

## Power MOSFET for 1-2 Cells Lithium-ion Battery Protection 24 V, 9.1 mΩ, 11 A, Dual N-Channel



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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	VDSS	24	V
Gate to Source Voltage	VGSS	±12.5	V
Drain Current (DC)	ID	11	A
Drain Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1%	IDP	60	A
Power Dissipation Surface mounted on ceramic substrate (900 mm <sup>2</sup> × 0.8 mm) 1 unit	PD	1.4	W
Total Dissipation Surface mounted on ceramic substrate (900 mm <sup>2</sup> × 0.8 mm)	PT	1.5	W
Junction Temperature	Tj	150	°C
Storage Temperature	Tstg	-55 to +150	°C

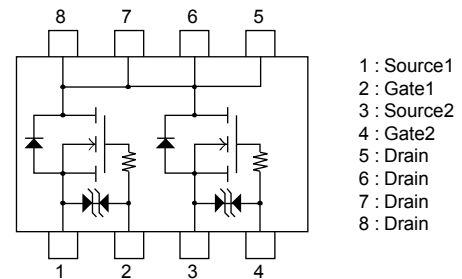
Note 1 : Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE RATINGS

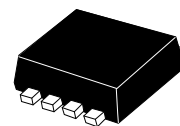
Parameter	Symbol	Value	Unit
Junction to Ambient Surface mounted on ceramic substrate (900 mm <sup>2</sup> × 0.8 mm) 1 unit	RθJA	89.2	°C/W

VDSS	RDS(on) Max	ID Max
24 V	9.1 mΩ @ 4.5 V	11 A
	9.5 mΩ @ 4.0 V	
	11.5 mΩ @ 3.1 V	
	13.3 mΩ @ 2.5 V	

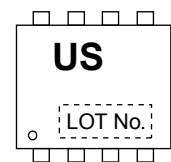
### ELECTRICAL CONNECTION N-Channel



### MARKING



SOT-28FL / ECH8



### ORDERING INFORMATION

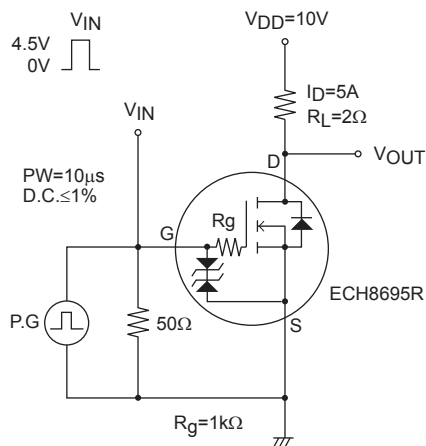
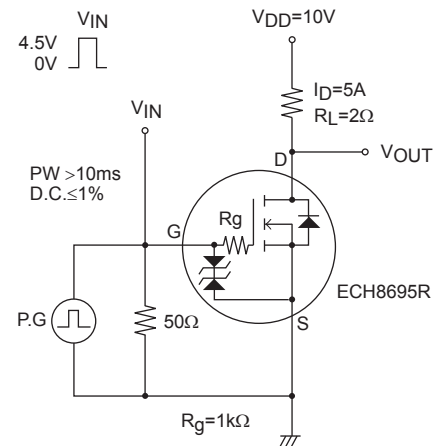
See detailed ordering and shipping information on page 5 of this data sheet.

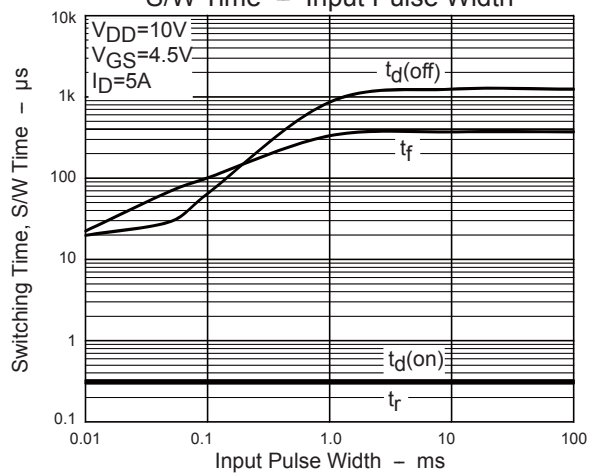
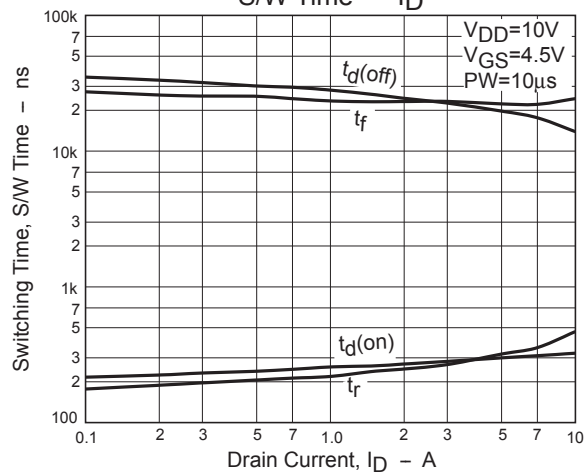
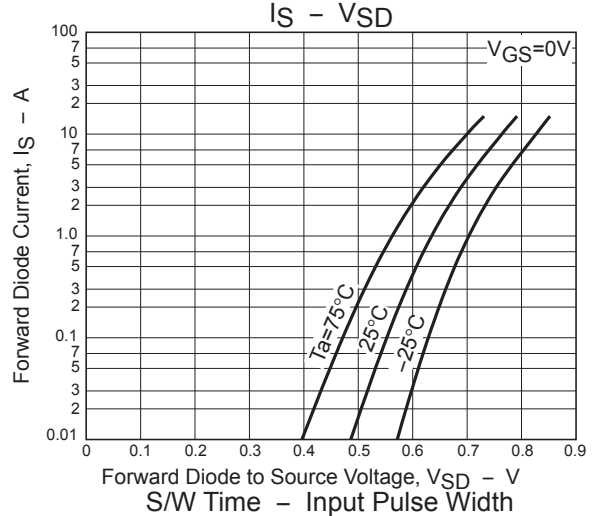
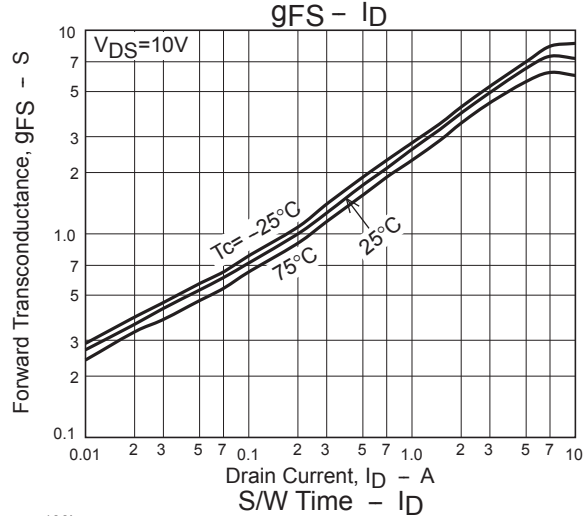
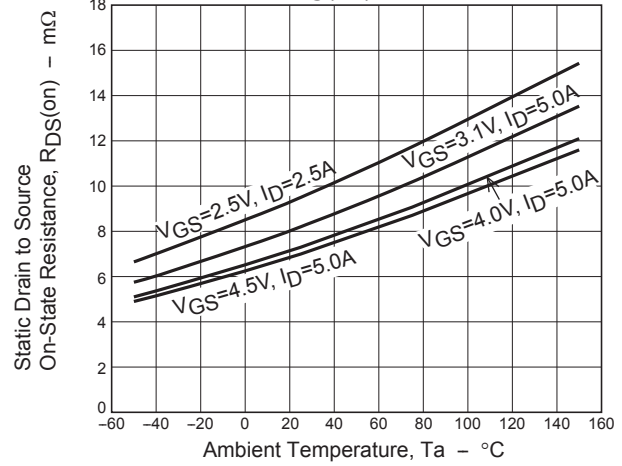
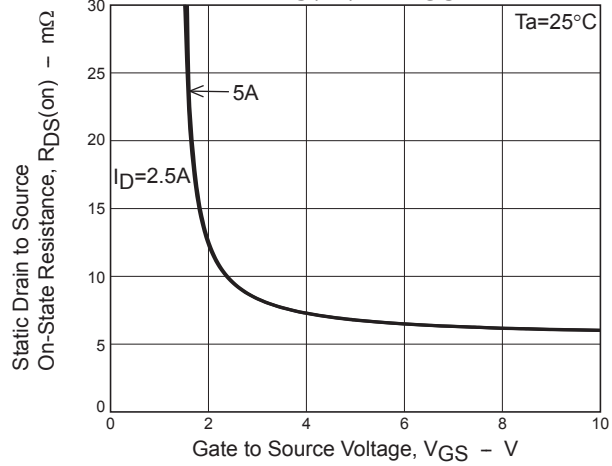
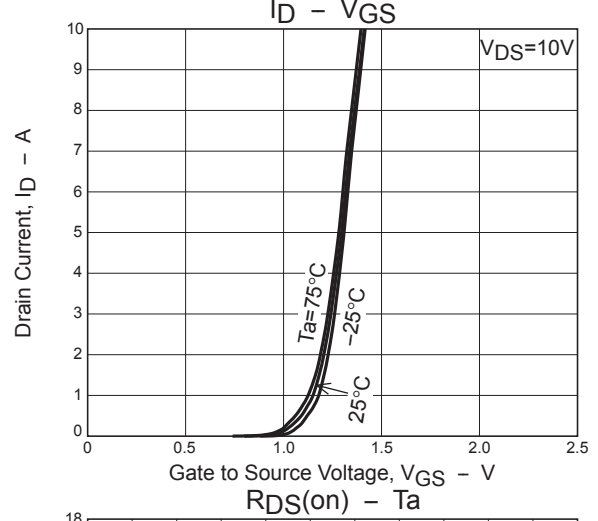
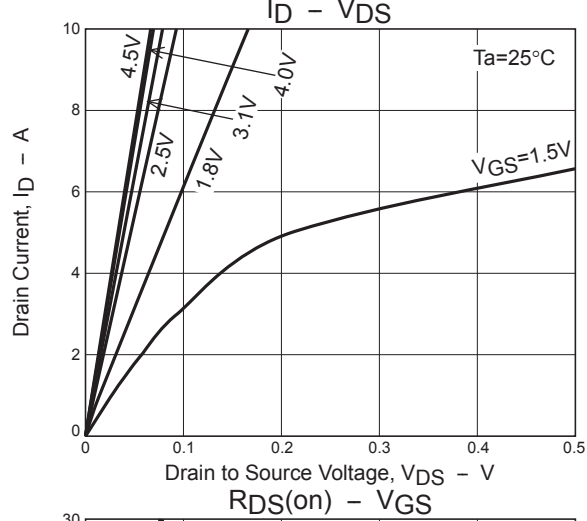
**ELECTRICAL CHARACTERISTICS** at  $T_a = 25^{\circ}\text{C}$  (Note 2)

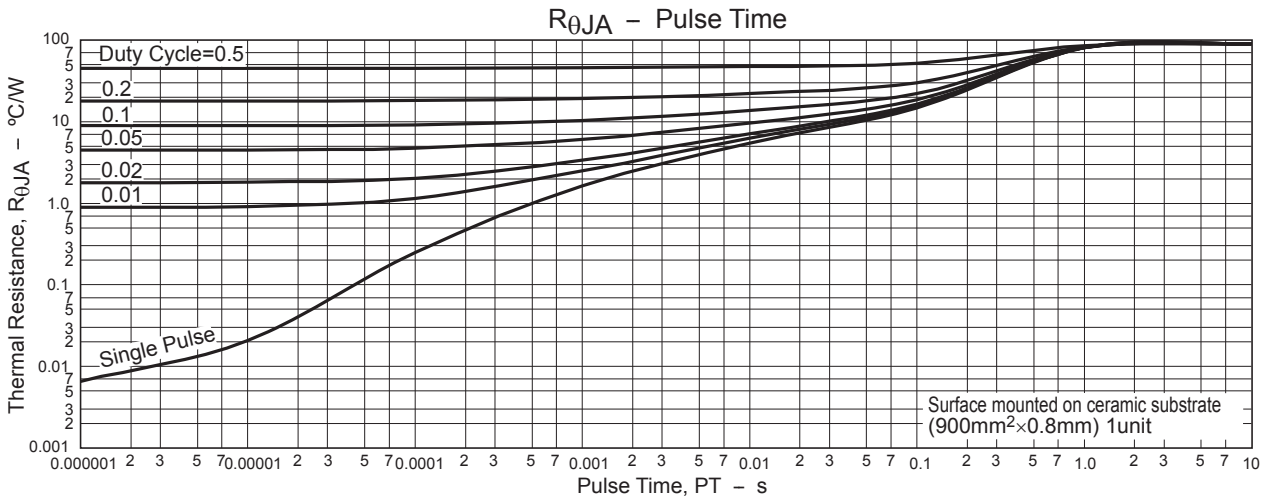
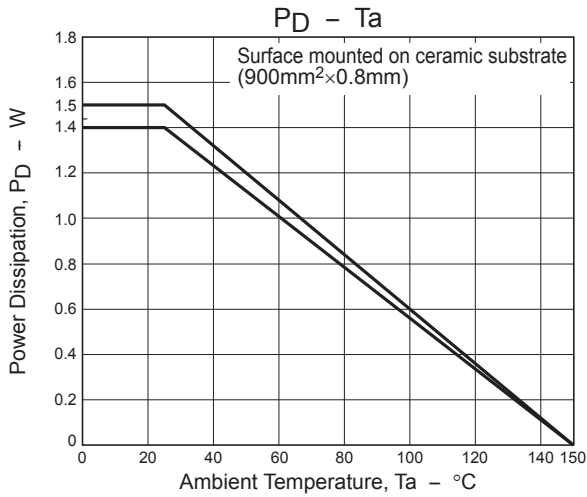
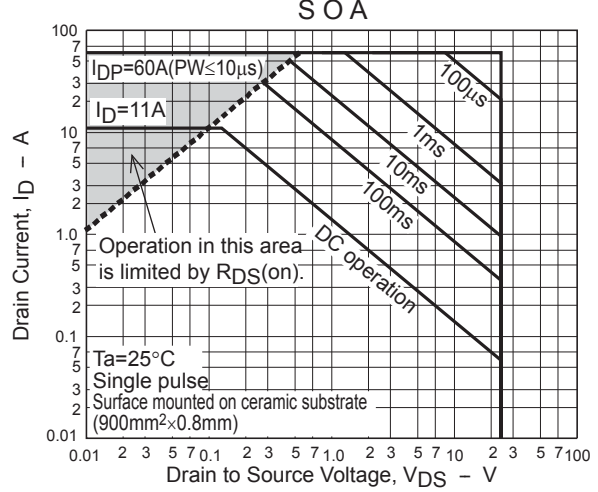
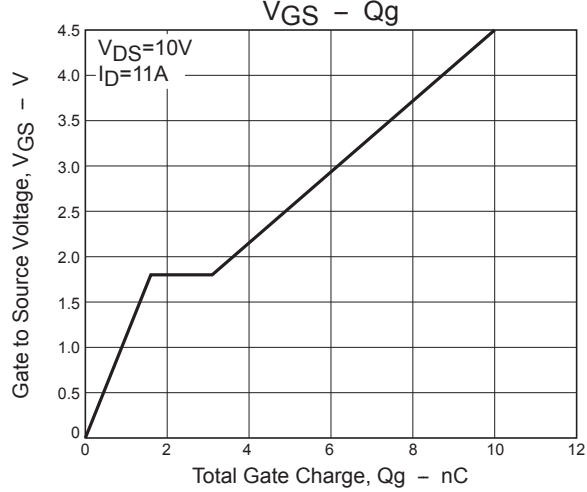
Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 1\text{ mA}$ , $V_{GS} = 0\text{ V}$	24			V
Zero-Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 8\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 1$	$\mu\text{A}$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$	0.5		1.3	V
Forward Transconductance	$g_{FS}$	$V_{DS} = 10\text{ V}$ , $I_D = 5\text{ A}$		6.5		S
Static Drain to Source On-State Resistance	$R_{DS(on)}$	$I_D = 5\text{ A}$ , $V_{GS} = 4.5\text{ V}$	5.6	7.0	9.1	$\text{m}\Omega$
		$I_D = 5\text{ A}$ , $V_{GS} = 4.0\text{ V}$	5.8	7.3	9.5	$\text{m}\Omega$
		$I_D = 5\text{ A}$ , $V_{GS} = 3.1\text{ V}$	6.5	8.2	11.5	$\text{m}\Omega$
		$I_D = 2.5\text{ A}$ , $V_{GS} = 2.5\text{ V}$	7.6	9.5	13.3	$\text{m}\Omega$
Turn-ON Delay Time	$t_{d(on)}$	See Fig. 1 (Note 3)		300		ns
Rise Time	$t_r$			320		ns
Turn-OFF Delay Time	$t_{d(off)}$			19.7		$\mu\text{s}$
Fall Time	$t_f$			22.3		$\mu\text{s}$
Turn-ON Delay Time	$t_{d(on)}$	See Fig. 2 (Note 3)		300		ns
Rise Time	$t_r$			320		ns
Turn-OFF Delay Time	$t_{d(off)}$			1,240		$\mu\text{s}$
Fall Time	$t_f$			370		$\mu\text{s}$
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 11\text{ A}$		10		nC
Gate to Source Charge	$Q_{gs}$			1.6		nC
Gate to Drain "Miller" Charge	$Q_{gd}$			1.5		nC
Forward Diode Voltage	$V_{SD}$	$I_S = 11\text{ A}$ , $V_{GS} = 0\text{ V}$		0.77	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**

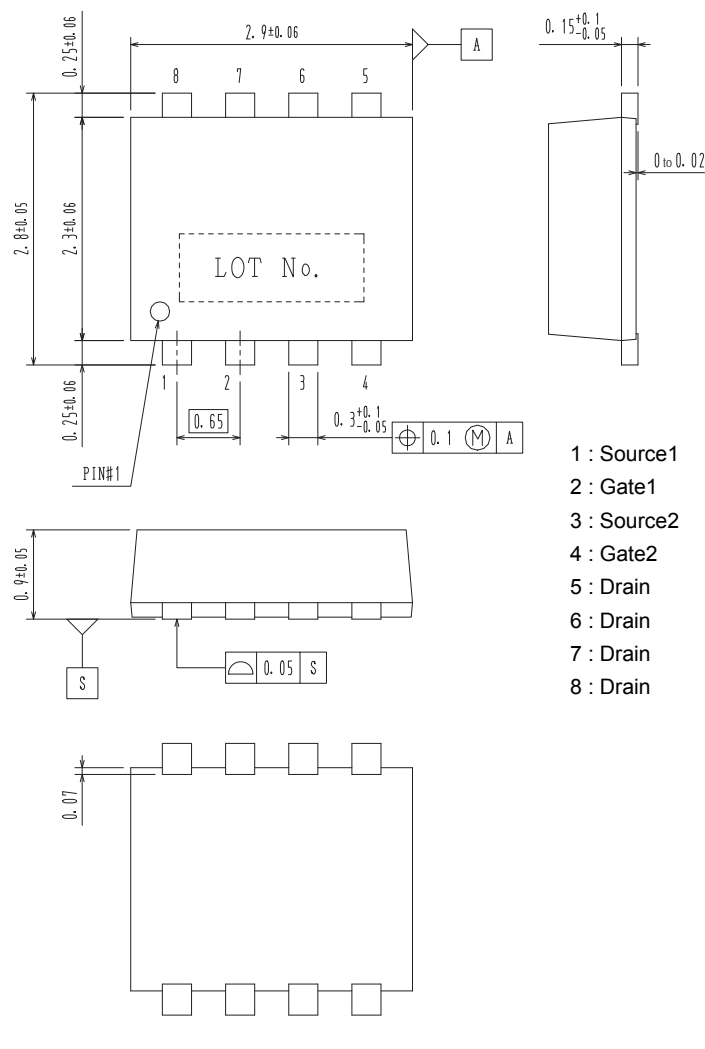




# PACKAGE DIMENSIONS

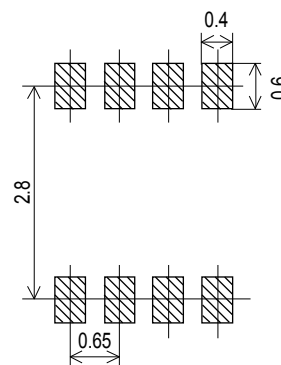
unit : mm

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)
ECH8695R-TL-W	US	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 ECH8695R 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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