

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 _{DSS} | 24 | V |
| Gate to Source Voltage | V _{GSS} | ±12.5 | V |
| Drain Current (DC) | I _D | 14 | A |
| Drain Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1% | I _{DP} | 60 | A |
| Power Dissipation Surface mounted on ceramic substrate (900 mm ² × 0.8 mm) 1 unit | P _D | 1.4 | W |
| Total Dissipation Surface mounted on ceramic substrate (900 mm ² × 0.8 mm) | P _T | 1.5 | W |
| Junction Temperature | T _j | 150 | °C |
| Storage Temperature | T _{stg} | -55 to +150 | °C |

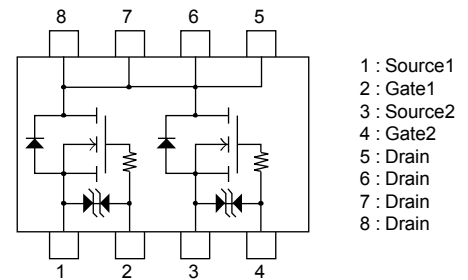
Note 1 : Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

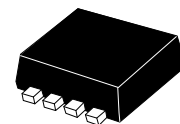
| Parameter | Symbol | Value | Unit |
|--|------------------|-------|------|
| Junction to Ambient Surface mounted on ceramic substrate (900 mm ² × 0.8 mm) 1 unit | R _{θJA} | 89.2 | °C/W |

| V _{DSS} | R _{DS(on)} Max | I _D 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 | |

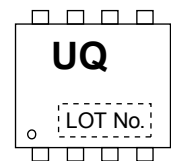
ELECTRICAL CONNECTION N-Channel



MARKING



SOT-28FL / ECH8



ORDERING INFORMATION

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

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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 _D = 1 mA, V _{GS} = 0 V | 24 | | | V |
| Zero-Gate Voltage Drain Current | I _{DSS} | V _{DS} = 20 V, V _{GS} = 0 V | | | 1 | μA |
| Gate to Source Leakage Current | I _{GSS} | V _{GS} = ±8 V, V _{DS} = 0 V | | | ±1 | μA |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = 10 V, I _D = 1 mA | 0.5 | | 1.3 | V |
| Forward Transconductance | g _{FS} | V _{DS} = 10 V, I _D = 5 A | | 8 | | S |
| Static Drain to Source On-State Resistance | R _{DS(on)} | I _D = 5 A, V _{GS} = 4.5 V | 4.4 | 5.6 | 7 | mΩ |
| | | I _D = 5 A, V _{GS} = 4.0 V | 4.6 | 5.8 | 7.5 | mΩ |
| | | I _D = 5 A, V _{GS} = 3.1 V | 5.2 | 6.5 | 9.1 | mΩ |
| | | I _D = 2.5 A, V _{GS} = 2.5 V | 6 | 7.5 | 10.5 | mΩ |
| Turn-ON Delay Time | t _{d(on)} | See Fig. 1 (Note 3) | | 545 | | ns |
| Rise Time | t _r | | | 525 | | ns |
| Turn-OFF Delay Time | t _{d(off)} | | | 18.65 | | μs |
| Fall Time | t _f | | | 22.2 | | μs |
| Turn-ON Delay Time | t _{d(on)} | See Fig. 2 (Note 3) | | 545 | | ns |
| Rise Time | t _r | | | 525 | | ns |
| Turn-OFF Delay Time | t _{d(off)} | | | 1,130 | | μs |
| Fall Time | t _f | | | 410 | | μs |
| Total Gate Charge | Q _g | V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 14 A | | 13 | | nC |
| Gate to Source Charge | Q _{gs} | | | 3 | | nC |
| Gate to Drain "Miller" Charge | Q _{gd} | | | 2.4 | | nC |
| Forward Diode Voltage | V _{SD} | I _S = 14 A, V _{GS} = 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

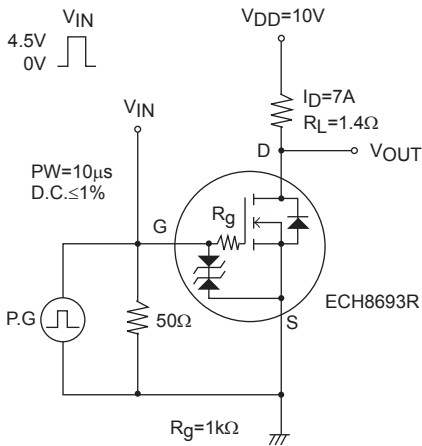
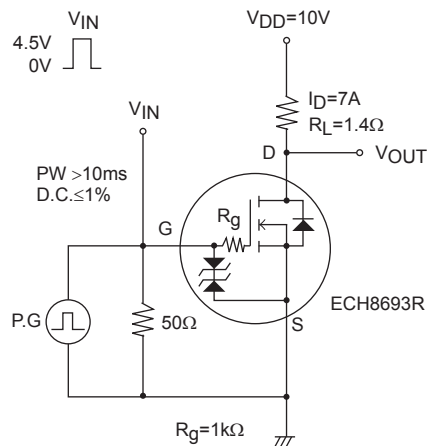
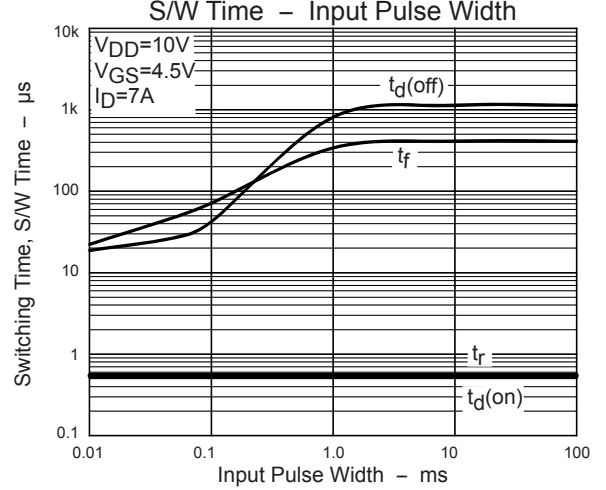
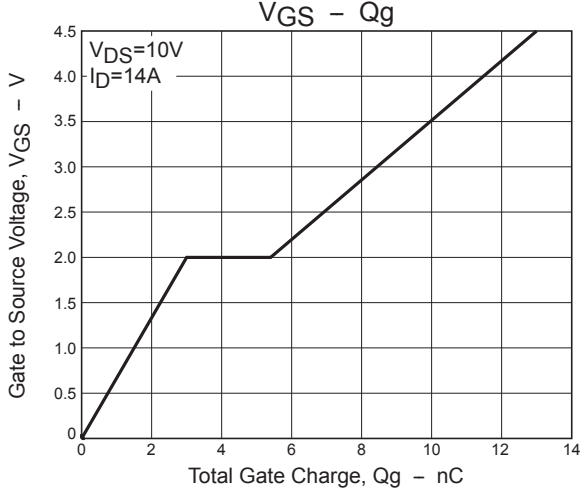
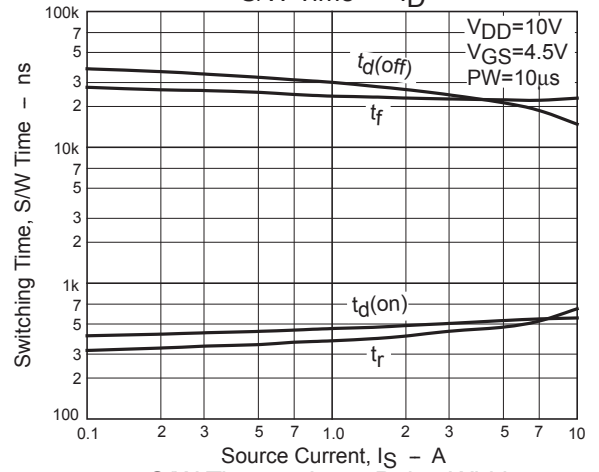
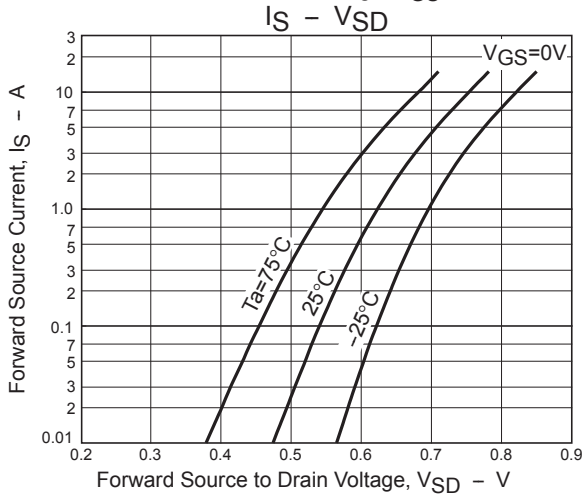
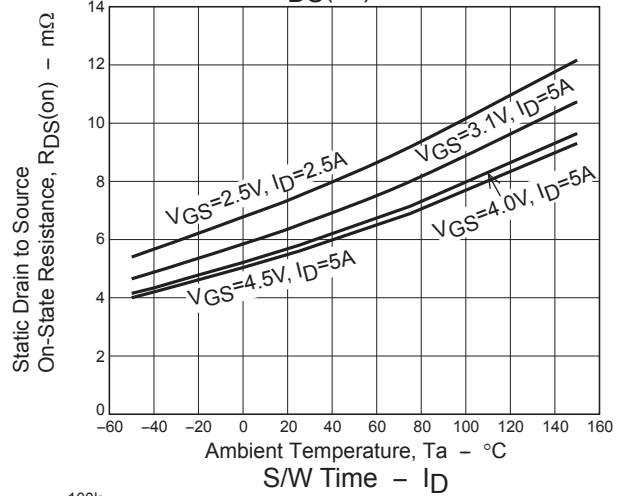
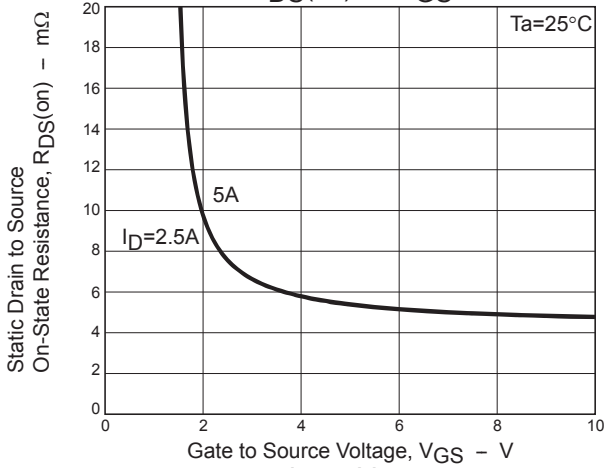
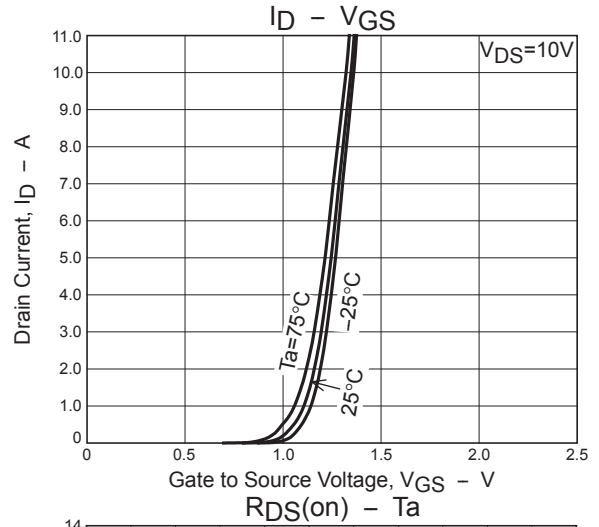
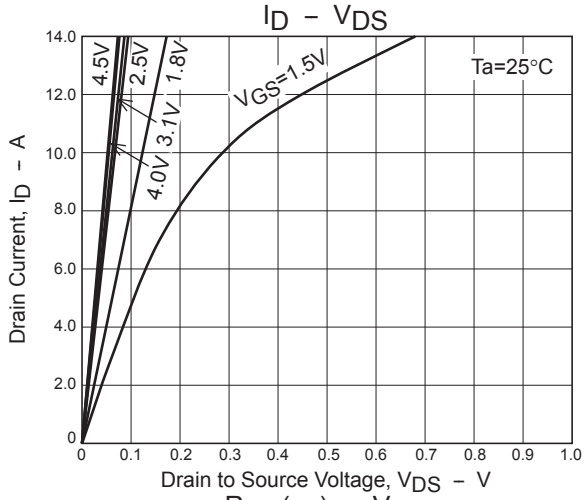


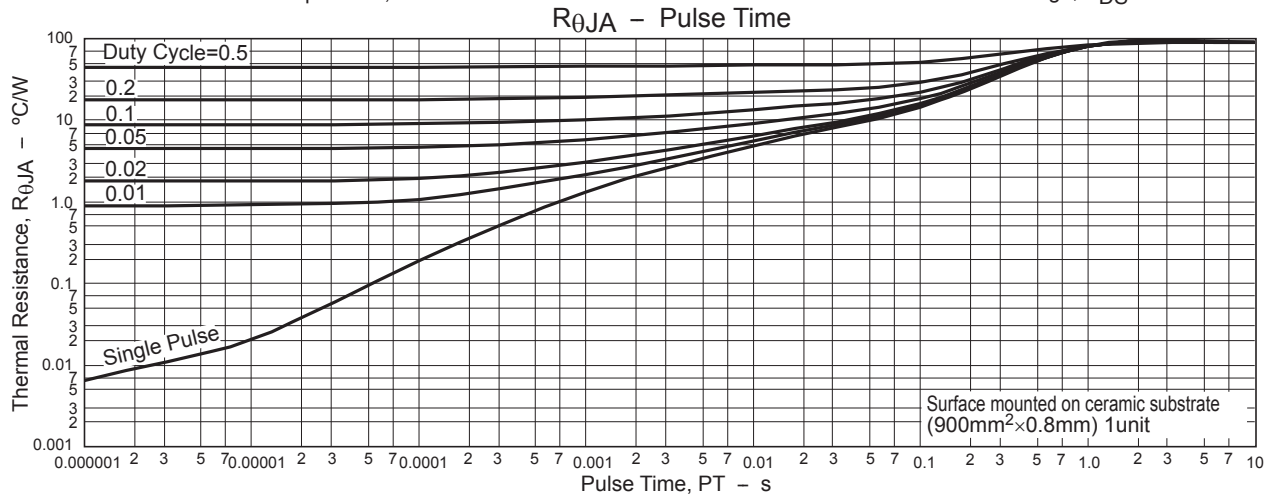
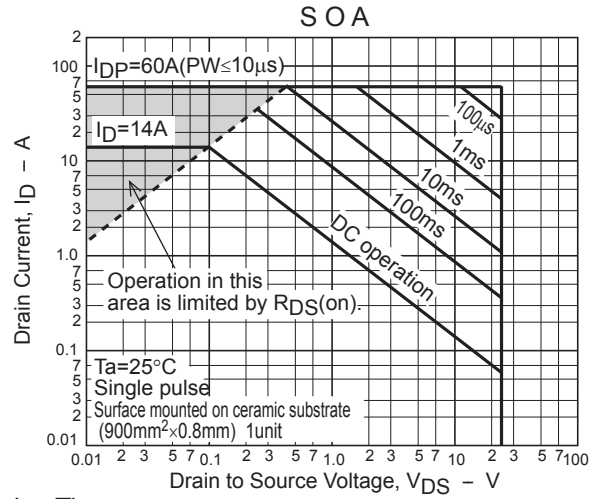
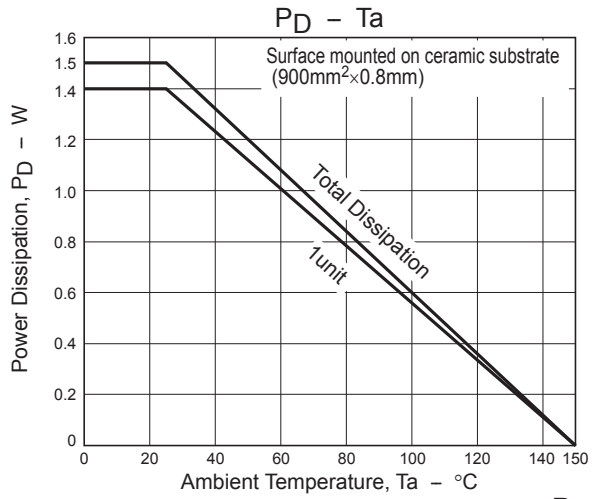
Fig.2 Switching Time Test Circuit 2



ECH8693R



ECH8693R

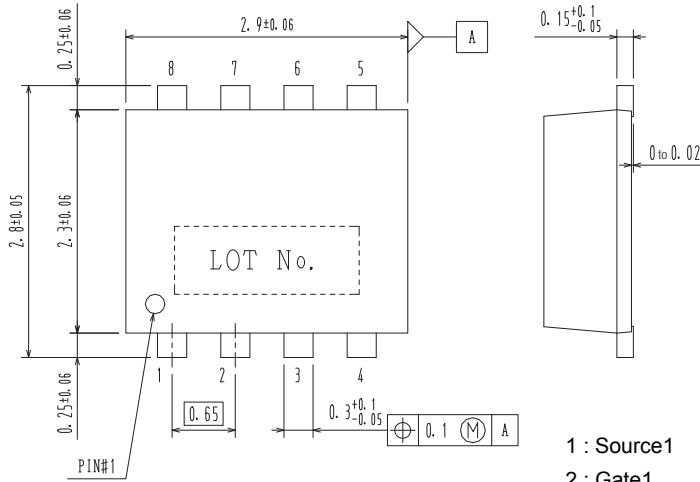


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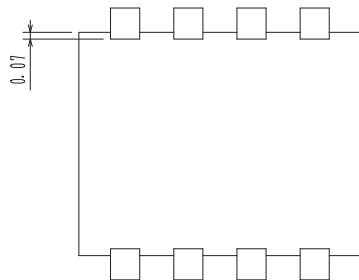
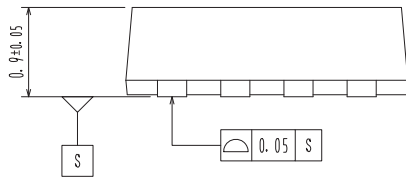
PACKAGE DIMENSIONS

unit : mm

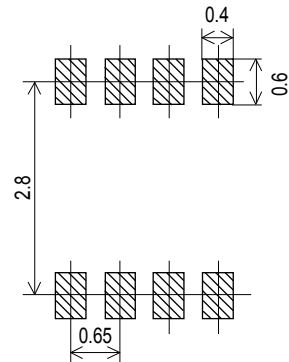
SOT-28FL / ECH8
CASE 318BF
ISSUE O



- 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

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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