

# MOSFET – Power, Complementary Dual ECH8

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

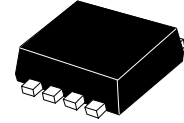
## ECH8690

### 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.

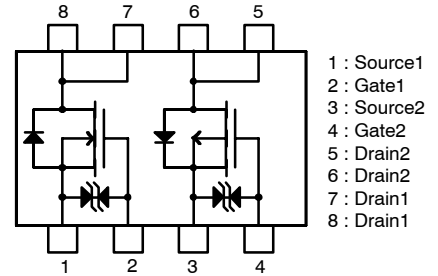
### Features

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

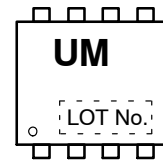


SOT-28FL/ECH8  
 CASE 318BF

### ELECTRICAL CONNECTION



### MARKING DIAGRAM



### ORDERING INFORMATION

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

# ECH8690

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)

Symbol	Parameter	Conditions	N-Channel	P-Channel	Unit
V <sub>DSS</sub>	Drain to Source Voltage		60	-60	V
V <sub>GSS</sub>	Gate to Source Voltage		±20	±20	V
I <sub>D</sub>	Drain Current (DC)		4.7	-3.5	A
I <sub>DP</sub>	Drain Current (Pulse)	PW ≤ 10 μs, duty cycle ≤ 1%	30	-30	A
P <sub>D</sub>	Allowable Power Dissipation	When mounted on ceramic substrate (1200 mm <sup>2</sup> X 0.8 mm) 1 unit	1.5		W
P <sub>T</sub>	Total Dissipation	When mounted on ceramic substrate (1200 mm <sup>2</sup> X 0.8 mm)	1.8		W
T <sub>ch</sub>	Channel Temperature		150		°C
T <sub>stg</sub>	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<sub>A</sub> = 25°C) (Note 3)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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### [N-channel]

V <sub>(BR)DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 1 mA, V <sub>GS</sub> = 0 V	60	-	-	V
I <sub>DSS</sub>	Zero-Gate Voltage Drain Current	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	-	-	1	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V		-	±10	μA
V <sub>GS(off)</sub>	Cutoff Voltage	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.2	-	2.6	V
y <sub>fs</sub>	Forward Transfer Admittance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 2 A	-	4.2	-	S
R <sub>DS(on)1</sub>	Static Drain to Source On-State Resistance	I <sub>D</sub> = 2 A, V <sub>GS</sub> = 10 V	-	42	55	mΩ
R <sub>DS(on)2</sub>		I <sub>D</sub> = 1 A, V <sub>GS</sub> = 4.5 V	-	53	74	mΩ
R <sub>DS(on)3</sub>		I <sub>D</sub> = 1 A, V <sub>GS</sub> = 4 V	-	61	85	mΩ
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 20 V, f = 1 MHz	-	955	-	pF
C <sub>oss</sub>	Output Capacitance		-	58	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	45	-	pF
t <sub>d(on)</sub>	Turn-ON Delay Time	See specified Test Circuit.	-	7	-	ns
t <sub>r</sub>	Rise Time		-	8.4	-	ns
t <sub>d(off)</sub>	Turn-OFF Delay Time		-	76	-	ns
t <sub>f</sub>	Fall Time		-	23	-	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.7 A	-	18	-	nC
Q <sub>gs</sub>	Gate to Source Charge		-	3	-	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		-	2.8	-	nC
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = 4.7 A, V <sub>GS</sub> = 0 V	-	0.82	1.2	V

### [P-channel]

V <sub>(BR)DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = -1 mA, V <sub>GS</sub> = 0 V	-60	-	-	V
I <sub>DSS</sub>	Zero-Gate Voltage Drain Current	V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V		-	±10	μA
V <sub>GS(off)</sub>	Cutoff Voltage	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA	-1.2	-	-2.6	V
y <sub>fs</sub>	Forward Transfer Admittance	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1.5 A	-	3.4	-	S
R <sub>DS(on)1</sub>	Static Drain to Source On-State Resistance	I <sub>D</sub> = -1 A, V <sub>GS</sub> = -10 V	-	73	94	mΩ
R <sub>DS(on)2</sub>		I <sub>D</sub> = -0.5 A, V <sub>GS</sub> = -4.5 V	-	97	135	mΩ
R <sub>DS(on)3</sub>		I <sub>D</sub> = -0.5 A, V <sub>GS</sub> = 4 V	-	108	153	mΩ

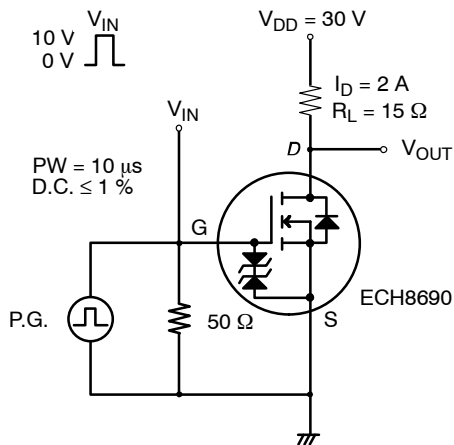
# ECH8690

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ ) (Note 3) (continued)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>[P-channel]</b>						
C <sub>iss</sub>	Input Capacitance	$V_{DS} = -20\text{ V}, f = 1\text{ MHz}$	-	790	-	pF
C <sub>oss</sub>	Output Capacitance		-	63	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	45	-	pF
t <sub>d(on)</sub>	Turn-ON Delay Time	See specified Test Circuit.	-	10	-	ns
t <sub>r</sub>	Rise Time		-	8.8	-	ns
t <sub>d(off)</sub>	Turn-OFF Delay Time		-	84	-	ns
t <sub>f</sub>	Fall Time		-	29	-	ns
Q <sub>g</sub>	Total Gate Charge		$V_{DS} = -30\text{ V}, V_{GS} = -10\text{ V}, I_D = -3.5\text{ A}$	-	15	-
Q <sub>gs</sub>	Gate to Source Charge	-		2.6	-	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge	-		2.2	-	nC
V <sub>SD</sub>	Diode Forward Voltage	$I_S = -3.5\text{ A}, V_{GS} = 0\text{ V}$	-	-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.

[N-Channel]



[P-Channel]

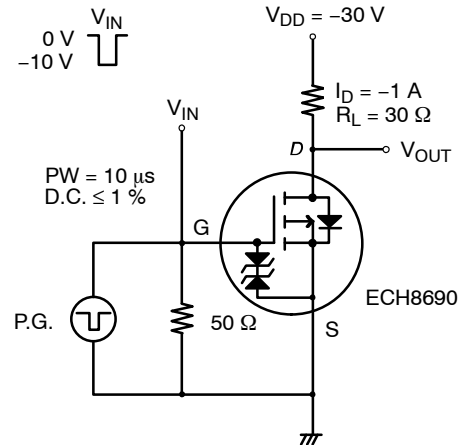


Figure 1. Switching Time Test Circuit

TYPICAL CHARACTERISTICS

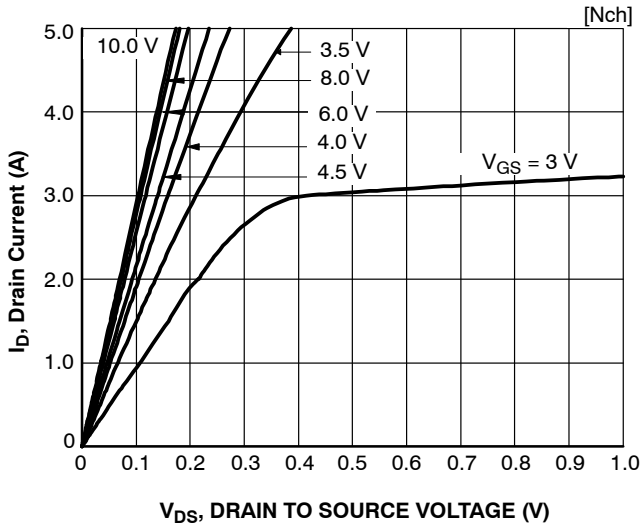


Figure 2.  $I_D - V_{DS}$

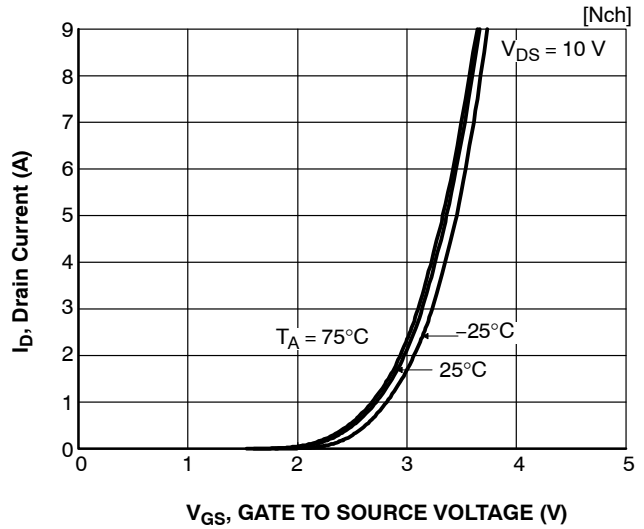


Figure 3.  $I_D - V_{GS}$

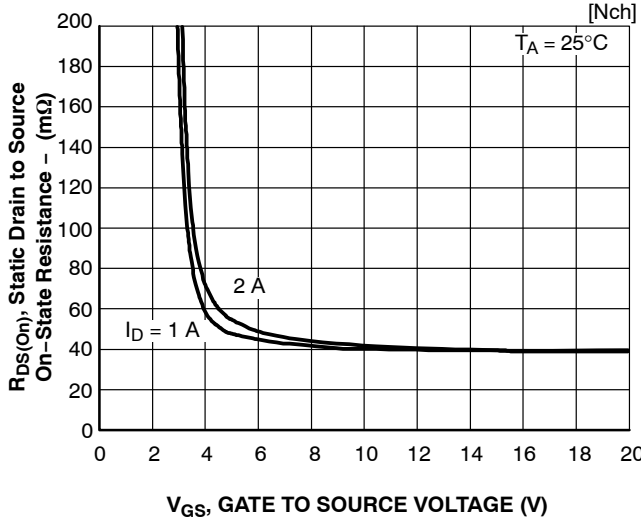


Figure 4.  $R_{DS(on)} - V_{GS}$

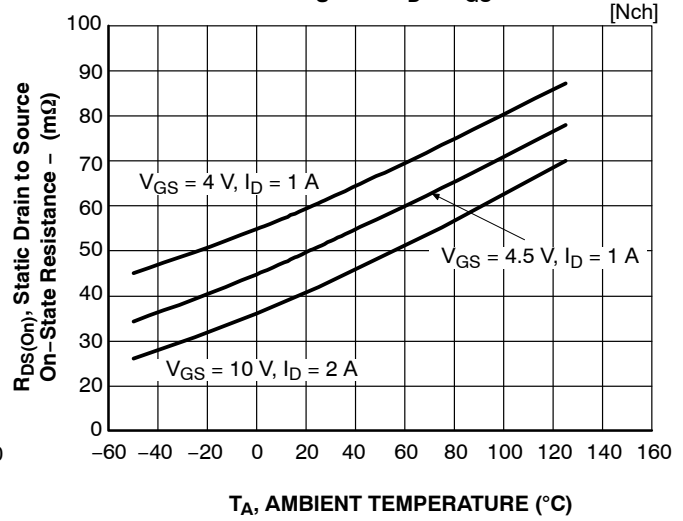


Figure 5.  $R_{DS(on)} - T_A$

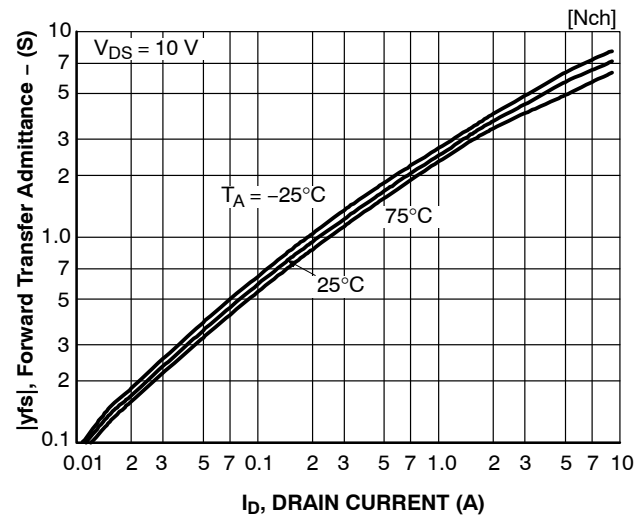


Figure 6.  $|Y_{fs}| - I_D$

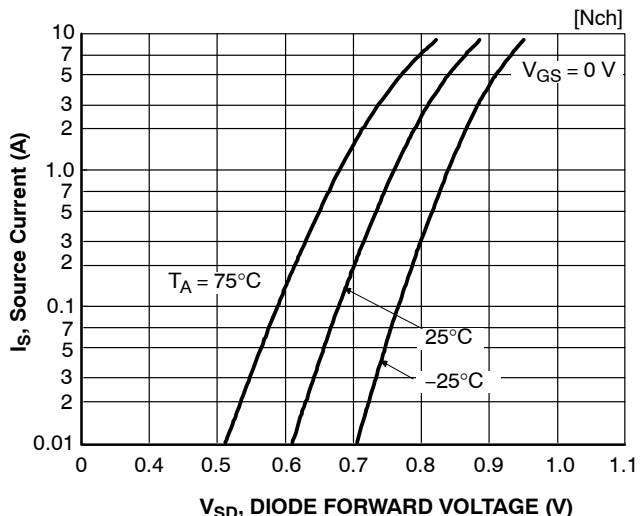


Figure 7.  $I_S - V_{SD}$

TYPICAL CHARACTERISTICS (CONTINUED)

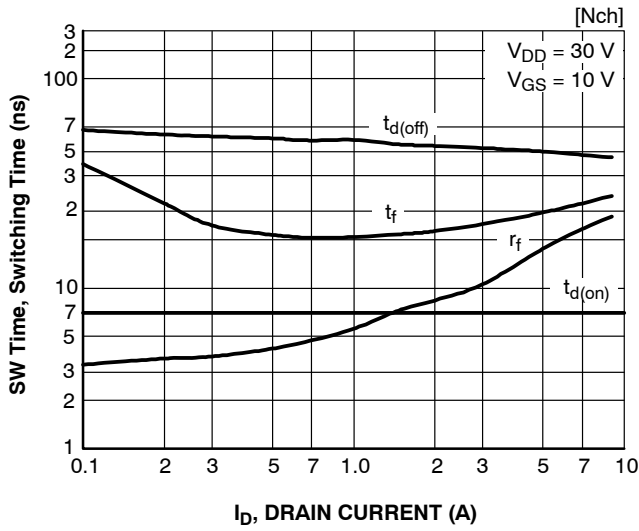


Figure 8.  $I_D$  - S/W Time

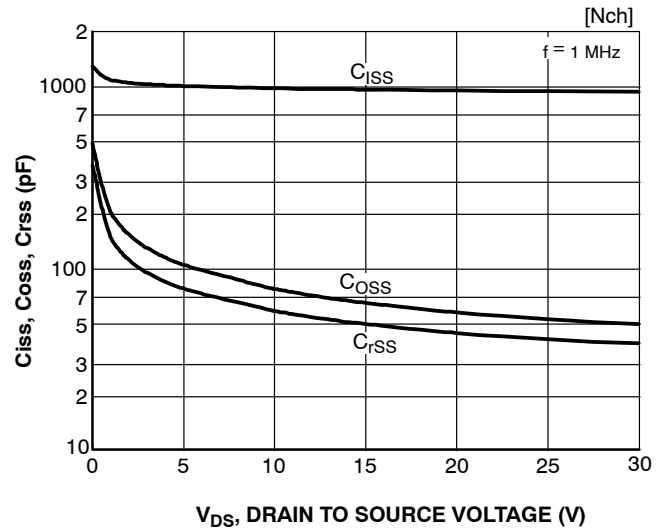


Figure 9. Ciss, Coss, Crss -  $V_{DS}$

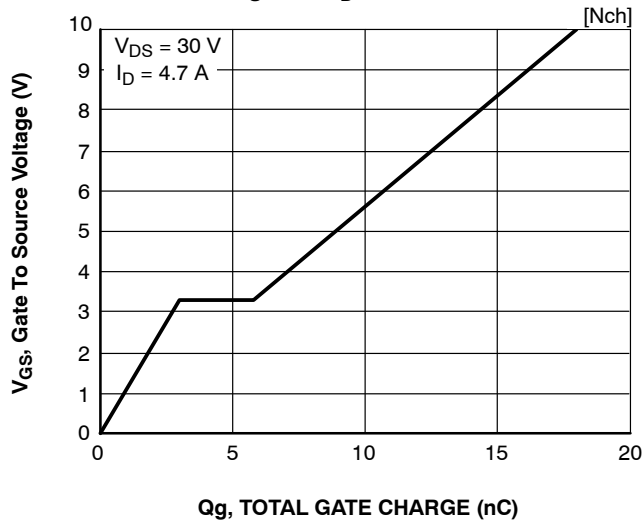


Figure 10.  $V_{GS}$  -  $Q_g$

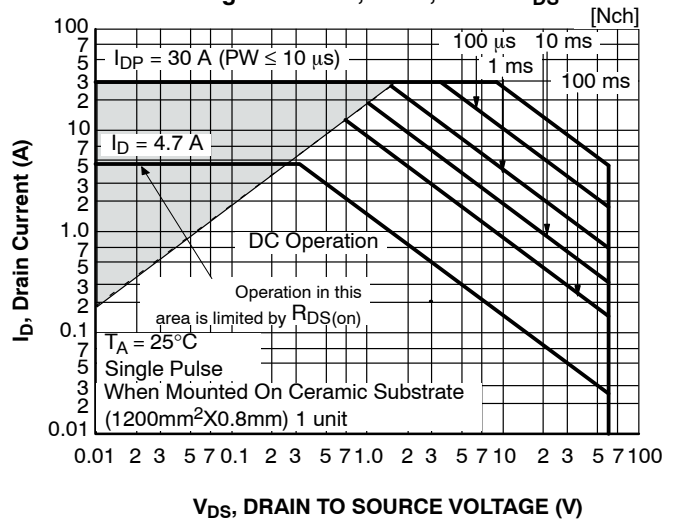


Figure 11. S O A

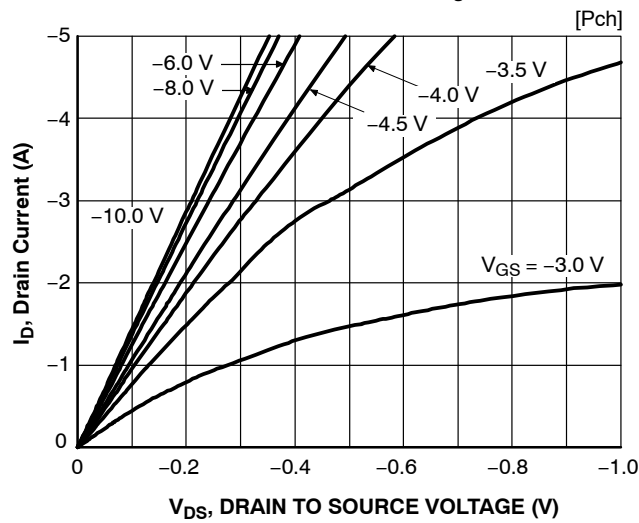


Figure 12.  $I_D$  -  $V_{DS}$

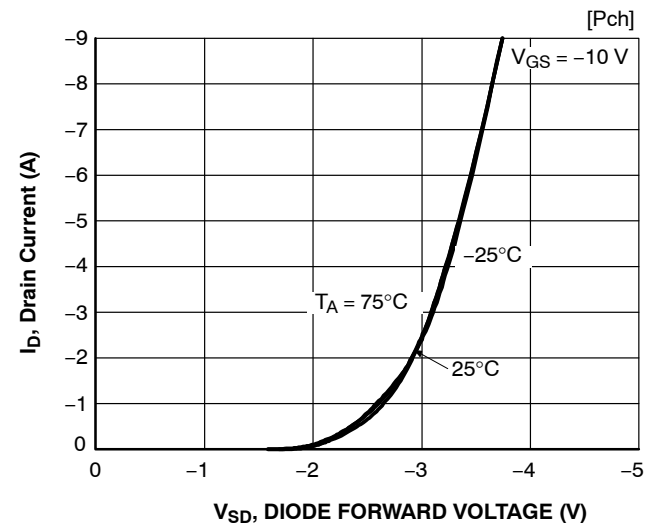
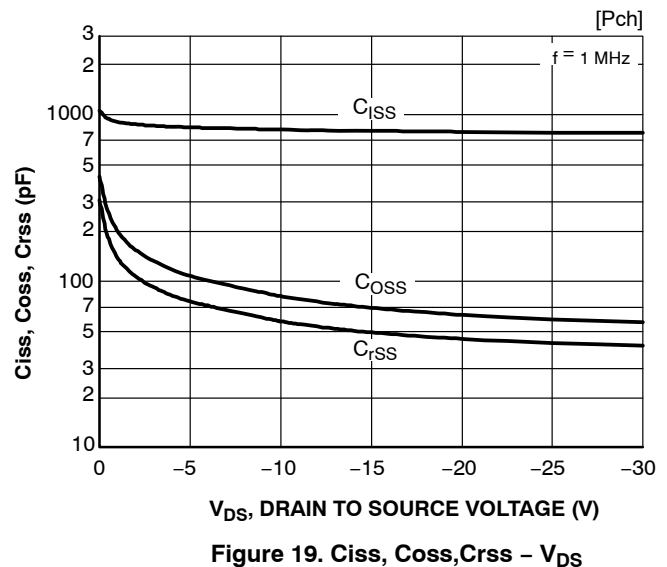
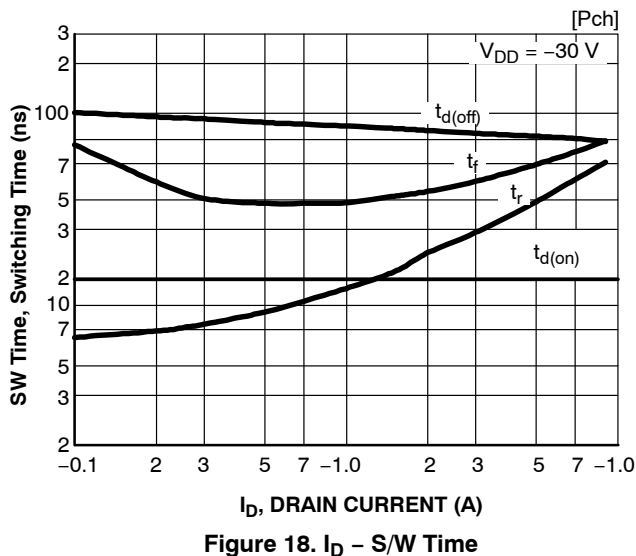
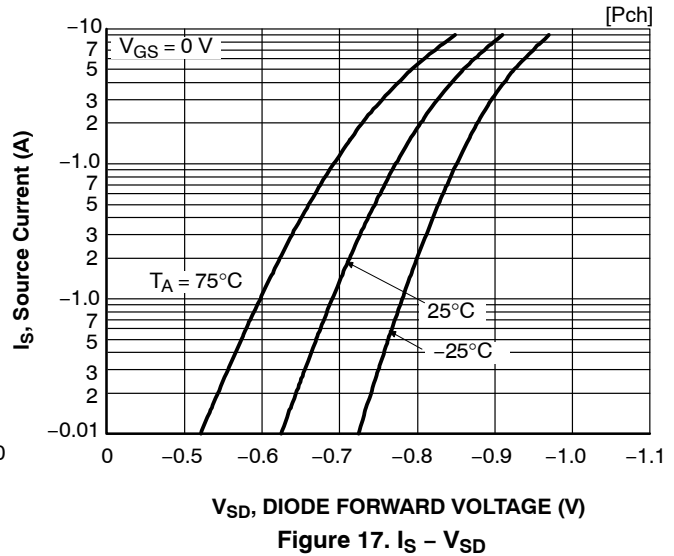
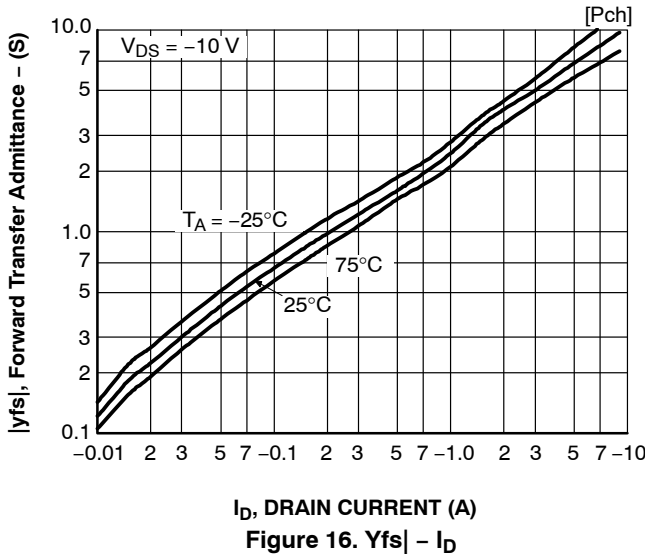
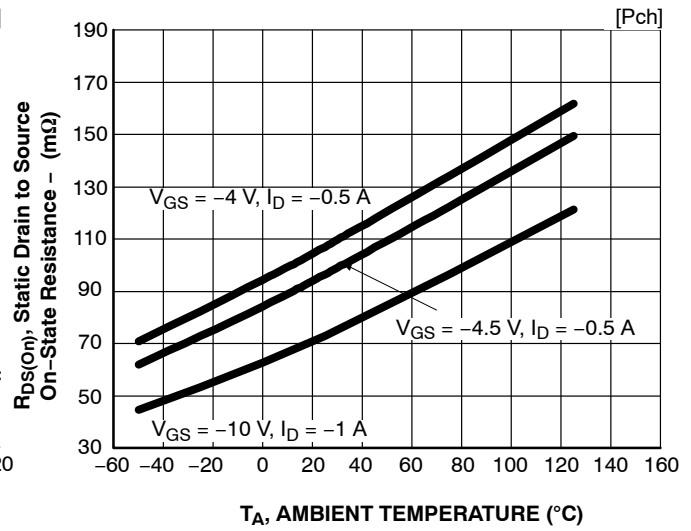
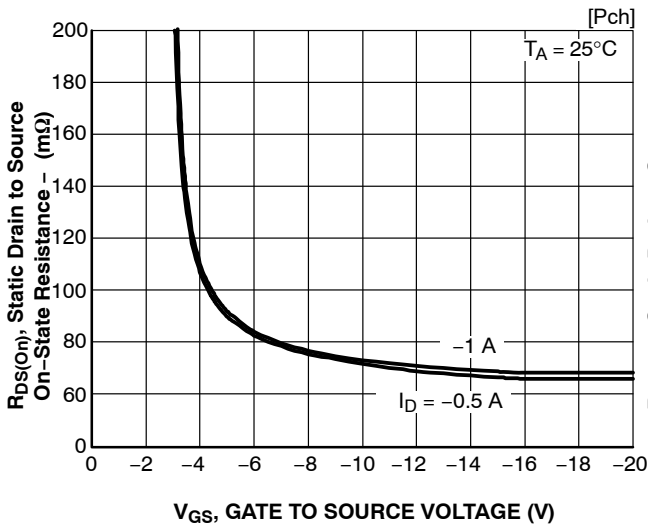


Figure 13.  $I_D$  -  $V_{GS}$

TYPICAL CHARACTERISTICS (CONTINUED)



TYPICAL CHARACTERISTICS (CONTINUED)

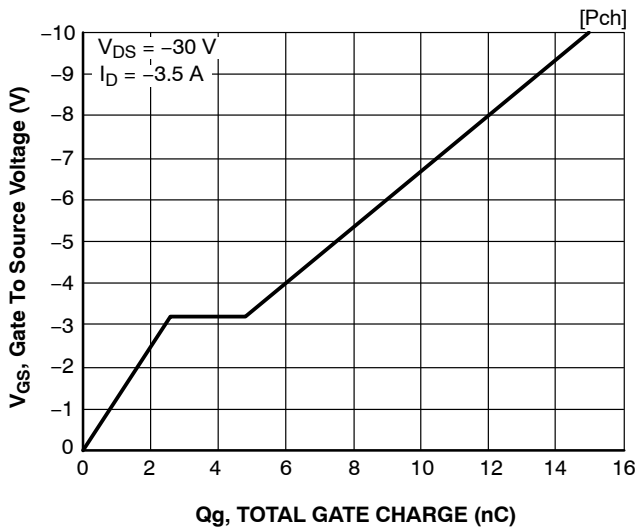


Figure 20.  $V_{GS} - Q_g$

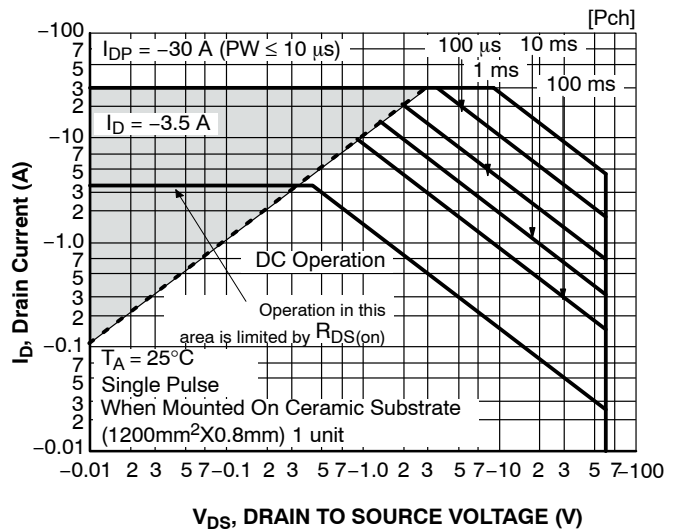


Figure 21. S O A

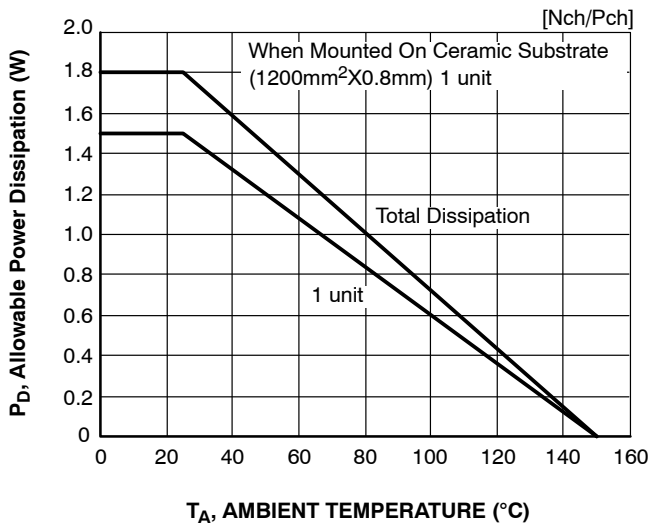


Figure 22.  $P_D - T_A$

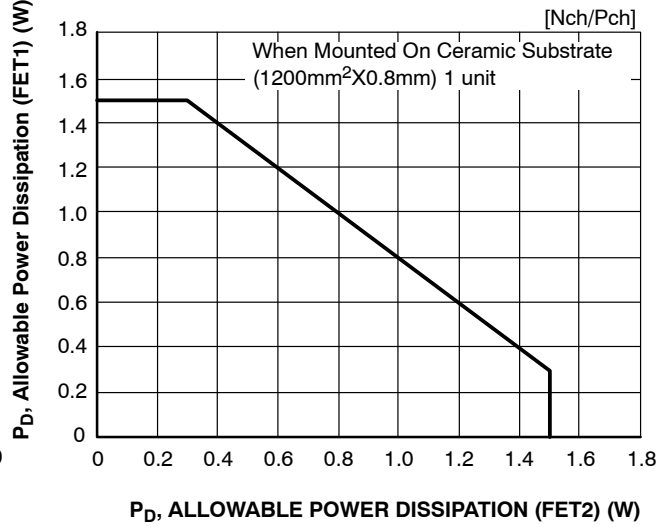


Figure 23.  $P_D$  (FET1) -  $P_D$  (FET2)

ORDERING INFORMATION

Product Number	Package	Shipping†
ECH8690-TL-H	SOT-28FL / ECH8 (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.

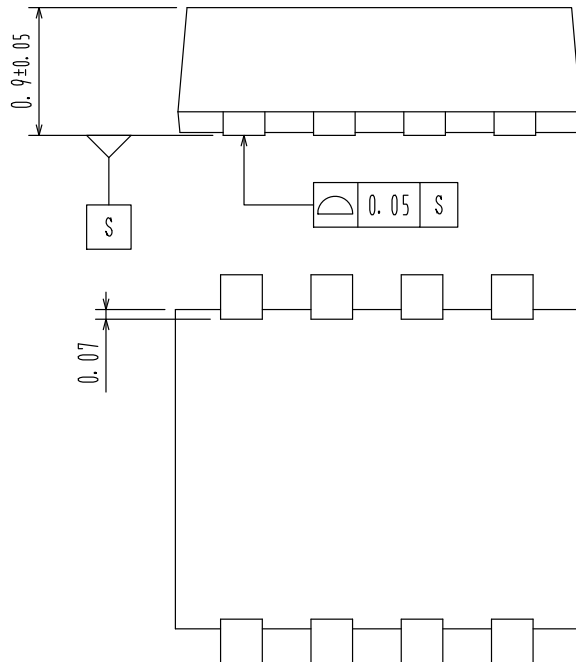
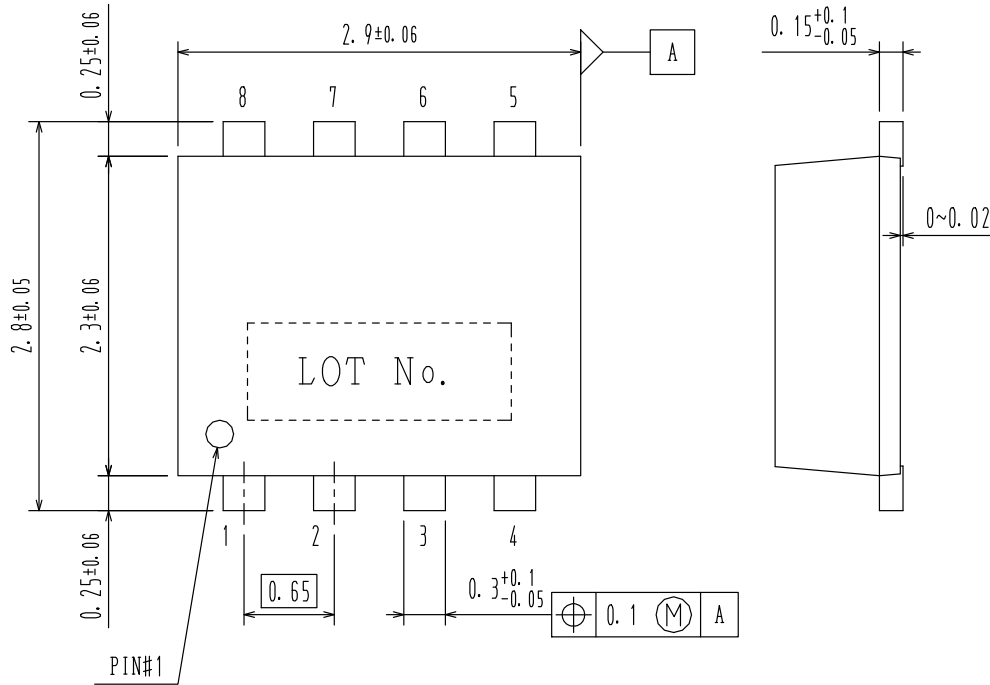
**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®



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

DATE 31 MAR 2012



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