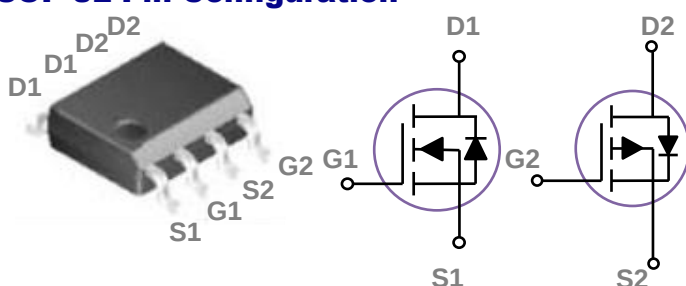


General Description

These N+P dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

SOP-8L Pin Configuration



BVDSS	RDSON	ID
60V	30mΩ	5.9A
-60V	48mΩ	-4.7A

Features

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications

Applications

- DC Fan
- Motor Drive Applications
- Networking
- Half / Full Bridge Topology

Absolute Maximum Ratings Tc=25°C unless otherwise noted

Symbol	Parameter	Rating		Units
V _{DS}	Drain-Source Voltage	60	-60	V
V _{GS}	Gate-Source Voltage	±20	±20	V
I _D	Drain Current – Continuous (T _A =25°C)	5.9	-4.7	A
	Drain Current – Continuous (T _A =70°C)	4.7	-3.8	A
I _{DM}	Drain Current – Pulsed ¹	23.6	-18.8	A
EAS	Single Pulse Avalanche Energy ²	26.4	54.4	mJ
IAS	Single Pulse Avalanche Current ²	23	33	A
P _D	Power Dissipation (T _A =25°C)	2.01		W
	Power Dissipation – Derate above 25°C	0.02		W/°C
T _{STG}	Storage Temperature Range	-55 to 150		°C
T _J	Operating Junction Temperature Range	-55 to 150		°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R _{θJC}	Thermal Resistance Junction to Case	---	38	°C/W
R _{θJA}	Thermal Resistance Junction to Ambient	---	62	°C/W

N-CH Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise)
Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	60	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1mA$	---	0.07	---	$V/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=60V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=48V$, $V_{GS}=0V$, $T_J=125^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V$, $I_D=5A$	---	25	30	$m\Omega$
		$V_{GS}=4.5V$, $I_D=3A$	---	28	36	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	1.6	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.6	---	$mV/^\circ\text{C}$
g_{fs}	Forward Transconductance	$V_{DS}=10V$, $I_D=3A$	---	10	---	S

Dynamic and switching Characteristics

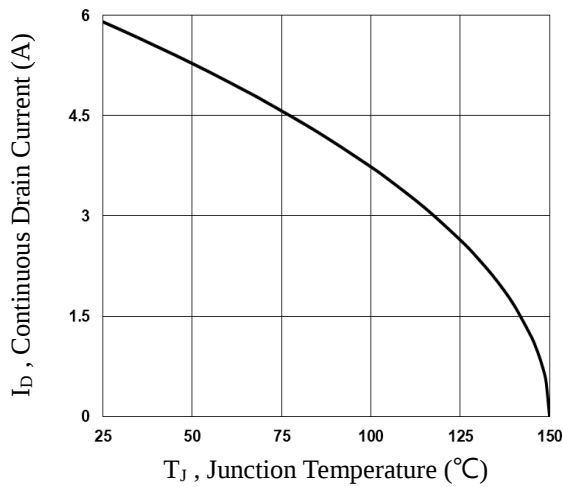
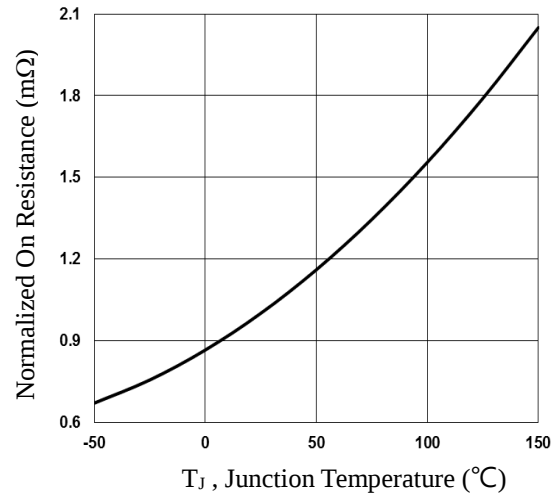
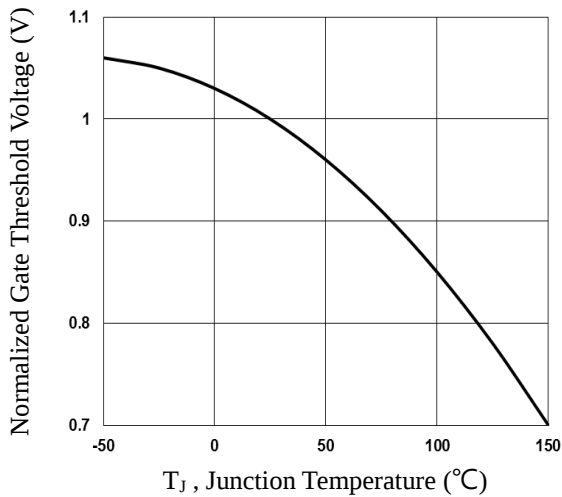
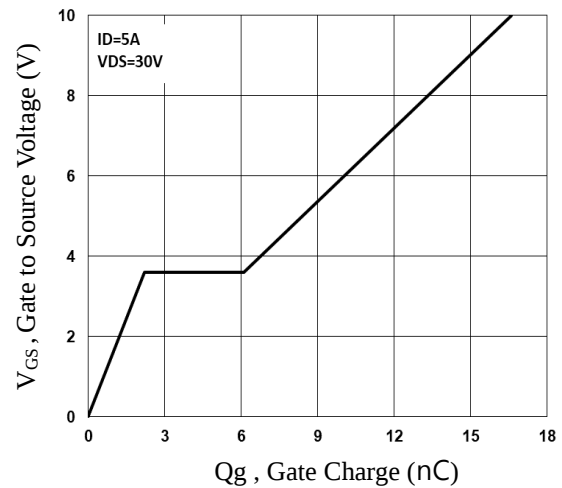
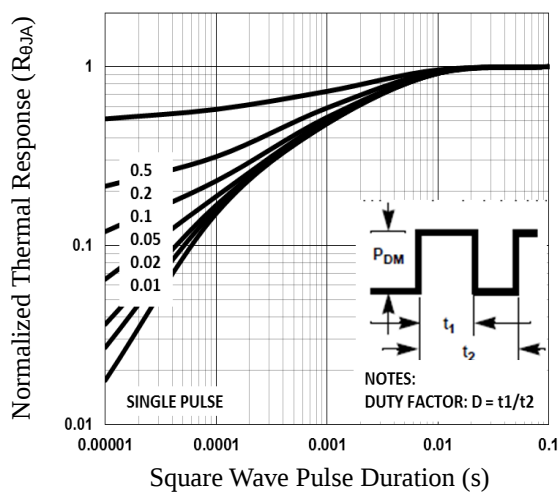
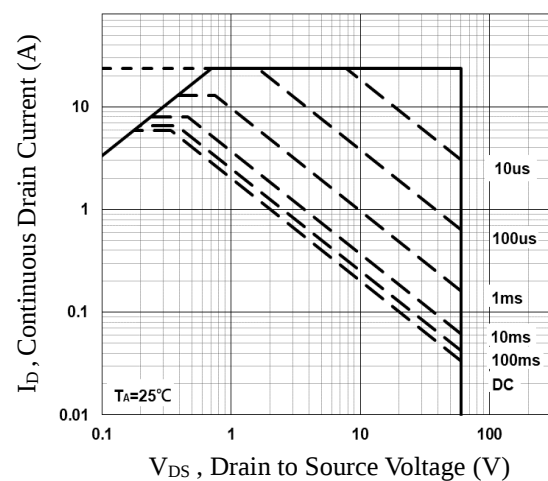
Q_g	Total Gate Charge ^{3, 4}	$V_{DS}=30V$, $V_{GS}=10V$, $I_D=5A$	---	16.6	24	nC
Q_{gs}	Gate-Source Charge ^{3, 4}		---	2.2	4.4	
Q_{gd}	Gate-Drain Charge ^{3, 4}		---	3.9	8	
$T_{d(on)}$	Turn-On Delay Time ^{3, 4}	$V_{DD}=30V$, $V_{GS}=10V$, $R_G=6\Omega$ $I_D=1A$	---	4.6	9	ns
T_r	Rise Time ^{3, 4}		---	14.8	28	
$T_{d(off)}$	Turn-Off Delay Time ^{3, 4}		---	27.2	52	
T_f	Fall Time ^{3, 4}		---	7.8	15	
C_{iss}	Input Capacitance	$V_{DS}=30V$, $V_{GS}=0V$, $F=1MHz$	---	1180	1720	pF
C_{oss}	Output Capacitance		---	68	100	
C_{rss}	Reverse Transfer Capacitance		---	45	70	
R_g	Gate resistance	$V_{GS}=0V$, $V_{DS}=0V$, $F=1MHz$	---	2.1	4.2	Ω

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	5.9	A
I_{SM}	Pulsed Source Current		---	---	11.8	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ\text{C}$	---	---	1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, N-CH $I_{AS}=23A$., P-CH $I_{AS}=33A$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.
3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
4. Essentially independent of operating temperature.


Fig.1 Continuous Drain Current vs. T_c

Fig.2 Normalized $R_{DS(on)}$ vs. T_J

Fig.3 Normalized V_{th} vs. T_J

Fig.4 Gate Charge Waveform

Fig.5 Normalized Transient Impedance

Fig.6 Maximum Safe Operation Area

P-CH Electrical Characteristics (T_J=25 °C, unless otherwise
Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-60	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.05	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-60V, V _{GS} =0V, T _J =25°C	---	---	-1	uA
		V _{DS} =-48V, V _{GS} =0V, T _J =125°C	---	---	-10	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA

On Characteristics

R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-4A	---	40	48	mΩ
		V _{GS} =-4.5V, I _D =-3A	---	53	68	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.2	-1.6	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	5	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =-10V, I _D =-3A	---	10	---	S

Dynamic and switching Characteristics

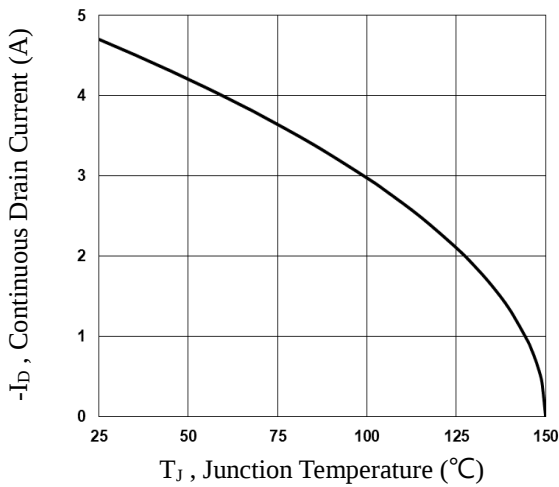
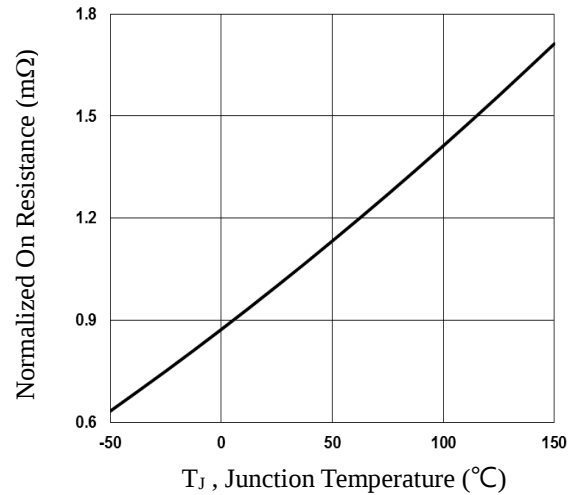
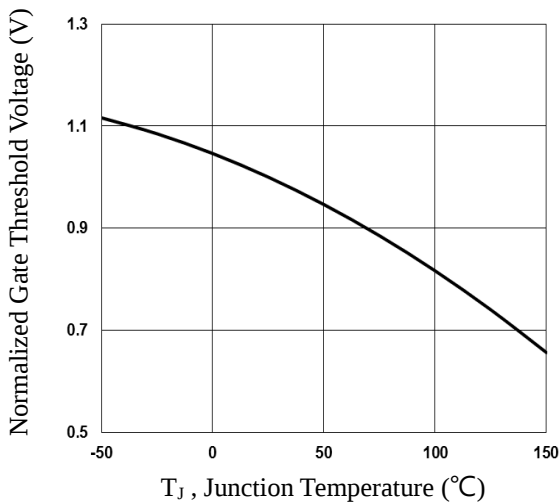
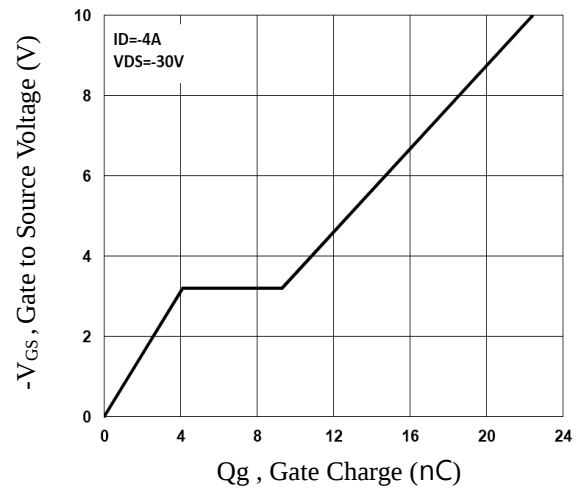
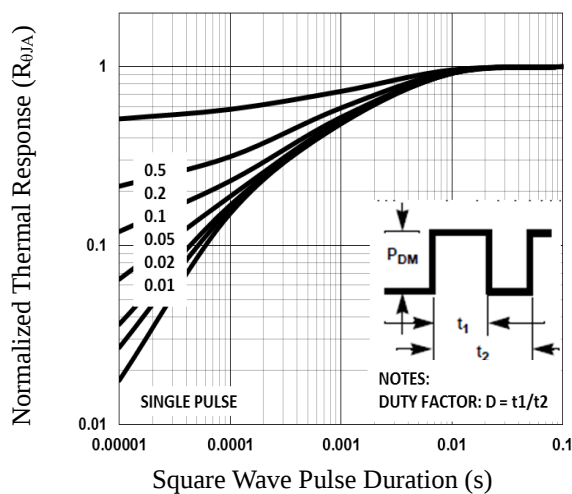
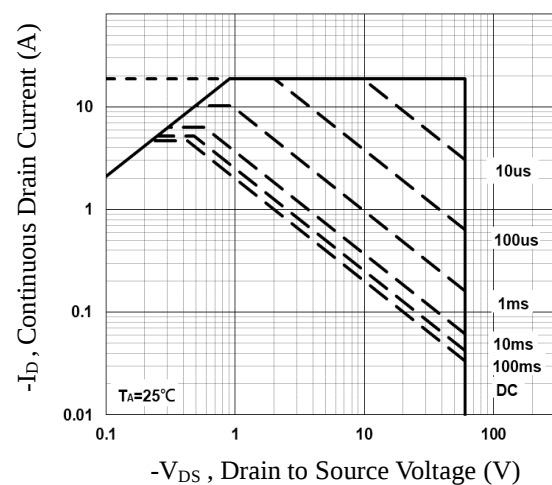
Q _g	Total Gate Charge ^{2, 3}	V _{DS} =-30V, V _{GS} =-10V, I _D =-4A	---	22.4	31	nC
Q _{gs}	Gate-Source Charge ^{2, 3}		---	4.1	6	
Q _{gd}	Gate-Drain Charge ^{2, 3}		---	5.2	7	
T _{d(on)}	Turn-On Delay Time ^{2, 3}	V _{DD} =-30V, V _{GS} =-10V, R _G =6Ω I _D =-1A	---	13	25	ns
T _r	Rise Time ^{2, 3}		---	42.4	81	
T _{d(off)}	Turn-Off Delay Time ^{2, 3}		---	64.6	123	
T _f	Fall Time ^{2, 3}		---	16.4	31	
C _{iss}	Input Capacitance	V _{DS} =-30V, V _{GS} =0V, F=1MHz	---	1250	1810	pF
C _{oss}	Output Capacitance		---	85	125	
C _{rss}	Reverse Transfer Capacitance		---	65	95	
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz		15	30	Ω

Drain-Source Diode Characteristics and Maximum Ratings

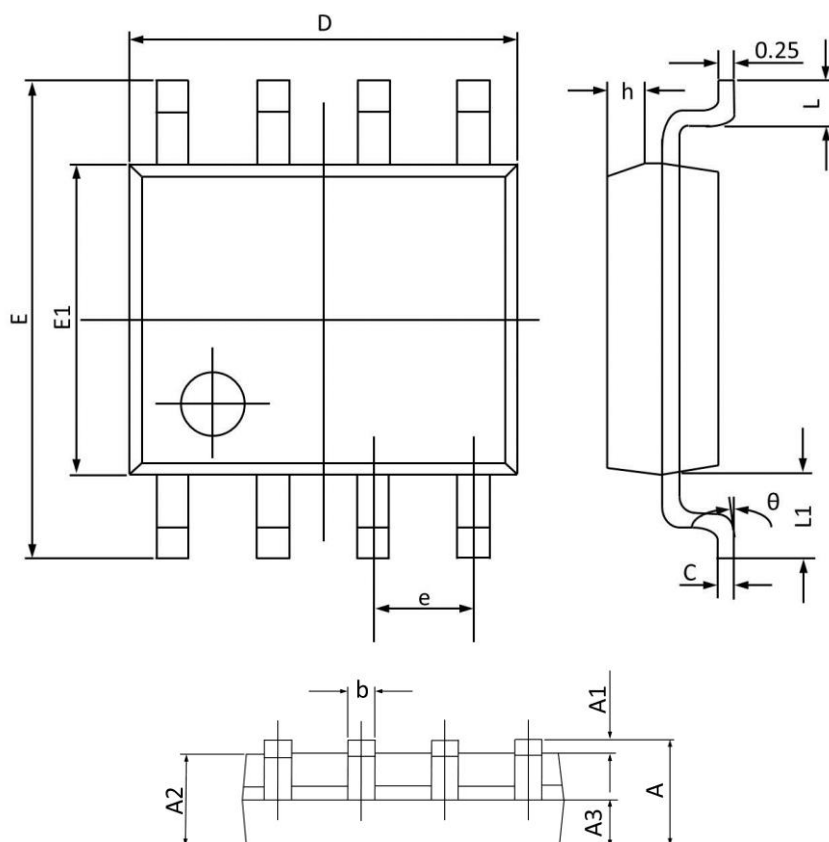
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current	V _G =V _D =0V, Force Current	---	---	-4.7	A
I _{SM}	Pulsed Source Current		---	---	-9.4	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1	V

Note :

5. Repetitive Rating : Pulsed width limited by maximum junction temperature.
6. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
7. Essentially independent of operating temperature.


Fig.7 Continuous Drain Current vs. T_c

Fig.8 Normalized $R_{DS(on)}$ vs. T_J

Fig.9 Normalized V_{th} vs. T_J

Fig.10 Gate Charge Waveform

Fig.11 Normalized Transient Impedance

Fig.12 Maximum Safe Operation Area

SOP-8L PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.068
A1	0.100	0.250	0.004	0.009
A2	1.300	1.500	0.052	0.059
A3	0.600	0.700	0.024	0.027
b	0.390	0.480	0.016	0.018
c	0.210	0.260	0.009	0.010
D	4.700	5.100	0.186	0.200
E	5.800	6.200	0.229	0.244
E1	3.700	4.100	0.146	0.161
e	1.270(BSC)		0.050(BSC)	
h	0.250	0.500	0.010	0.019
L	0.500	0.800	0.019	0.031
L1	1.050(BSC)		0.041(BSC)	
θ	0°	8°	0°	8°