

40V P-Channel MOSFETs

General Description

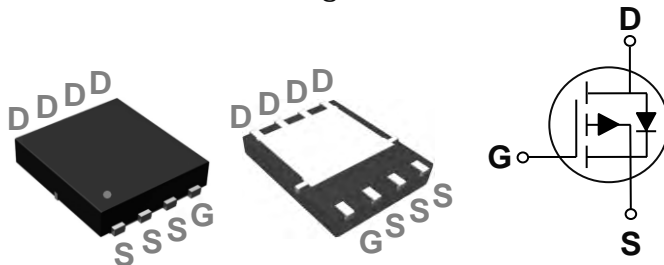
These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BVDSS	RDSON	ID
-40V	5.8mΩ	-85A

Features

- -40V, -85A, $R_{DS(ON)} = 5.8m\Omega @ V_{GS} = -10V$
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

PPAK5X6 Pin Configuration



Applications

- Motor Drive
- Power Tools
- LED Lighting

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-40	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	-85	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	-53.7	A
I_{DM}	Drain Current – Pulsed ¹	-340	A
EAS	Single Pulse Avalanche Energy ²	245	mJ
IAS	Single Pulse Avalanche Current ²	-70	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	135	W
	Power Dissipation – Derate above 25°C	1.09	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	---	62	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	0.92	$^\circ\text{C}/\text{W}$



FTK4959DFN56

40V P-Channel MOSFETs

Electrical Characteristics ($T_J=25\text{ }^\circ\text{C}$, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to $25\text{ }^\circ\text{C}, I_D=-1mA$	---	-0.03	---	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-40V, V_{GS}=0V, T_J=25\text{ }^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-32V, V_{GS}=0V, T_J=125\text{ }^\circ\text{C}$	---	---	-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	$V_{GS}=-10V, I_D=-25A$	---	4.7	5.8	m Ω
		$V_{GS}=-4.5V, I_D=-12A$	---	6.4	8.5	m Ω
$V_{GS(th)}$	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		---	5.38	---	mV/ $^\circ\text{C}$
g_{fs}	Forward Transconductance	$V_{DS}=-10V, I_D=-3A$	---	15	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{3, 4}	$V_{DS}=-32V, V_{GS}=-10V, I_D=-10A$	---	106	160	nC
Q_{gs}	Gate-Source Charge ^{3, 4}		---	13.1	20	
Q_{gd}	Gate-Drain Charge ^{3, 4}		---	24.9	38	
$T_{d(on)}$	Turn-On Delay Time ^{3, 4}	$V_{DD}=-32V, V_{GS}=-10V, R_G=6\Omega$ $I_D=-1A$	---	41.6	82	ns
T_r	Rise Time ^{3, 4}		---	12.7	26	
$T_{d(off)}$	Turn-Off Delay Time ^{3, 4}		---	308	600	
T_f	Fall Time ^{3, 4}		---	70	140	
C_{iss}	Input Capacitance	$V_{DS}=-25V, V_{GS}=0V, F=1MHz$	---	5720	8580	pF
C_{oss}	Output Capacitance		---	527	790	
C_{rss}	Reverse Transfer Capacitance		---	352	528	
R_g	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1MHz$	---	4.2	6.3	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	---	---	-85	A
I_{SM}	Pulsed Source Current		---	---	-170	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25\text{ }^\circ\text{C}$	---	---	-1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-70A, R_G=25\Omega$, Starting $T_J=25\text{ }^\circ\text{C}$
3. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
4. Essentially independent of operating temperature.

Typical Performance Characteristics

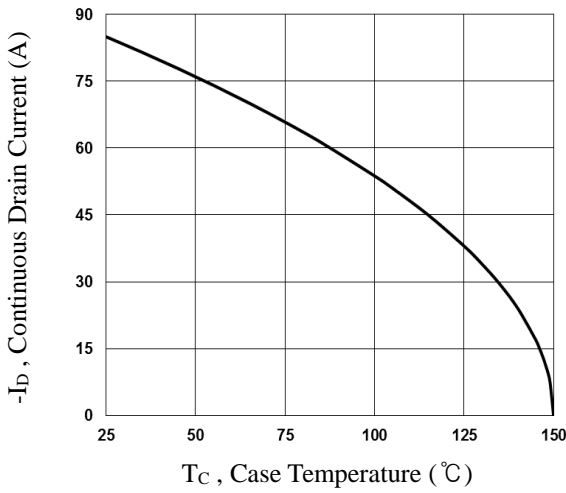


Fig.1 Continuous Drain Current vs. T_c

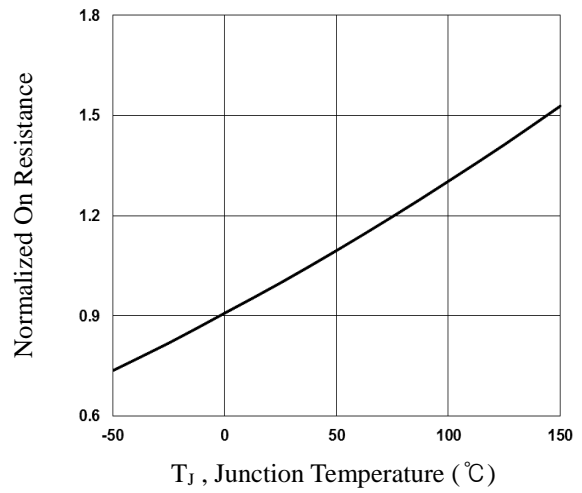


Fig.2 Normalized RDSON vs. T_J

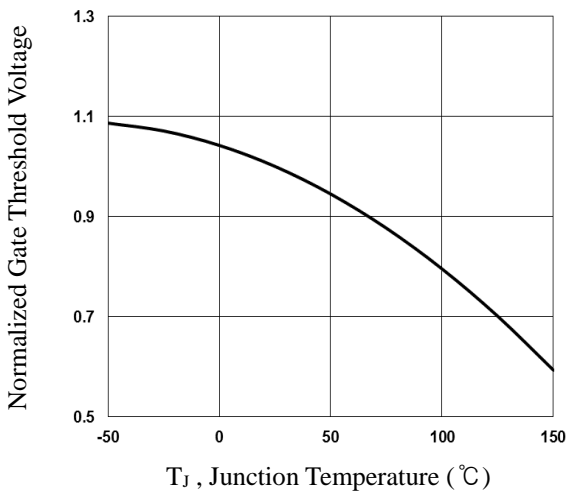


Fig.3 Normalized V_{th} vs. T_J

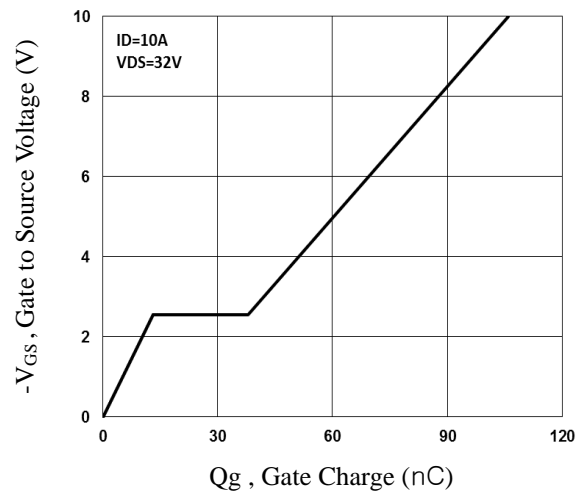


Fig.4 Gate Charge Waveform

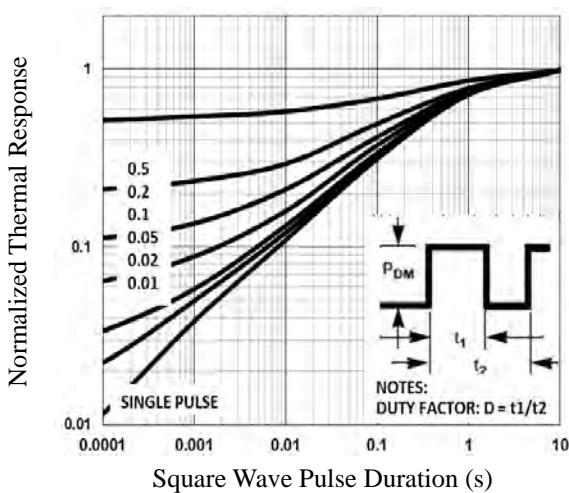


Fig.5 Normalized Transient Impedance

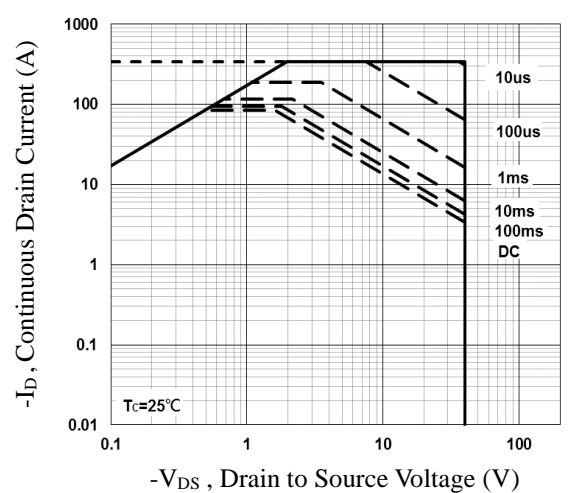


Fig.6 Maximum Safe Operation Area

Typical Performance Characteristics(Con.)

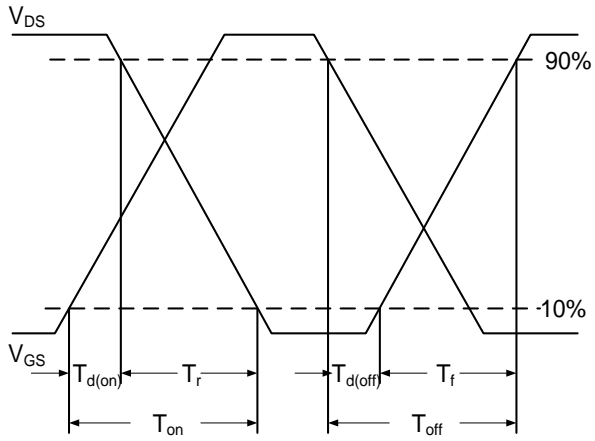


Fig.7 Switching Time Waveform

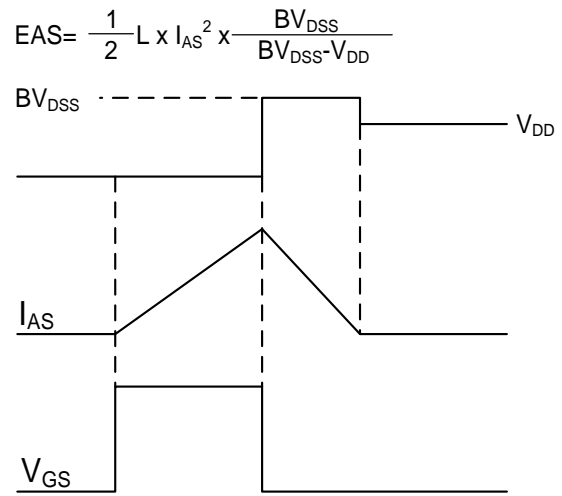
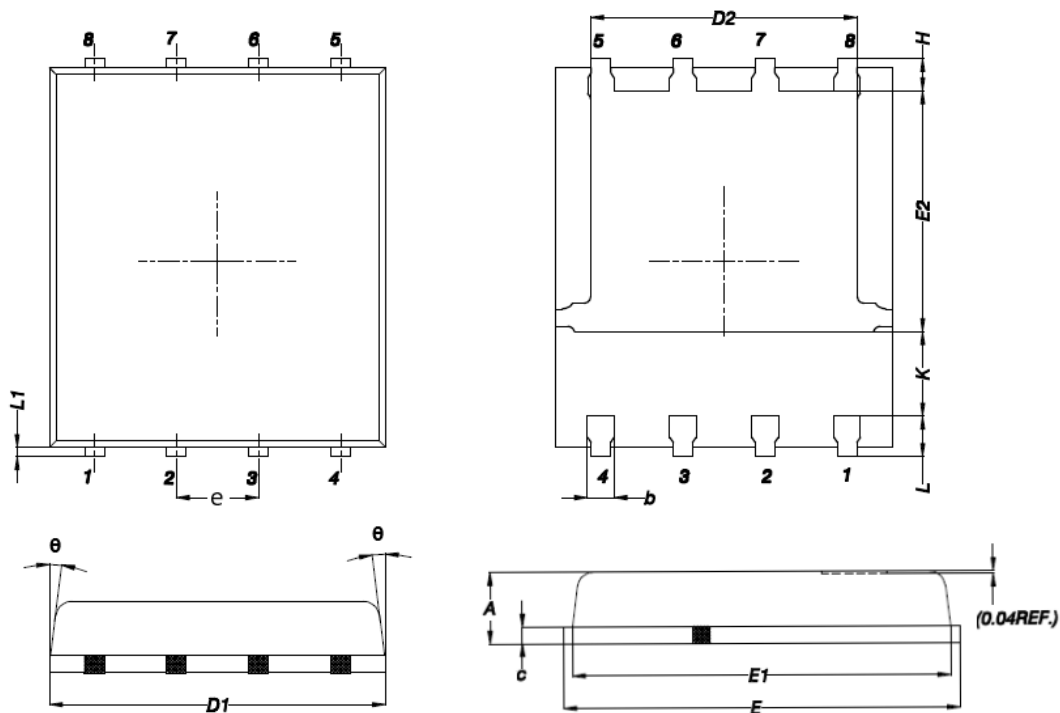


Fig.8 EAS Waveform

PPAK5x6 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	1.200	0.850	0.047	0.031
b	0.510	0.300	0.020	0.012
C	0.300	0.200	0.012	0.008
D1	5.400	4.800	0.212	0.189
D2	4.310	3.610	0.170	0.142
E	6.300	5.850	0.248	0.230
E1	5.960	5.450	0.235	0.215
E2	3.920	3.300	0.154	0.130
e	1.27BSC		0.05BSC	
H	0.650	0.380	0.026	0.015
K	---	1.100	---	0.043
L	0.710	0.380	0.028	0.015
L1	0.250	0.050	0.009	0.002
θ	12°	0°	12°	0°