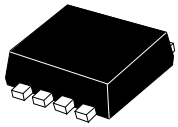
# MOSFET – Power,
## Complementary Dual ECH8

## 60 V, 4.7 A, 55 mΩ
## -60 V, -3.5 A, 94 mΩ

# ECH8690



SOT−28FL/ECH8
CASE 318BF

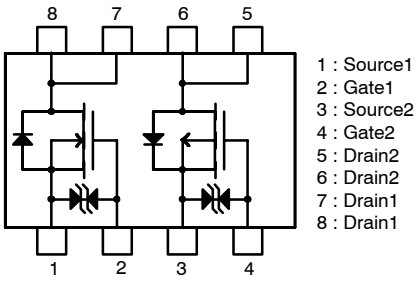
### Description

This Power MOSFET is Produced Using onsemi's Trench Technology, Which is Specifically Designed to Low on Resistance. This devices is suitable for applications with low on resistance requirements.

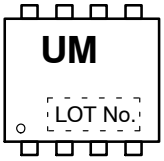
### Features

- On−State Resistance
  - Nch:$R_{DS(on)}$ 1 = 42 mΩ (typ.)
  - Pch:$R_{DS(on)}$ 1 = 73 mΩ (typ.)
- Protection Diode In
- 4 V rive
- Nch + Pch MOSFET
- This Device is Pb−Free, Halogen Free and RoHS Compliant

### ELECTRICAL CONNECTION




### MARKING DIAGRAM




### ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C)

| Symbol | Parameter | Conditions | N−Channel | P−Channel | Unit |
|---|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | | 60 | −60 | V |
| $V_{GSS}$ | Gate to Source Voltage | | ±20 | ±20 | V |
| $I_D$ | Drain Current (DC) | | 4.7 | −3.5 | A |
| $I_{DP}$ | Drain Current (Pulse) | PW ≤ 10 μs, duty cycle ≤ 1% | 30 | −30 | A |
| $P_D$ | Allowable Power Dissipation | When mounted on ceramic substrate (1200 $mm^2$ X 0.8 mm) 1 unit | 1.5 | | W |
| $P_T$ | Total Dissipation | When mounted on ceramic substrate (1200 $mm^2$ X 0.8 mm) | 1.8 | | W |
| Tch | Channel Temperature | | 150 | | °C |
| Tstg | Storage Temperature | | −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.

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C) (Note 3)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **[N−channel]** | | | | | | |
| $V_{(BR)DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = 1 mA, $V_{GS}$ = 0 V | 60 | − | − | V |
| $I_{DSS}$ | Zero−Gate Voltage Drain Current | $V_{DS}$ = 60 V, $V_{GS}$ = 0 V | − | − | 1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±16 V, $V_{DS}$ = 0 V | | − | ±10 | μA |
| $V_{GS(off)}$ | Cutoff Voltage | $V_{DS}$ = 10 V, $I_D$ = 1 mA | 1.2 | − | 2.6 | V |
| \| yfs \| | Forward Transfer Admittance | $V_{DS}$ =10 V, $I_D$ = 2 A | − | 4.2 | − | S |
| $R_{DS(on)1}$ | Static Drain to Source On−State Resistance | $I_D$ = 2 A, $V_{GS}$ = 10 V | − | 42 | 55 | mΩ |
| $R_{DS(on)2}$ | | $I_D$ = 1 A, $V_{GS}$ = 4.5 V | − | 53 | 74 | mΩ |
| $R_{DS(on)3}$ | | $I_D$ = 1 A, $V_{GS}$ = 4 V | − | 61 | 85 | mΩ |
| Ciss | Input Capacitance | $V_{DS}$ = 20 V, f = 1 MHz | − | 955 | − | pF |
| Coss | Output Capacitance | | − | 58 | − | pF |
| Crss | Reverse Transfer Capacitance | | − | 45 | − | pF |
| $t_{d(on)}$ | Turn−ON Delay Time | See specified Test Circuit. | − | 7 | − | ns |
| $t_r$ | Rise Time | | − | 8.4 | − | ns |
| $t_{d(off)}$ | Turn−OFF Delay Time | | − | 76 | − | ns |
| $t_f$ | Fall Time | | − | 23 | − | ns |
| Qg | Total Gate Charge | $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 4.7 A | − | 18 | − | nC |
| Qgs | Gate to Source Charge | | − | 3 | − | nC |
| Qgd | Gate to Drain “Miller” Charge | | − | 2.8 | − | nC |
| $V_{SD}$ | Diode Forward Voltage | $I_S$ = 4.7 A, $V_{GS}$ = 0 V | − | 0.82 | 1.2 | V |
| **[P−channel]** | | | | | | |
| $V_{(BR)DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = −1 mA, $V_{GS}$ = 0 V | −60 | − | − | V |
| $I_{DSS}$ | Zero−Gate Voltage Drain Current | $V_{DS}$ = −60 V, $V_{GS}$ = 0 V | − | − | −1 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±16 V, $V_{DS}$ = 0 V | | − | ±10 | μA |
| $V_{GS(off)}$ | Cutoff Voltage | $V_{DS}$ = −10 V, $I_D$ = −1 mA | −1.2 | − | −2.6 | V |
| \| yfs \| | Forward Transfer Admittance | $V_{DS}$ = −10 V, $I_D$ = −1.5 A | − | 3.4 | − | S |
| $R_{DS(on)1}$ | Static Drain to Source On−State Resistance | $I_D$ = −1 A, $V_{GS}$ = −10 V | − | 73 | 94 | mΩ |
| $R_{DS(on)2}$ | | $I_D$ = −0.5 A, $V_{GS}$ = −4.5 V | − | 97 | 135 | mΩ |
| $R_{DS(on)3}$ | | $I_D$ = −0.5 A, $V_{GS}$ = 4 V | − | 108 | 153 | mΩ |

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C) (Note 3) (continued)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **[P−channel]** | | | | | | |
| Ciss | Input Capacitance | $V_{DS}$ = −20 V, f = 1 MHz | – | 790 | – | pF |
| Coss | Output Capacitance | | – | 63 | – | pF |
| Crss | Reverse Transfer Capacitance | | – | 45 | – | pF |
| $t_{d(on)}$ | Turn−ON Delay Time | See specified Test Circuit. | – | 10 | – | ns |
| $t_r$ | Rise Time | | – | 8.8 | – | ns |
| $t_{d(off)}$ | Turn−OFF Delay Time | | – | 84 | – | ns |
| $t_f$ | Fall Time | | – | 29 | – | ns |
| Qg | Total Gate Charge | $V_{DS}$ = −30 V, $V_{GS}$ = −10 V, $I_D$ = −3.5 A | – | 15 | – | nC |
| Qgs | Gate to Source Charge | | – | 2.6 | – | nC |
| Qgd | Gate to Drain “Miller” Charge | | – | 2.2 | – | nC |
| $V_{SD}$ | Diode Forward Voltage | $I_S$ = −3.5 A, $V_{GS}$ = 0 V | – | −0.83 | −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.

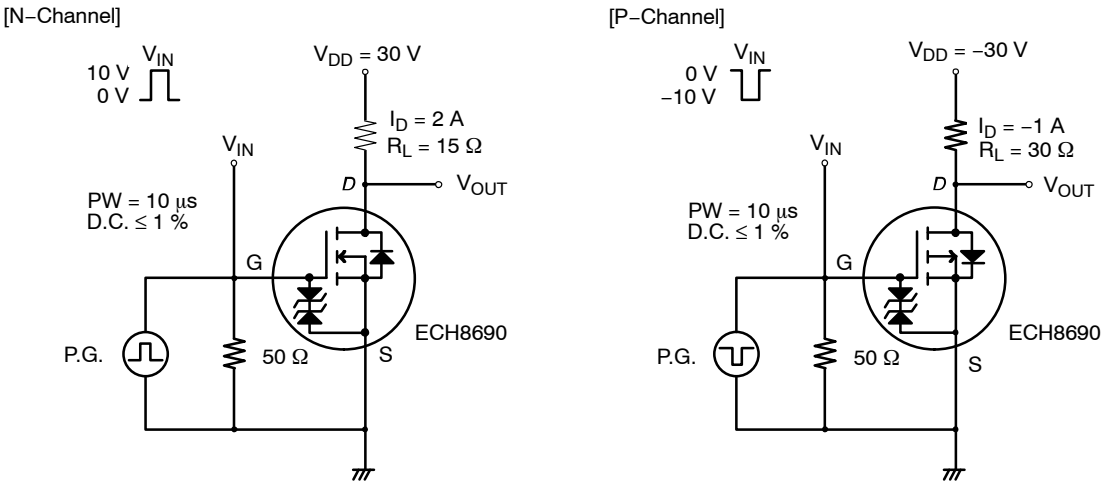



**Figure 1. Switching Time Test Circuit**

## TYPICAL CHARACTERISTICS

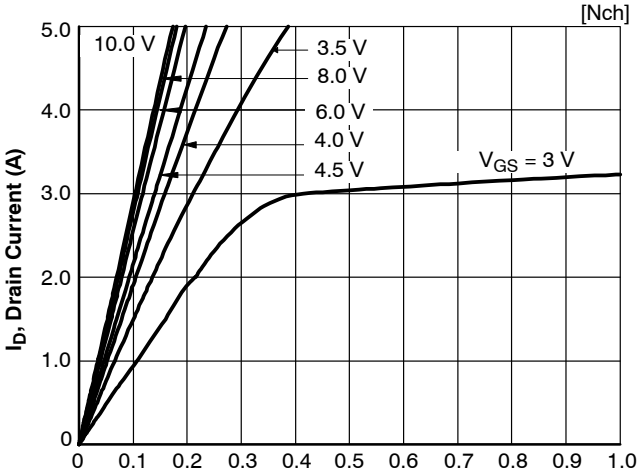



Figure 2. $I_D - V_{DS}$

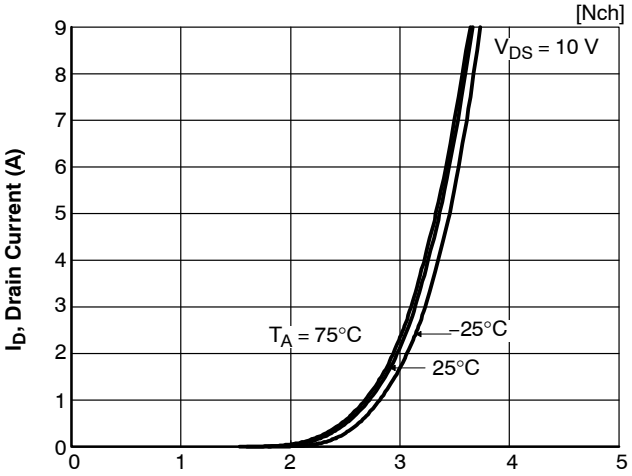



Figure 3. $I_D - V_{GS}$

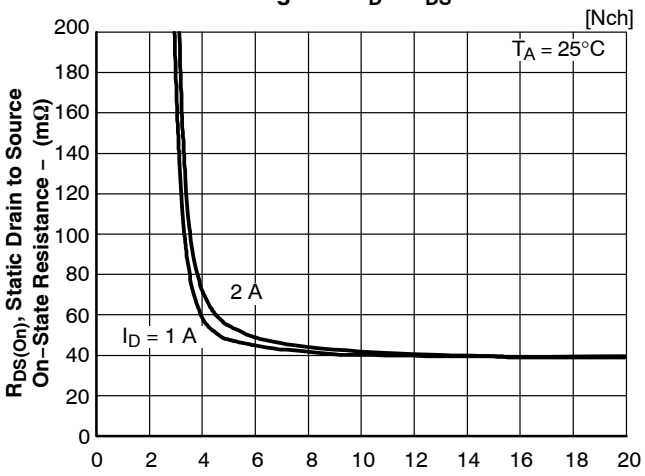



Figure 4. $R_{DS(on)} - V_{GS}$

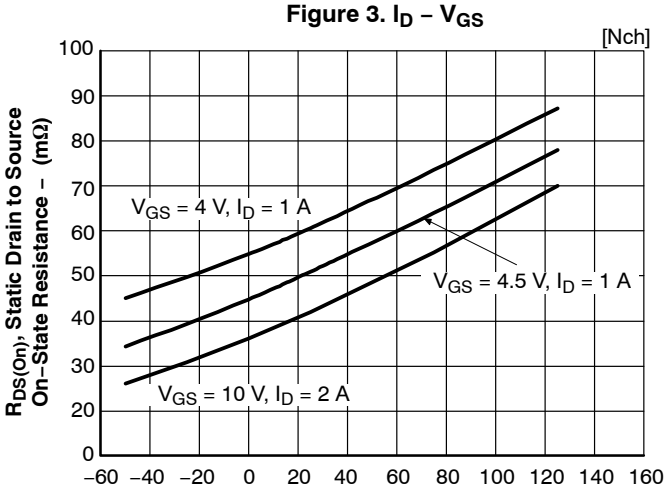



Figure 5. $R_{DS(on)} - T_A$

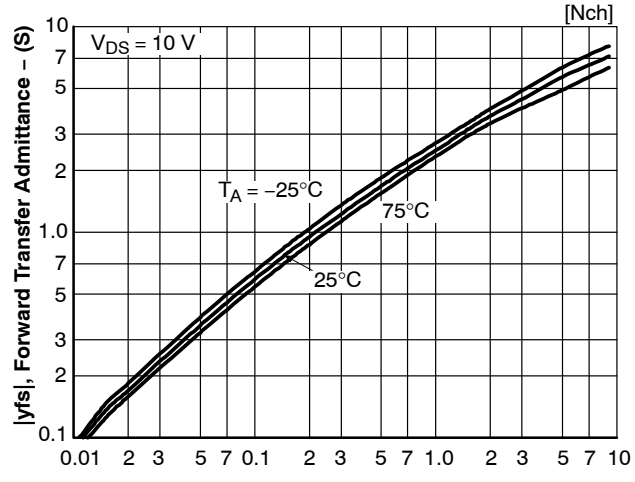



Figure 6. $|Yfs| - I_D$

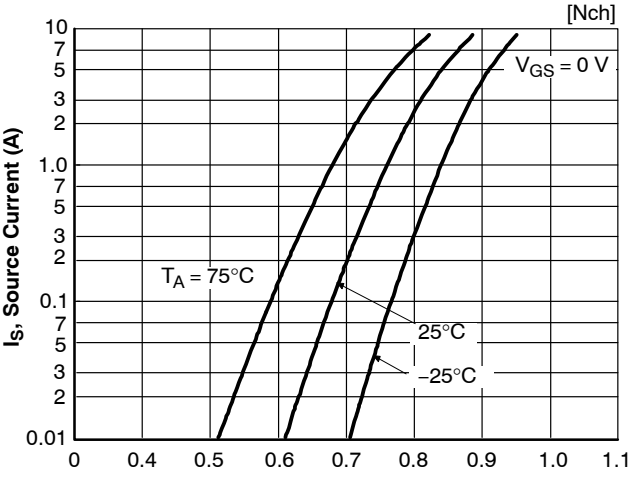



Figure 7. $I_S - V_{SD}$

## TYPICAL CHARACTERISTICS (CONTINUED)

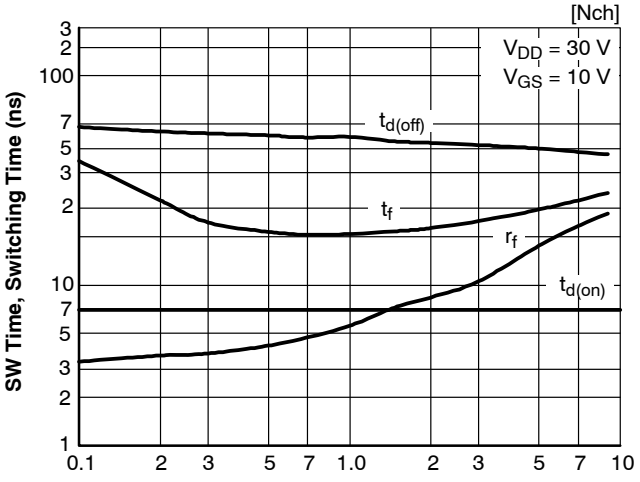



Figure 8. $I_D$ – S/W Time

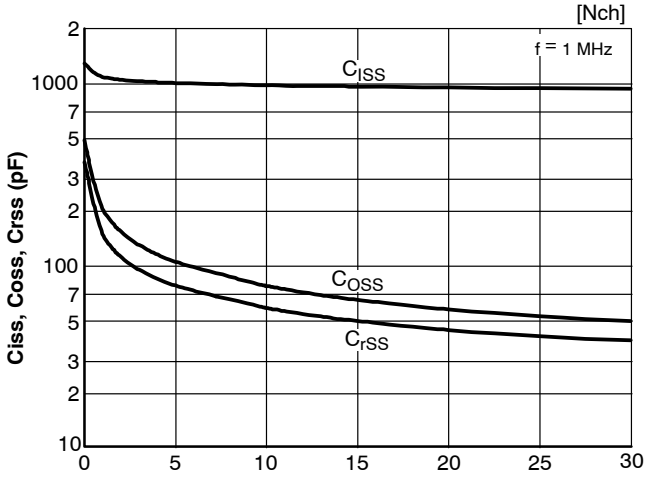



Figure 9. Ciss, Coss,Crss – $V_{DS}$

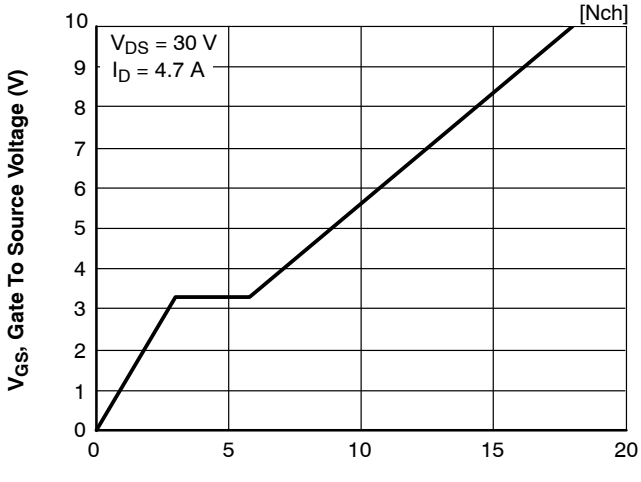



Figure 10. $V_{GS}$ – $Q_g$

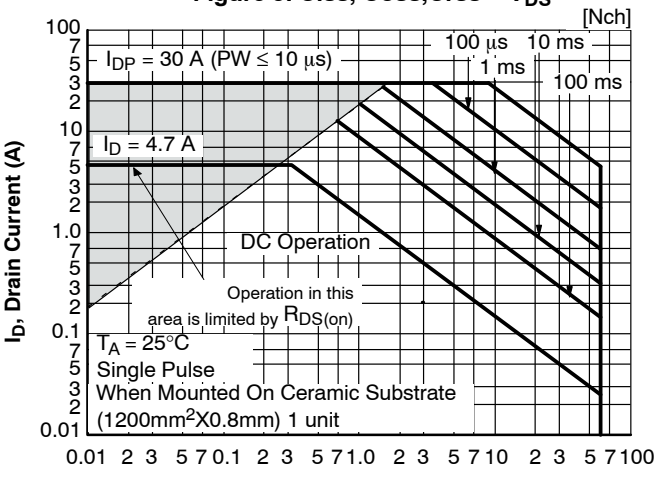



Figure 11. S O A

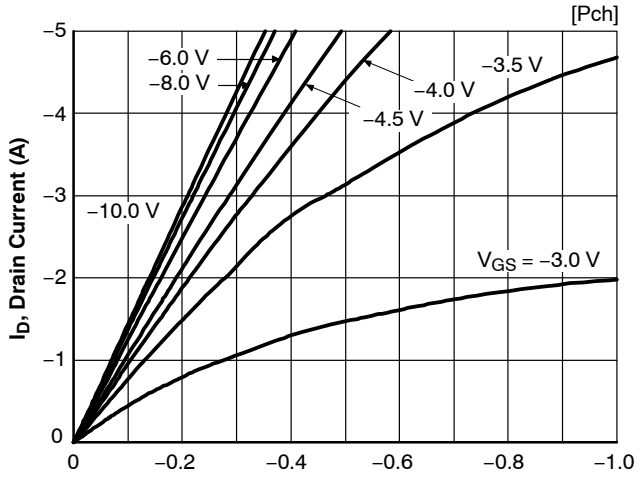



Figure 12. $I_D$ – $V_{DS}$

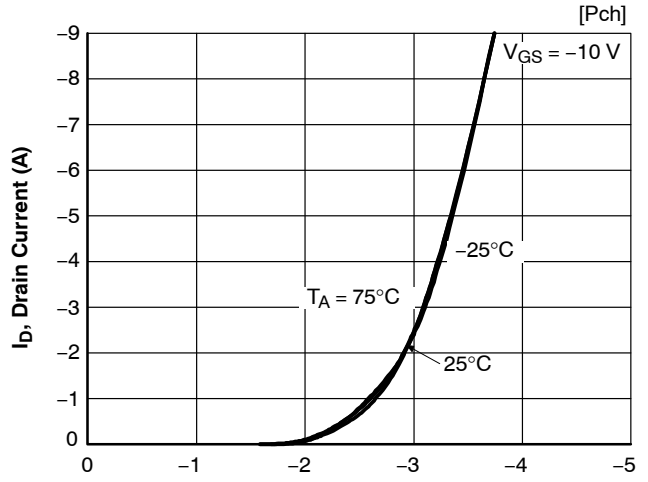



Figure 13. $I_D$ – $V_{GS}$

## TYPICAL CHARACTERISTICS (CONTINUED)

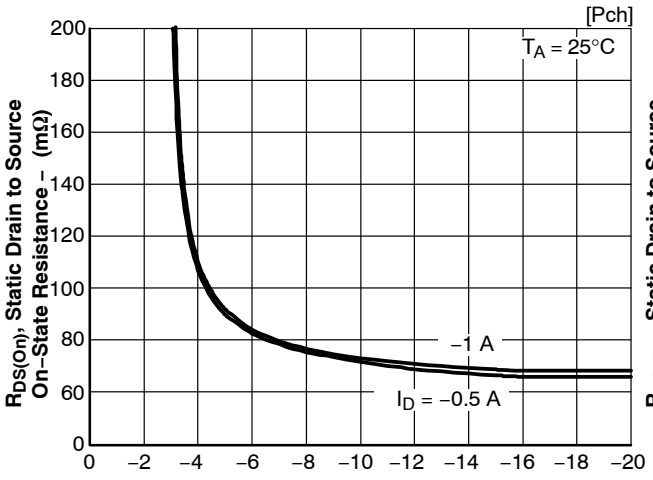



Figure 14. $R_{DS(on)}$ − $V_{GS}$

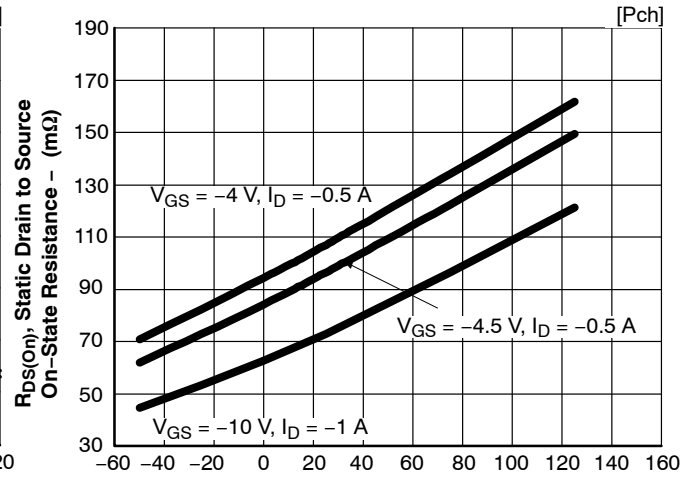



Figure 15. $R_{DS(on)}$ − $T_A$

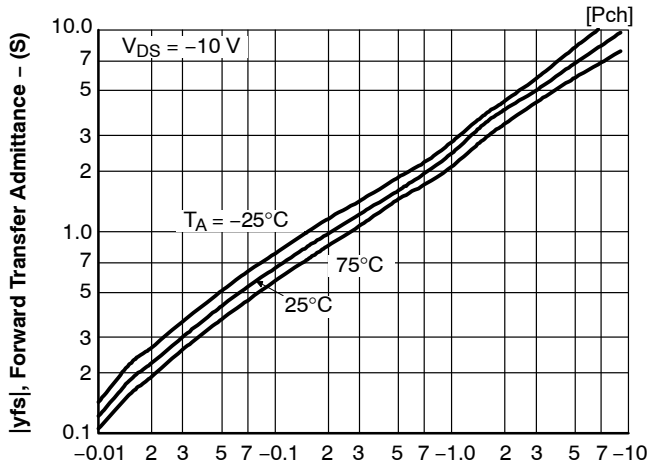



Figure 16. Yfs| − $I_D$

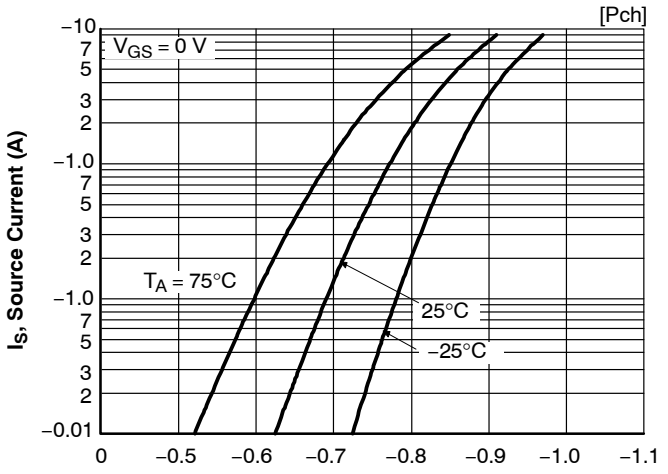



Figure 17. $I_S$ − $V_{SD}$

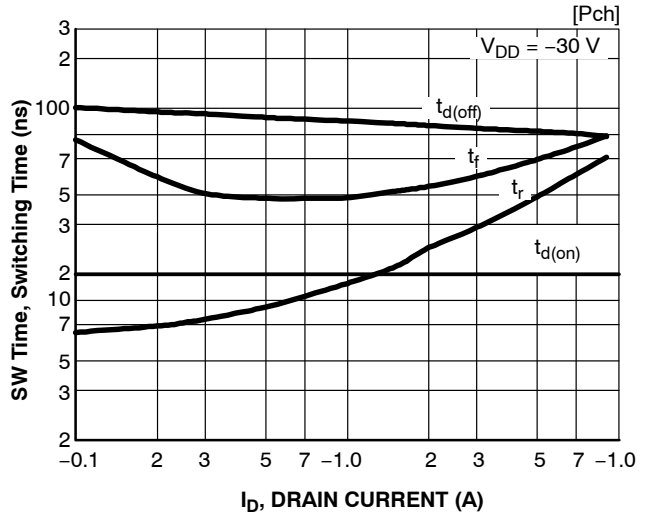



Figure 18. $I_D$ − S/W Time

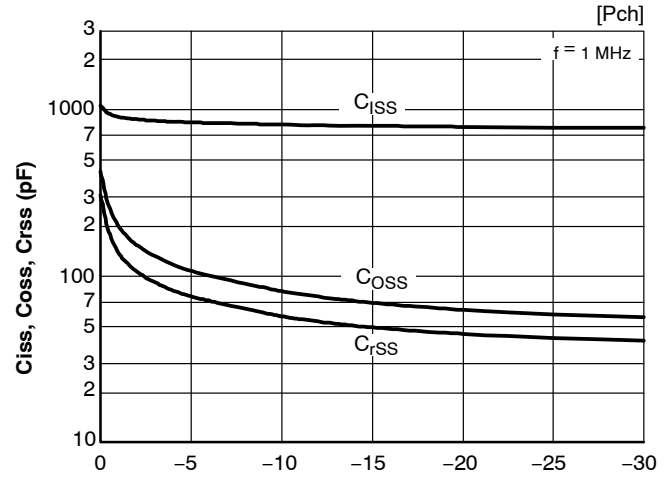



Figure 19. Ciss, Coss,Crss − $V_{DS}$

## TYPICAL CHARACTERISTICS (CONTINUED)

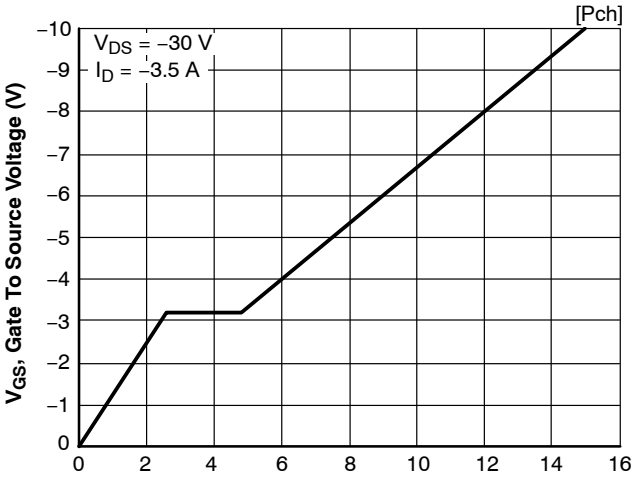



Figure 20. $V_{GS}$ – $Q_g$

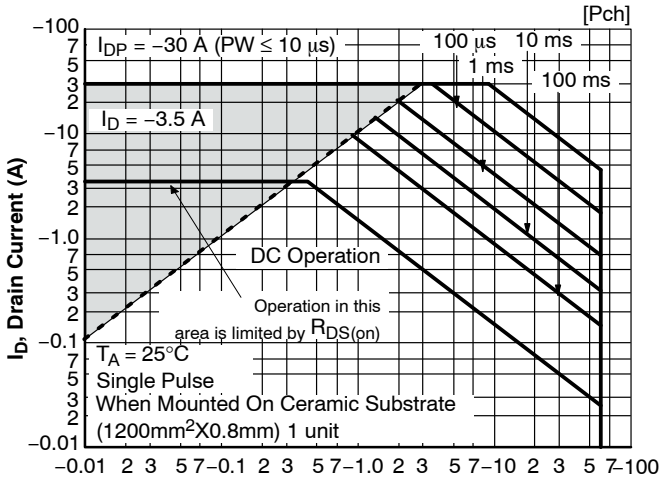



Figure 21. S O A

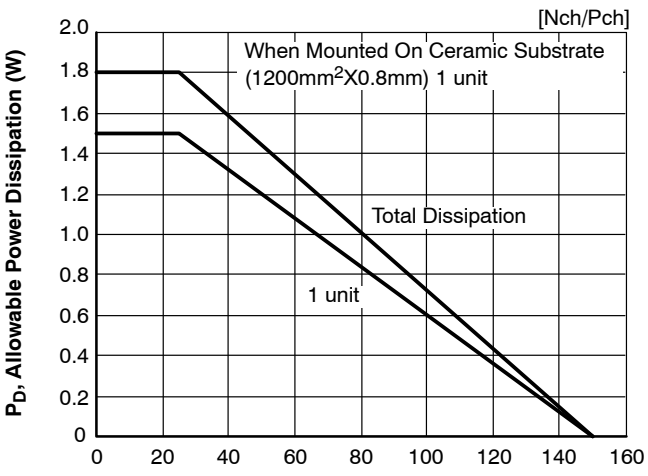



Figure 22. $P_D$ – $T_A$

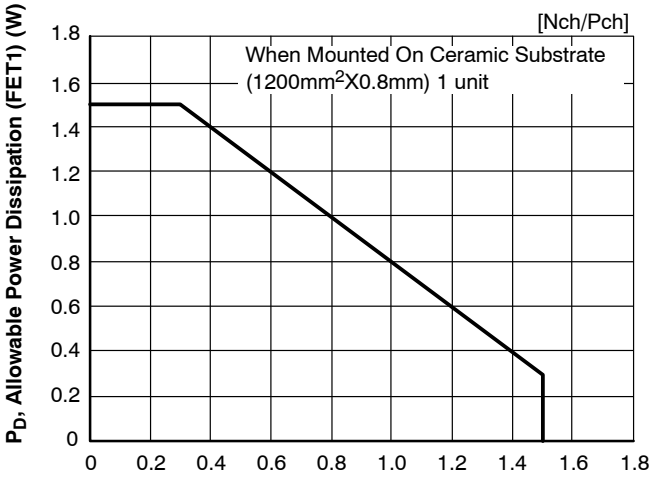



Figure 23. $P_D$ (FET1) – $P_D$ (FET2)

### ORDERING INFORMATION

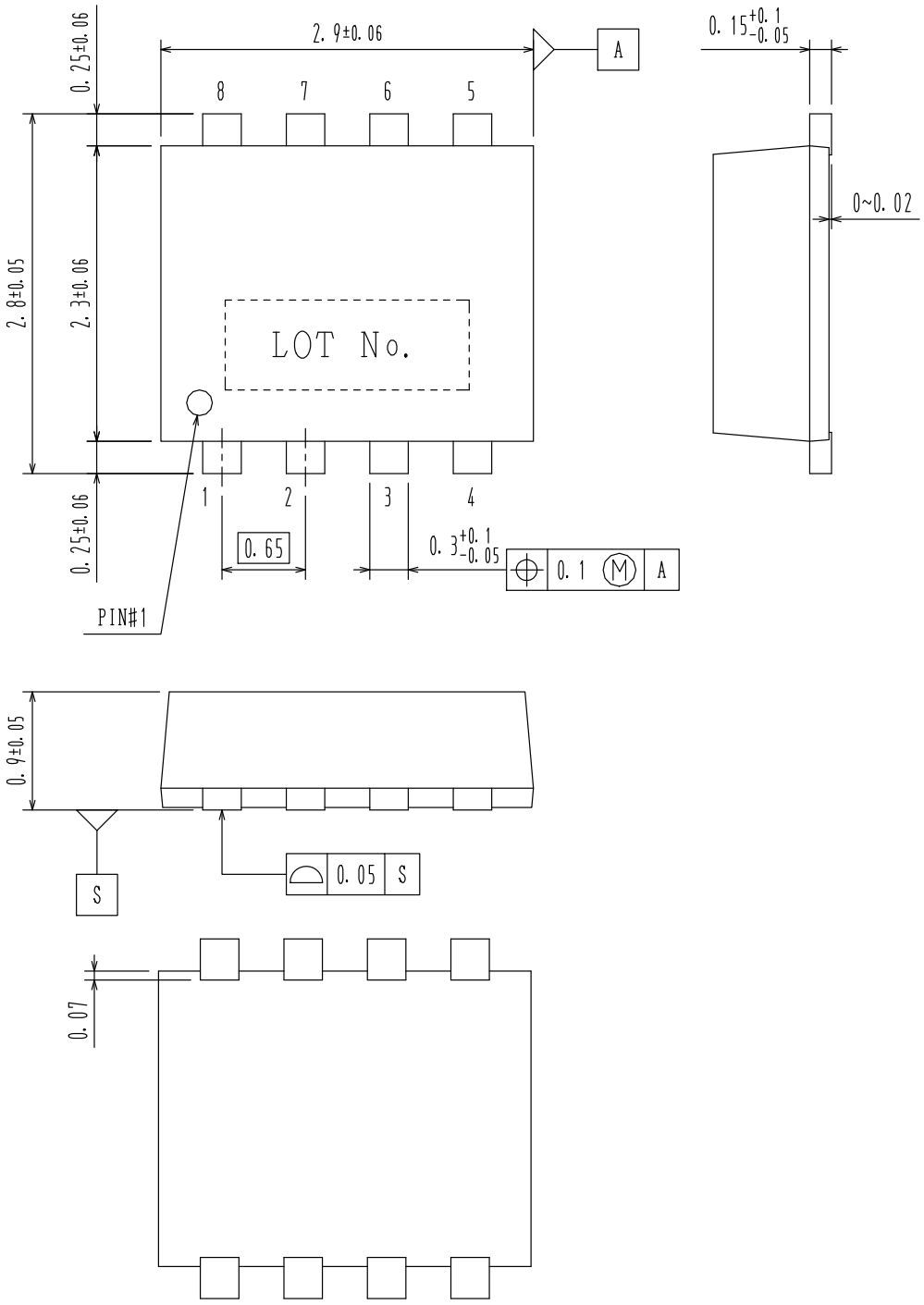
| Product Number | Package | Shipping† |
|---|---|---|
| ECH8690−TL−H | SOT−28FL / ECH8<br>(Pb−Free / Halogen Free) | 3000 / Tape and Reel |

†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.

Note on usage : Since the ECH8690 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.

**SOT−28FL / ECH8**
CASE 318BF
ISSUE O

DATE 31 MAR 2012

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| **DESCRIPTION:** | **SOT−28FL / ECH8** | | **PAGE 1 OF 1** |

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**For additional information, please contact your local Sales Representative at** www.onsemi.com/support/sales