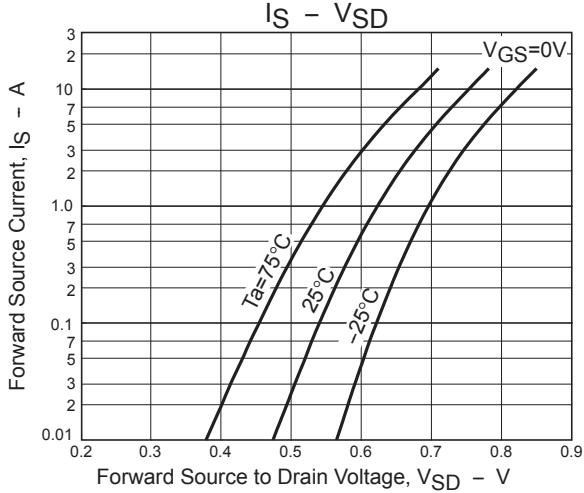
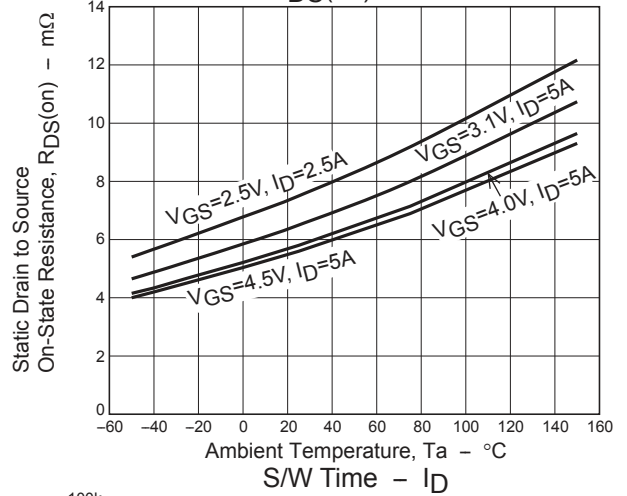
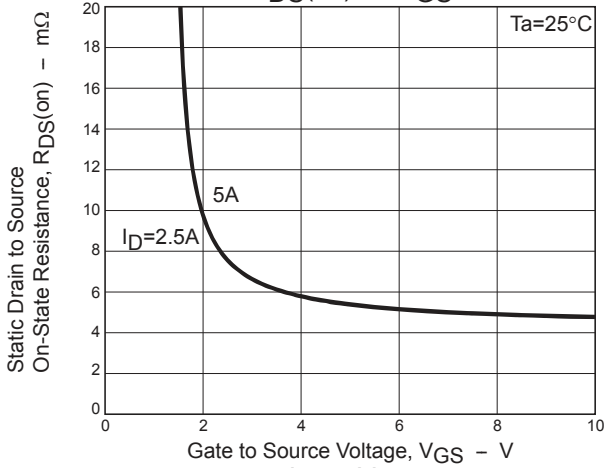
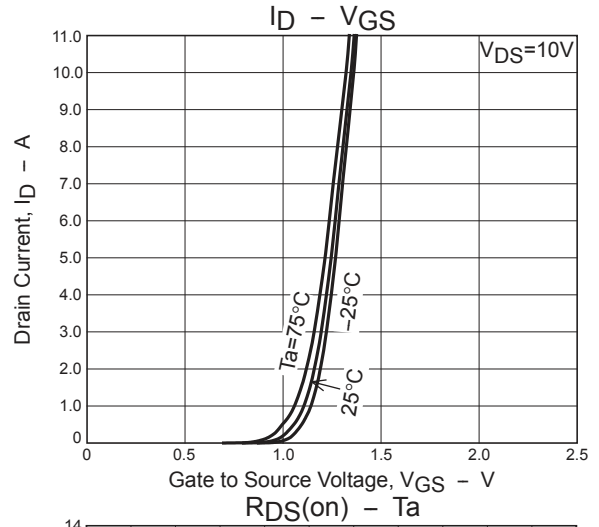
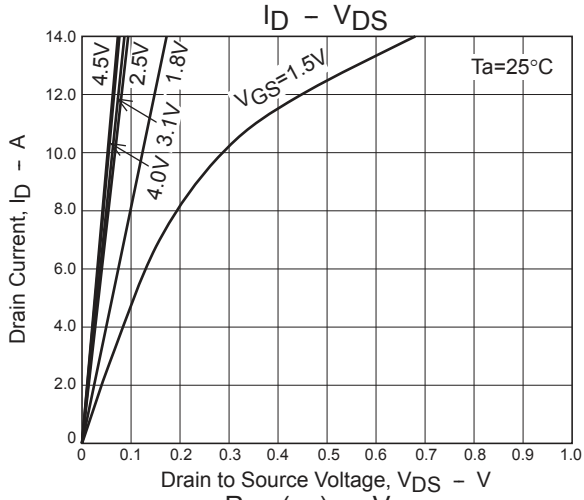
**Fig.1 Switching Time Test Circuit 1**



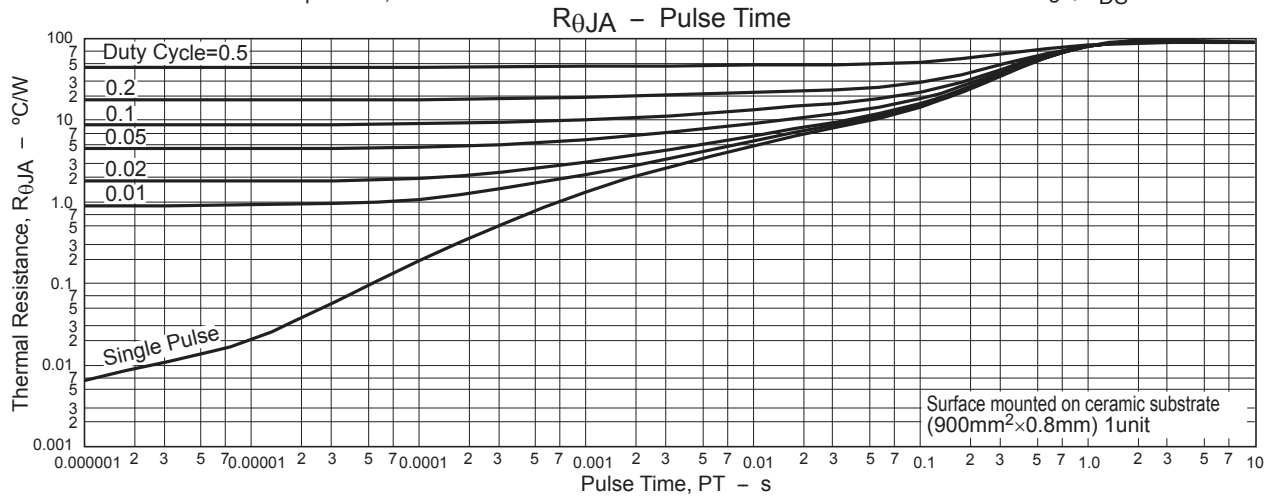
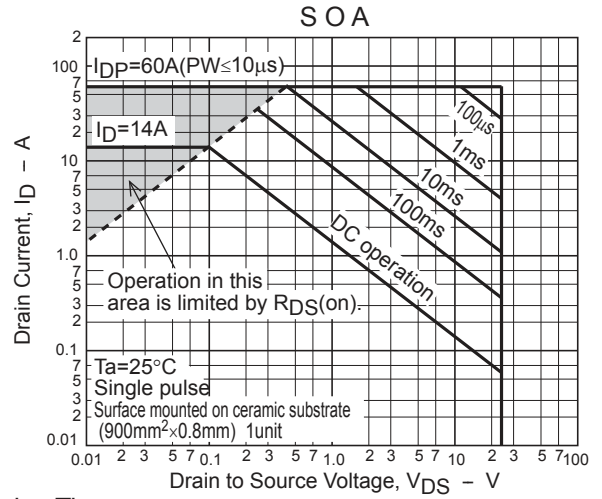
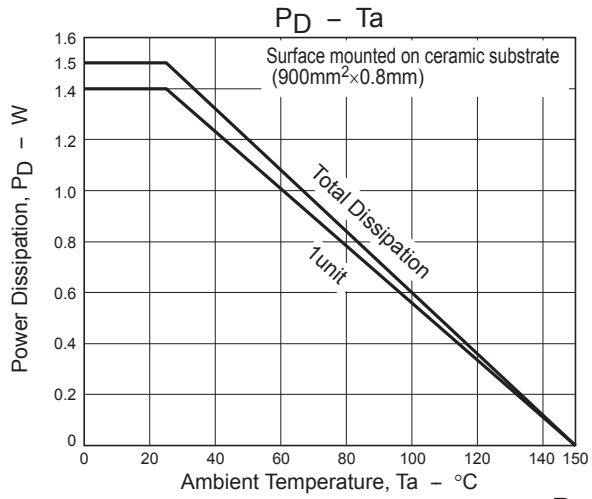
**Fig.2 Switching Time Test Circuit 2**



# ECH8693R



# ECH8693R

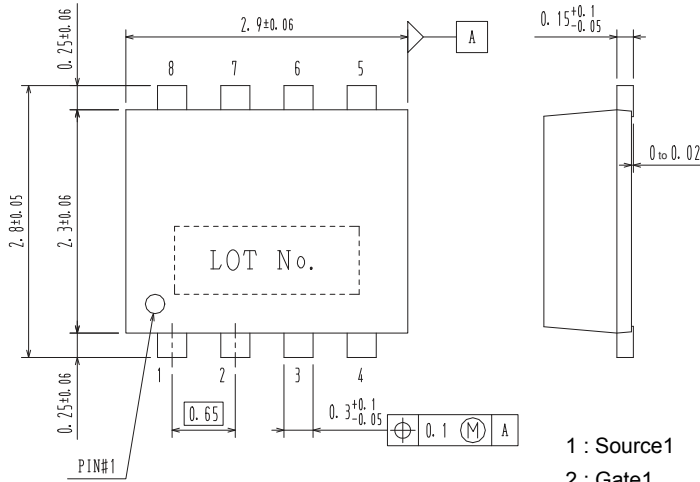


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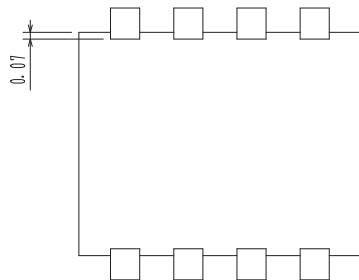
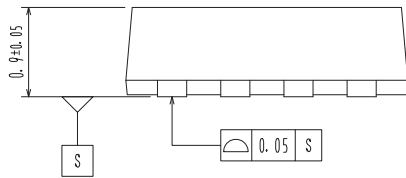
## PACKAGE DIMENSIONS

unit : mm

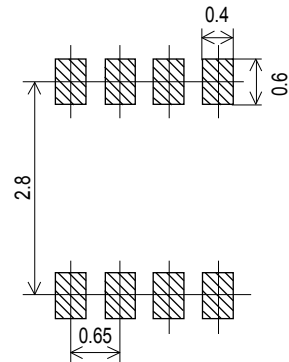
SOT-28FL / ECH8  
CASE 318BF  
ISSUE O



- 1 : Source1
- 2 : Gate1
- 3 : Source2
- 4 : Gate2
- 5 : Drain
- 6 : Drain
- 7 : Drain
- 8 : Drain



### Recommended Soldering Footprint



## ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing)
ECH8693R-TL-W	UQ	SOT-28FL / ECH8 (Pb-Free / Halogen Free)	3,000 / 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 ECH8693R 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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