

# ECH8659

## Power MOSFET 30V, 24mΩ, 7A, Dual N-Channel

This Power MOSFET is produced using ON Semiconductor's trench technology, which is specifically designed to minimize gate charge and low on resistance. This device is suitable for applications with low gate charge driving or low on resistance requirements.

### Features

- 4V drive
- Composite type, Facilitating high-density mounting
- ESD Diode-Protected Gate
- Pb-Free, Halogen Free and RoHS compliance

### Typical Applications

- LiB Protection Switch
- Motor Drive

### SPECIFICATIONS

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

| Parameter                                                                                    | Symbol           | Value       | Unit |
|----------------------------------------------------------------------------------------------|------------------|-------------|------|
| Drain to Source Voltage                                                                      | V <sub>DSS</sub> | 30          | V    |
| Gate to Source Voltage                                                                       | V <sub>GSS</sub> | ±20         | V    |
| Drain Current (DC)                                                                           | I <sub>D</sub>   | 7           | A    |
| Drain Current (Pulse)<br>PW ≤ 10μs, duty cycle ≤ 1%                                          | I <sub>DP</sub>  | 40          | A    |
| Power Dissipation<br>When mounted on ceramic substrate<br>(900mm <sup>2</sup> × 0.8mm) 1unit | P <sub>D</sub>   | 1.3         | W    |
| Total Dissipation<br>When mounted on ceramic substrate<br>(900mm <sup>2</sup> × 0.8mm)       | 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<br>When mounted on ceramic substrate<br>(900mm <sup>2</sup> × 0.8mm) 1unit | R <sub>θJA</sub> | 96.1  | °C/W |

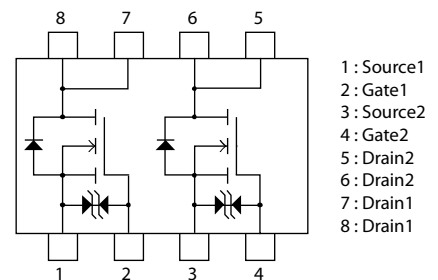


**ON Semiconductor®**

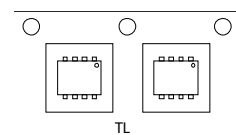
[www.onsemi.com](http://www.onsemi.com)

| V <sub>DSS</sub> | R <sub>DS(on)</sub> Max | I <sub>D</sub> Max |
|------------------|-------------------------|--------------------|
| 30V              | 24mΩ@ 10V               | 7A                 |
|                  | 41mΩ@ 4.5V              |                    |
|                  | 55mΩ@ 4V                |                    |

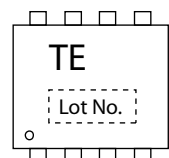
### ELECTRICAL CONNECTION N-Channel



### PACKING TYPE : TL



### MARKING



### ORDERING INFORMATION

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

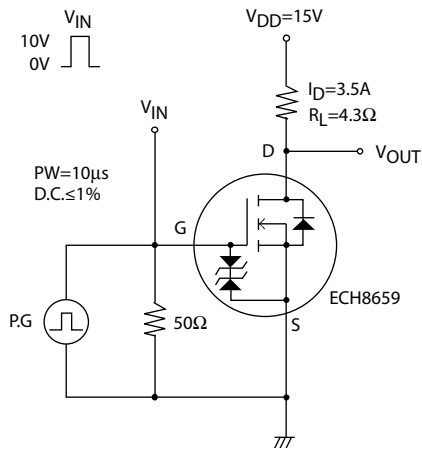
## ECH8659

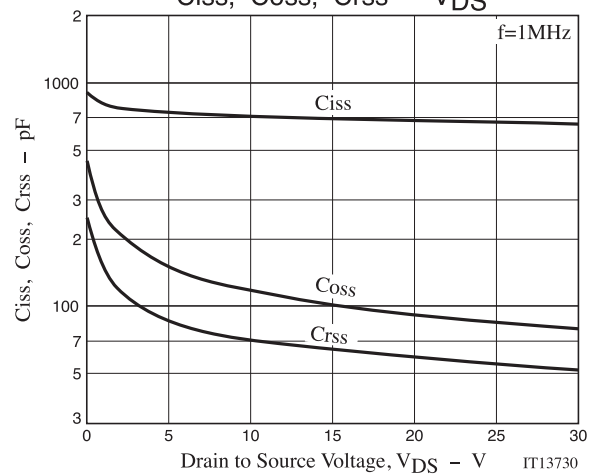
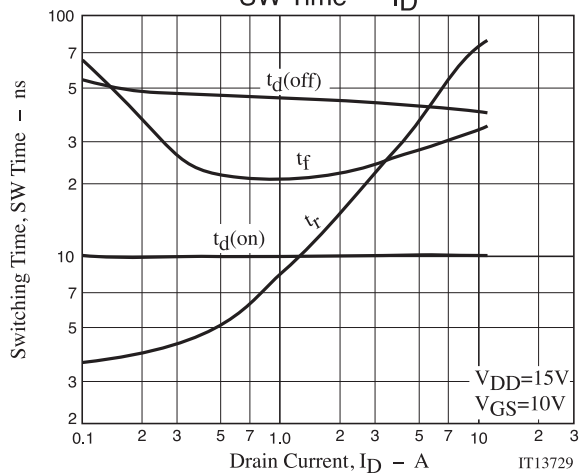
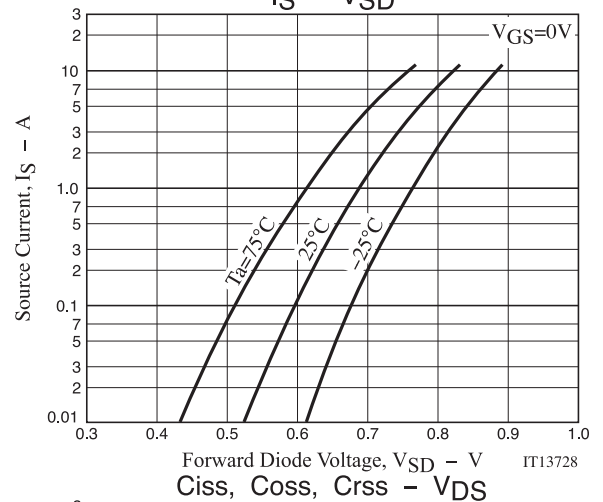
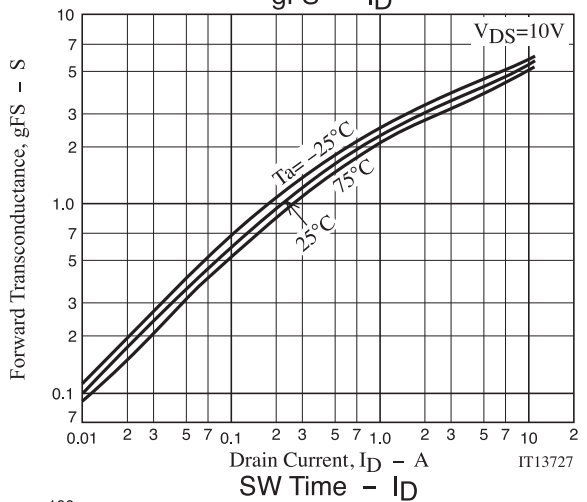
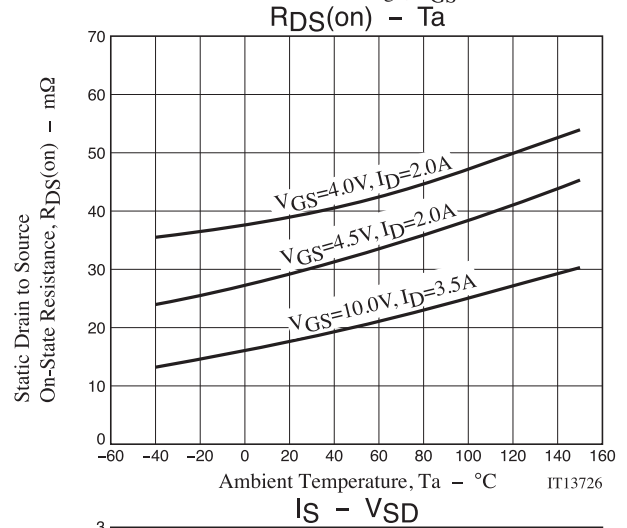
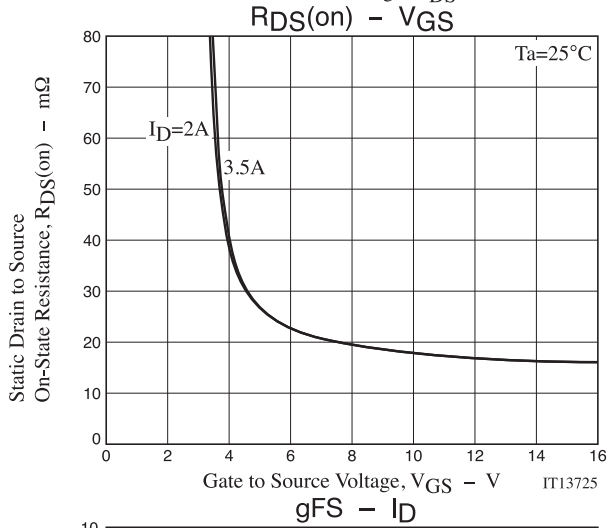
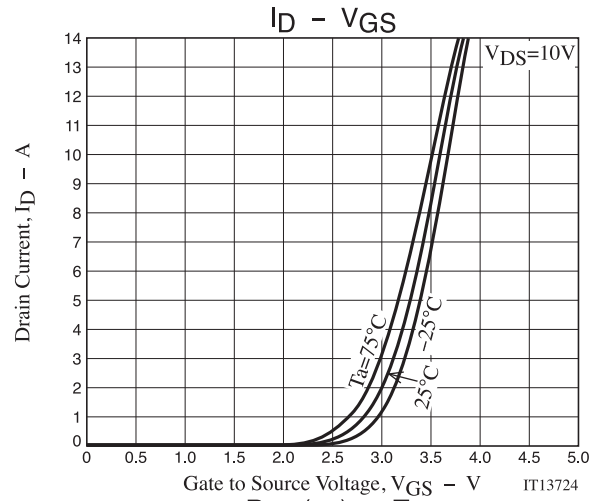
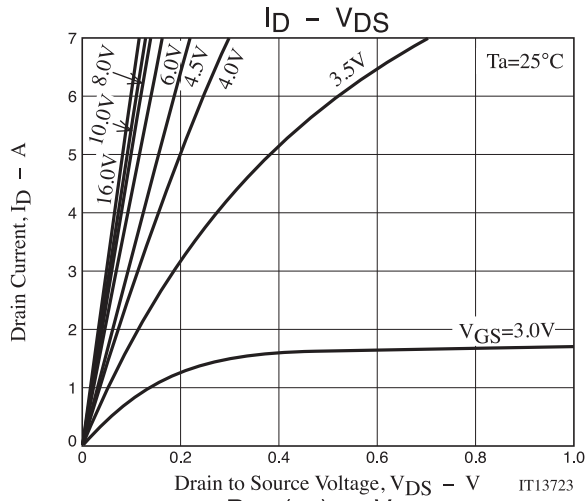
### ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 2)

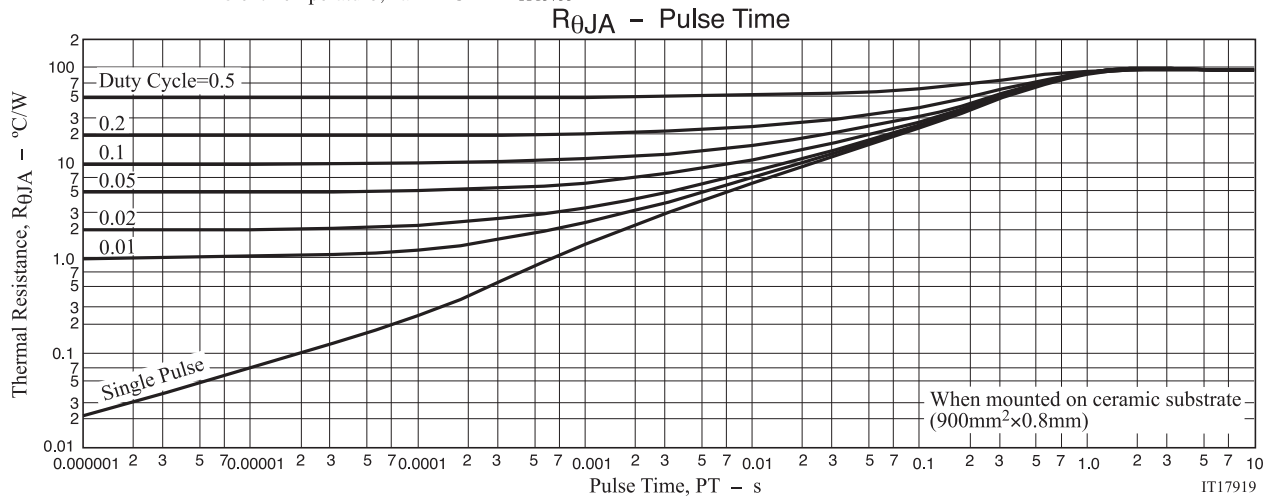
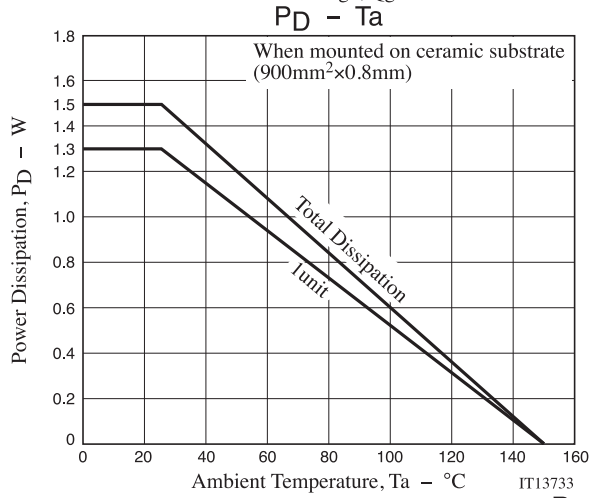
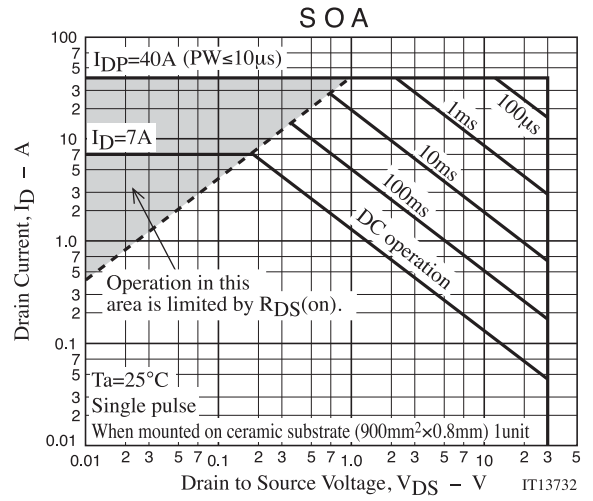
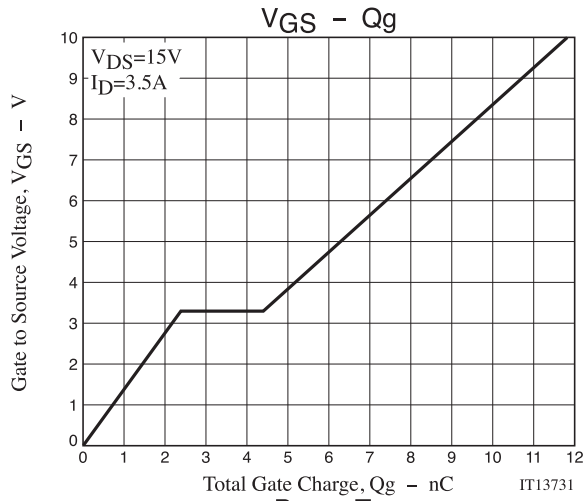
| Parameter                                  | Symbol               | Conditions                                                       | Value |      |     | Unit |
|--------------------------------------------|----------------------|------------------------------------------------------------------|-------|------|-----|------|
|                                            |                      |                                                                  | min   | typ  | max |      |
| Drain to Source Breakdown Voltage          | V(BR)DSS             | I <sub>D</sub> =1mA, V <sub>GS</sub> =0V                         | 30    |      |     | V    |
| Zero-Gate Voltage Drain Current            | I <sub>DSS</sub>     | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V                        |       |      | 1   | μA   |
| Gate to Source Leakage Current             | I <sub>GSS</sub>     | V <sub>GS</sub> =±16V, V <sub>DS</sub> =0V                       |       |      | ±10 | μA   |
| Gate Threshold Voltage                     | V <sub>GS(th)</sub>  | V <sub>DS</sub> =10V, I <sub>D</sub> =1mA                        | 1.2   |      | 2.6 | V    |
| Forward Transconductance                   | g <sub>FS</sub>      | V <sub>DS</sub> =10V, I <sub>D</sub> =3.5A                       | 2.2   | 3.7  |     | S    |
| Static Drain to Source On-State Resistance | R <sub>DS(on)1</sub> | I <sub>D</sub> =3.5A, V <sub>GS</sub> =10V                       |       | 18   | 24  | mΩ   |
|                                            | R <sub>DS(on)2</sub> | I <sub>D</sub> =2A, V <sub>GS</sub> =4.5V                        |       | 29   | 41  | mΩ   |
|                                            | R <sub>DS(on)3</sub> | I <sub>D</sub> =2A, V <sub>GS</sub> =4V                          |       | 39   | 55  | mΩ   |
| Input Capacitance                          | C <sub>iss</sub>     | V <sub>DS</sub> =10V, f=1MHz                                     |       | 710  |     | pF   |
| Output Capacitance                         | C <sub>oss</sub>     |                                                                  |       | 120  |     | pF   |
| Reverse Transfer Capacitance               | C <sub>rss</sub>     |                                                                  |       | 72   |     | pF   |
| Turn-ON Delay Time                         | t <sub>d(on)</sub>   | See specified Test Circuit                                       |       | 10   |     | ns   |
| Rise Time                                  | t <sub>r</sub>       |                                                                  |       | 25   |     | ns   |
| Turn-OFF Delay Time                        | t <sub>d(off)</sub>  |                                                                  |       | 43   |     | ns   |
| Fall Time                                  | t <sub>f</sub>       |                                                                  |       | 25   |     | ns   |
| Total Gate Charge                          | Q <sub>g</sub>       | V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A |       | 11.8 |     | nC   |
| Gate to Source Charge                      | Q <sub>gs</sub>      |                                                                  |       | 2.4  |     | nC   |
| Gate to Drain "Miller" Charge              | Q <sub>gd</sub>      |                                                                  |       | 2.0  |     | nC   |
| Forward Diode Voltage                      | V <sub>SD</sub>      | I <sub>S</sub> =7A, V <sub>GS</sub> =0V                          |       | 0.79 | 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.

### Switching Time Test Circuit





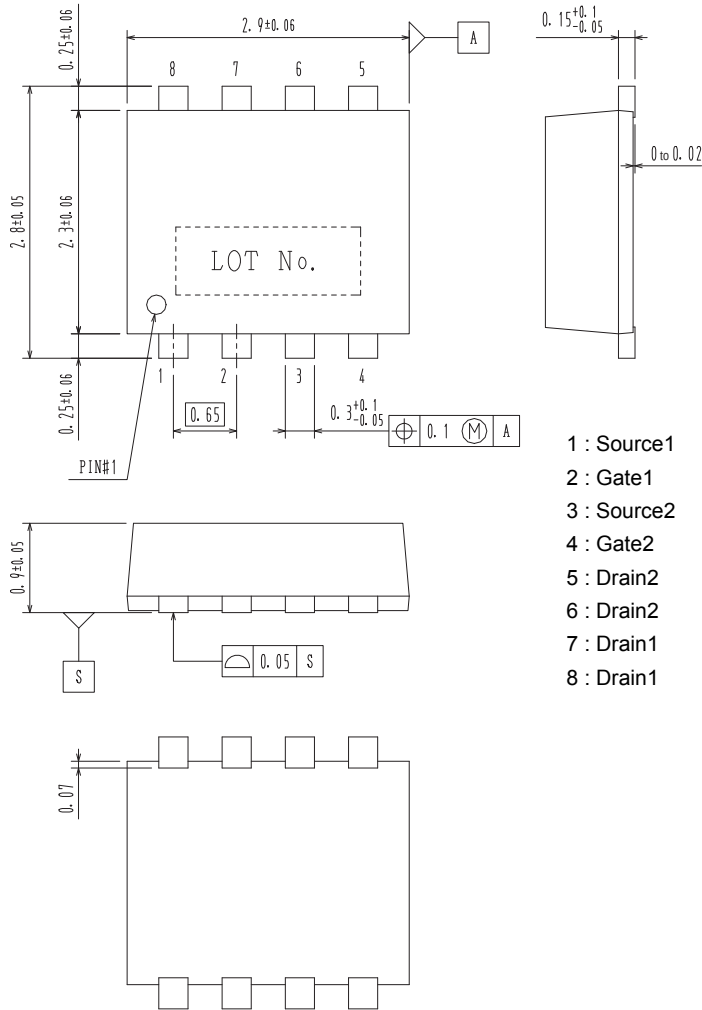


# ECH8659

## PACKAGE DIMENSIONS

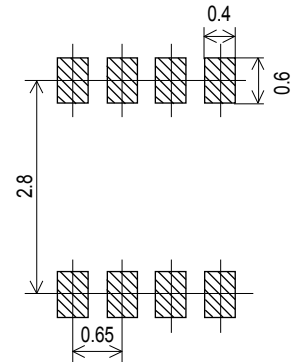
unit : mm

SOT-28FL / ECH8  
CASE 318BF  
ISSUE O



- 1 : Source1
- 2 : Gate1
- 3 : Source2
- 4 : Gate2
- 5 : Drain2
- 6 : Drain2
- 7 : Drain1
- 8 : Drain1

### Recommended Soldering Footprint



## ORDERING INFORMATION

| Device       | Marking | Package                                     | Shipping (Qty / Packing) |
|--------------|---------|---------------------------------------------|--------------------------|
| ECH8659-TL-H | TE      | SOT-28FL / ECH8<br>(Pb-Free / Halogen Free) | 3,000 / Tape & Reel      |
| ECH8659-TL-W |         |                                             |                          |

† 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 ECH8659 is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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