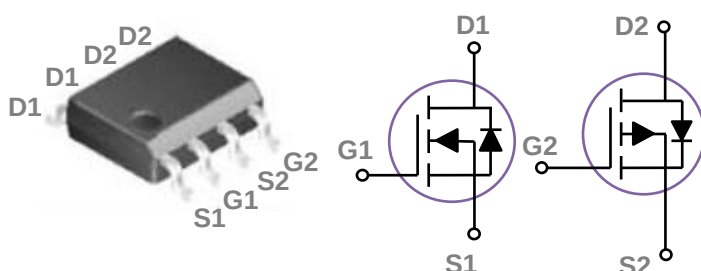


General Description

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.

SOP8 Pin Configuration



BVDSS	RDS(on)	ID
60V	54mΩ	4.5A
-60V	105mΩ	-3.5A

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 $T_c=25^{\circ}\text{C}$ 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 ($T_c=25^{\circ}\text{C}$)	4.5	-3.5	A
	Drain Current – Continuous ($T_c=100^{\circ}\text{C}$)	2.85	-2.21	A
I_{DM}	Drain Current – Pulsed ¹	18	-14	A
P_D	Power Dissipation ($T_c=25^{\circ}\text{C}$)	3.57		W
	Power Dissipation – Derate above 25°C	0.028		W/ $^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150		$^{\circ}\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150		$^{\circ}\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	75	$^{\circ}\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	35	$^{\circ}\text{C/W}$

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 , $I_D=1mA$	---	0.05	---	$V/^\circ\text{C}$
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	$V_{GS}=10V$, $I_D=6A$	---	45	54	$m\Omega$
		$V_{GS}=4.5V$, $I_D=3A$	---	52	63	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	1.8	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.2	---	$mV/^\circ\text{C}$
gfs	Forward Transconductance	$V_{DS}=10V$, $I_D=4A$	---	4.2	---	S

Dynamic and switching Characteristics

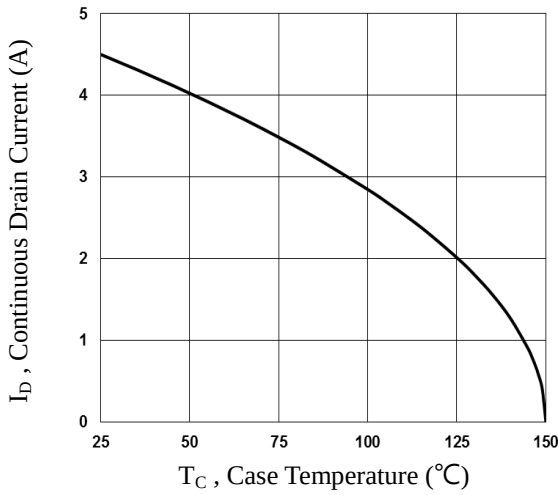
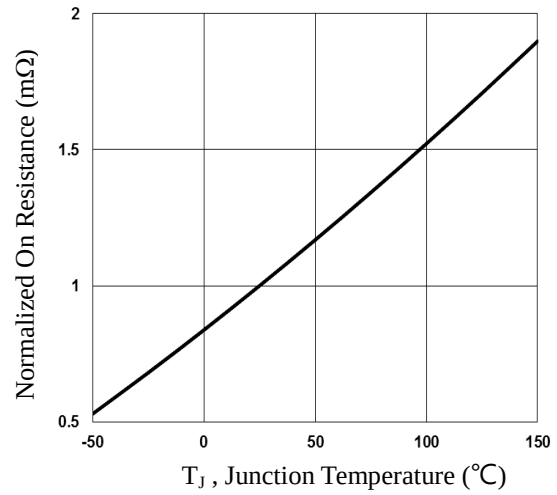
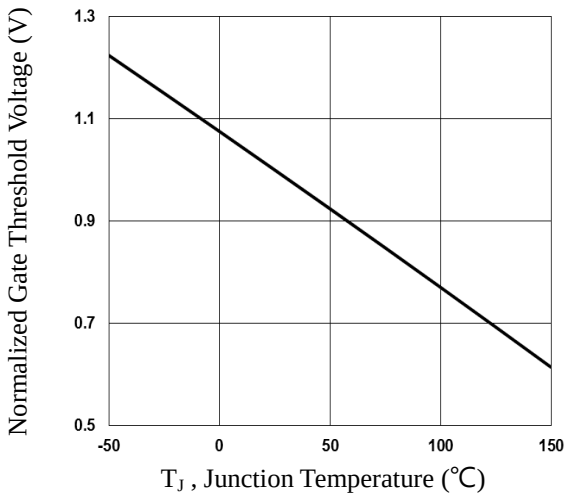
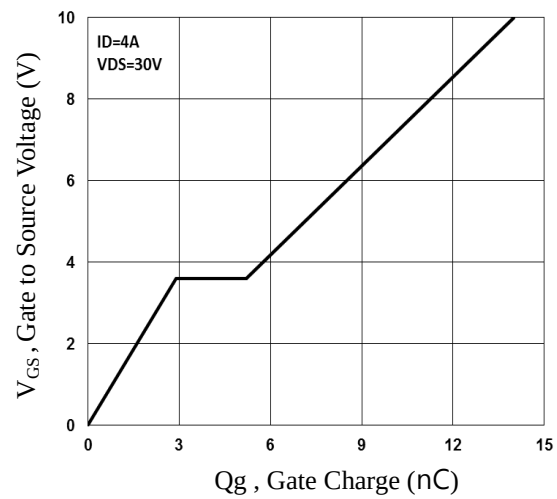
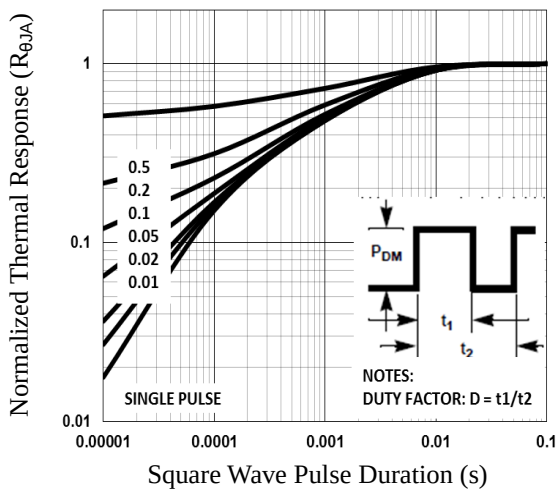
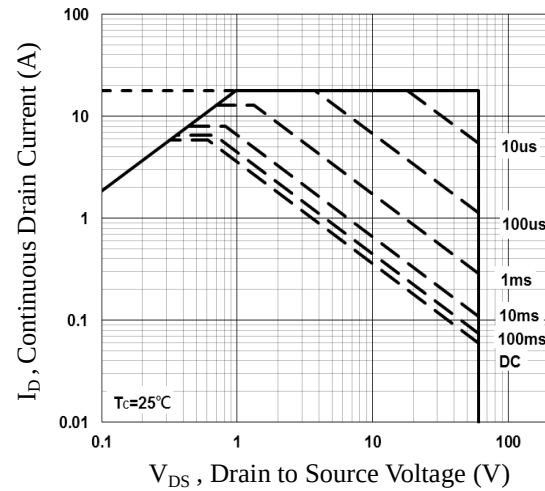
Q_g	Total Gate Charge ^{2,3}	$V_{DS}=30V$, $V_{GS}=10V$, $I_D=4A$	---	14	21	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	2.9	5	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	2.3	4	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=30V$, $V_{GS}=10V$, $R_G=3.3\Omega$ $I_D=1A$	---	3.9	7	ns
T_r	Rise Time ^{2,3}		---	12.6	24	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	23.1	44	
T_f	Fall Time ^{2,3}		---	6.7	13	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $F=1MHz$	---	800	1160	pF
C_{oss}	Output Capacitance		---	380	550	
C_{rss}	Reverse Transfer Capacitance		---	115	170	
R_g	Gate resistance	$V_{GS}=0V$, $V_{DS}=0V$, $F=1MHz$	---	1.7	3.4	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	---	---	4.5	A
I_{SM}	Pulsed Source Current		---	---	9	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. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
3. 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 =-6A	---	87	105	mΩ
		V _{GS} =-4.5V, I _D =-3A	---	120	145	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.0	-1.6	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	3	---	mV/°C
gfs	Forward Transconductance	V _{DS} =-10V, I _D =-6A	---	5.5	---	S

Dynamic and switching Characteristics

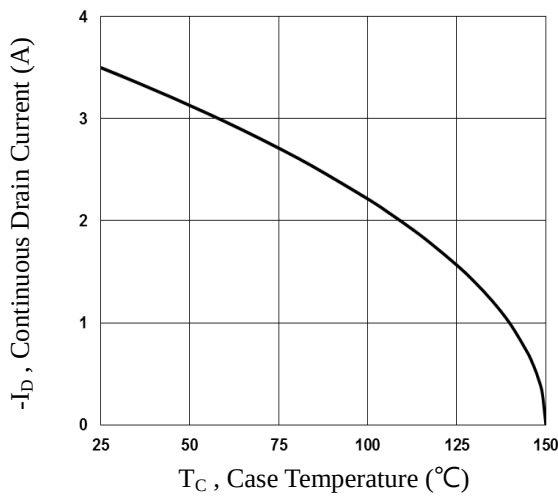
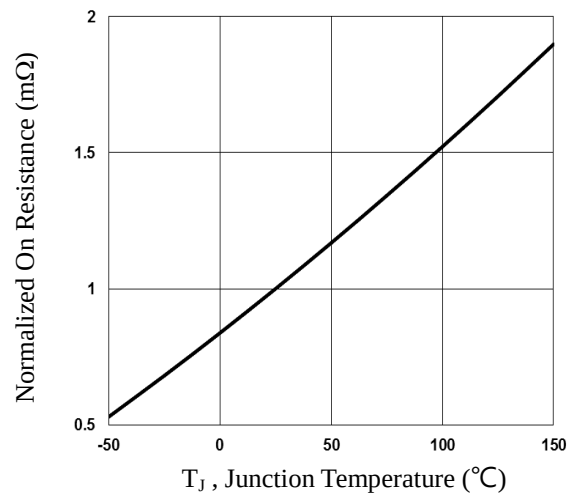
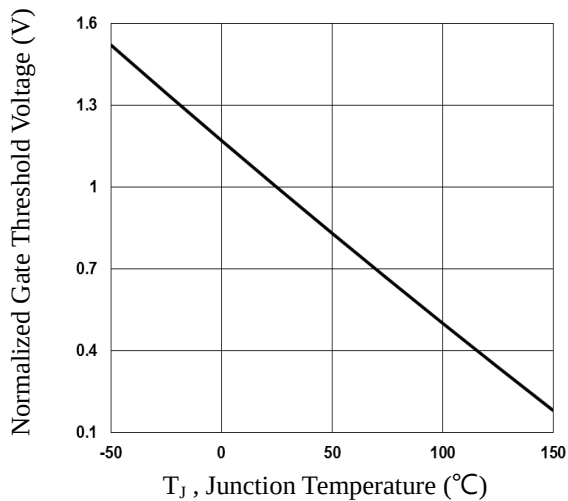
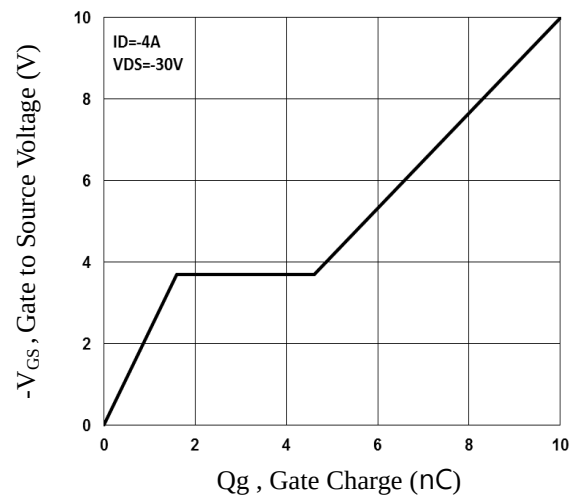
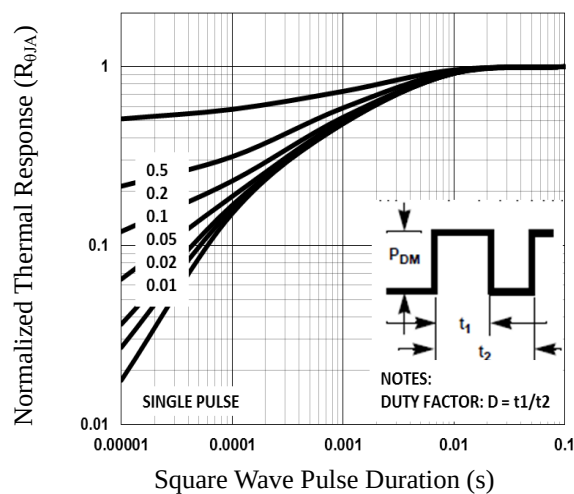
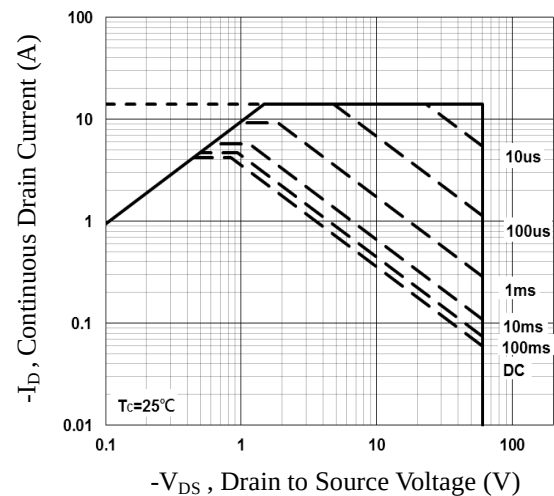
Q _g	Total Gate Charge ^{2, 3}	V _{DS} =-30V, V _{GS} =-10V, I _D =-4A	---	10	15	nC
Q _{gs}	Gate-Source Charge ^{2, 3}		---	1.6	3.2	
Q _{gd}	Gate-Drain Charge ^{2, 3}		---	3	6	
T _{d(on)}	Turn-On Delay Time ^{2, 3}	V _{DD} =-30V, V _{GS} =-10V, R _G =6Ω I _D =-1A	---	8	16	ns
T _r	Rise Time ^{2, 3}		---	15.4	30	
T _{d(off)}	Turn-Off Delay Time ^{2, 3}		---	42.8	80	
T _f	Fall Time ^{2, 3}		---	8.4	16	
C _{iss}	Input Capacitance	V _{DS} =-30V, V _{GS} =0V, F=1MHz	---	785	1300	pF
C _{oss}	Output Capacitance		---	175	300	
C _{rss}	Reverse Transfer Capacitance		---	112	220	

Drain-Source Diode Characteristics and Maximum Ratings

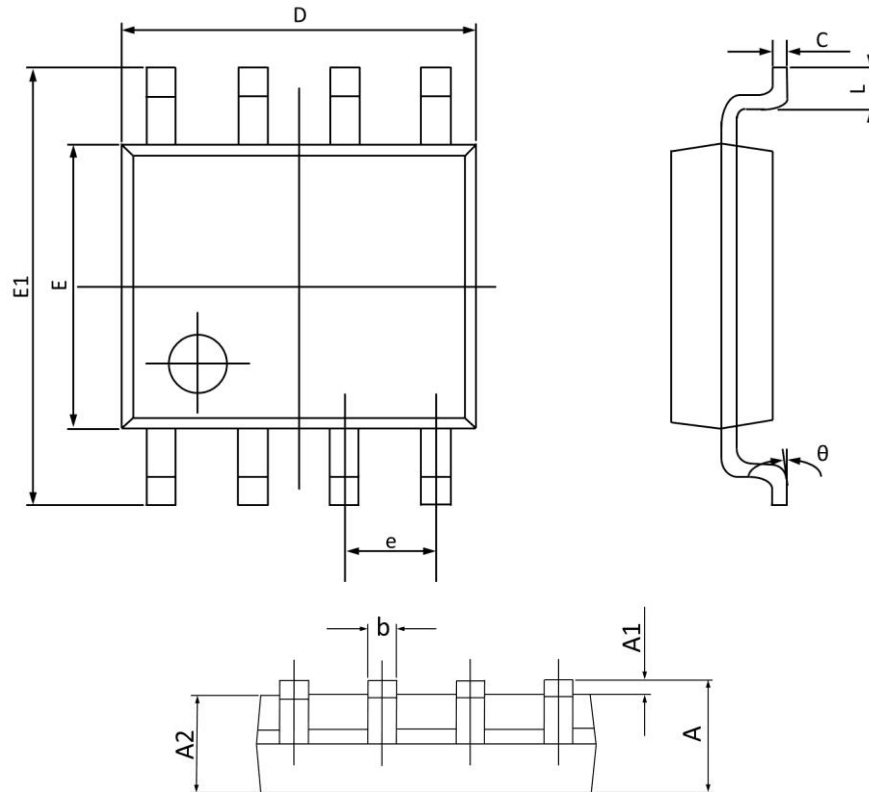
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current	V _G =V _D =0V, Force Current	---	---	-3.5	A
I _{SM}	Pulsed Source Current		---	---	-7	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1	V

Note :

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

SOP8 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	1.750	1.350	0.069	0.053
A1	0.250	0.100	0.010	0.004
A2	1.500	1.300	0.059	0.051
b	0.490	0.350	0.019	0.014
C	0.260	0.190	0.010	0.007
D	5.100	4.700	0.201	0.185
E	4.100	3.700	0.161	0.146
E1	6.200	5.800	0.244	0.228
e	1.27BSC		0.05BSC	
L	0.900	0.400	0.035	0.016
θ	8°	0°	8°	0°