

N-Ch 40V Fast Switching MOSFETs

Features:

- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Description:

The KEP4016 is the high cell density trench N-ch MOSFETs, which provide excellent $R_{DS(on)}$ and gate charge for most of the synchronous buck converter applications.

The KEP4016 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

Product Summary

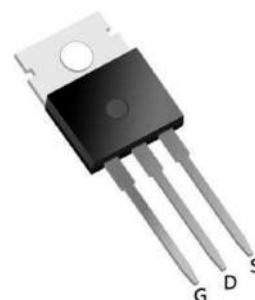
BVDSS	$R_{DS(on)}$	I_D
40V	6.5m Ω	90A

Absolute Maximum Ratings

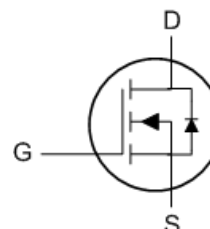
Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	90	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	57	A
$I_D@T_A=25^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	13.6	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, V_{GS} @ 10V ¹	11	A
I_{DM}	Pulsed Drain Current ²	270	A
EAS	Single Pulse Avalanche Energy ³	110	mJ
I_{AS}	Avalanche Current	47	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	87	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	1.44	$^\circ C/W$



TO220 Pin Configuration



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1mA$	---	0.034	---	V/ $^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V$, $I_D=30A$	---	---	6.5	m Ω
		$V_{GS}=4.5V$, $I_D=20A$	---	---	8.5	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	---	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.84	---	mV/ $^{\circ}\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=32V$, $V_{GS}=0V$, $T_J=25^{\circ}\text{C}$	---	---	1	μA
		$V_{DS}=32V$, $V_{GS}=0V$, $T_J=55^{\circ}\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=30A$	---	50	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	1.4	---	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=32V$, $V_{GS}=4.5V$, $I_D=20A$	---	30	---	nC
Q_{gs}	Gate-Source Charge		---	7.2	---	
Q_{gd}	Gate-Drain Charge		---	13	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V$, $V_{GS}=10V$, $R_G=3.3\Omega$ $I_D=20A$	---	10	---	ns
T_r	Rise Time		---	34	---	
$T_{d(off)}$	Turn-Off Delay Time		---	56	---	
T_f	Fall Time		---	14.5	---	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $f=1MHz$	---	3415	---	pF
C_{oss}	Output Capacitance		---	282	---	
C_{rss}	Reverse Transfer Capacitance		---	210	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	90	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	270	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^{\circ}\text{C}$	---	---	1	V
t_{rr}	Reverse Recovery Time	$I_F=30A$, $dI/dt=100A/\mu s$, $T_J=25^{\circ}\text{C}$	---	4.5	---	nS
Q_{rr}	Reverse Recovery Charge		---	0.5	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch²FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=47A$
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics

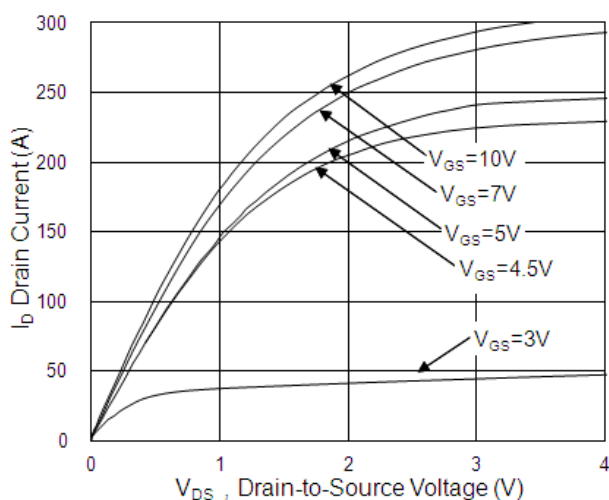


Fig.1 Typical Output Characteristics

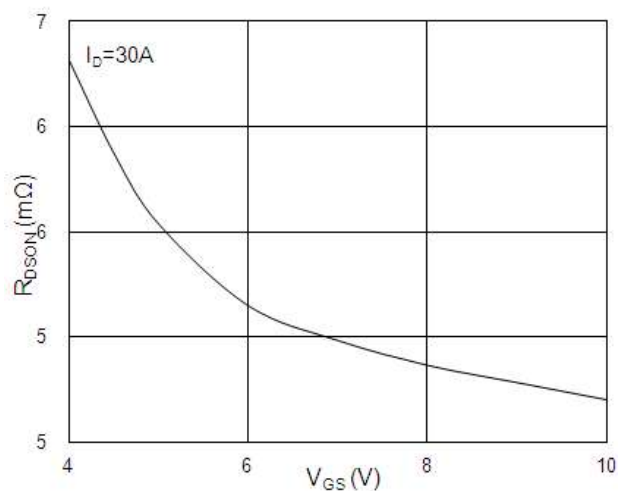


Fig.2 On-Resistance vs. G-S Voltage

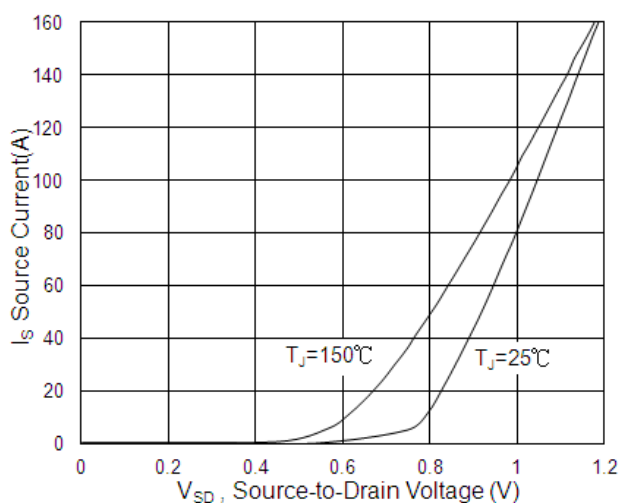


Fig.3 Forward Characteristics Of Reverse

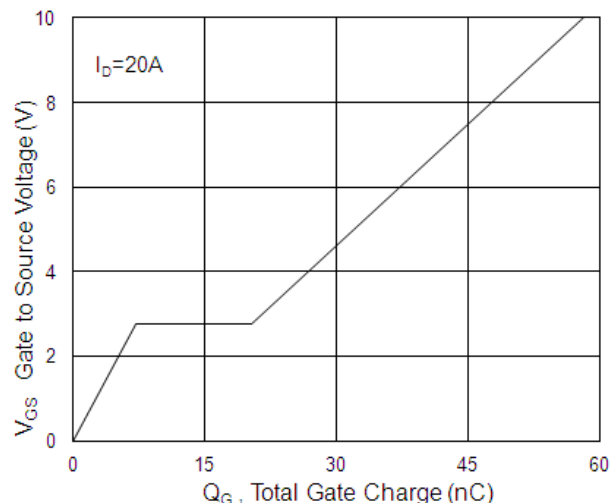


Fig.4 Gate-Charge Characteristics

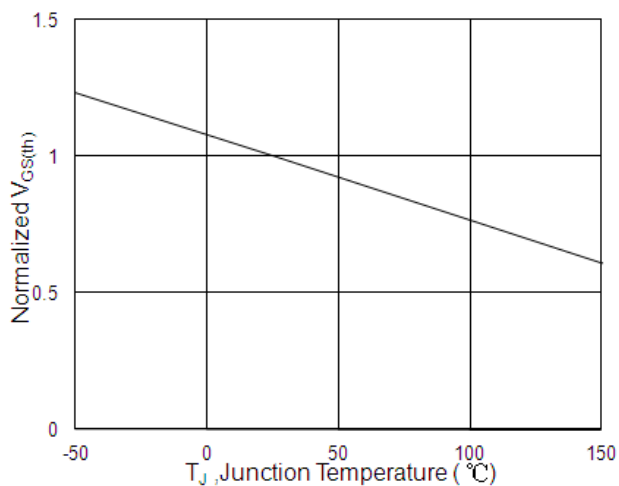


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

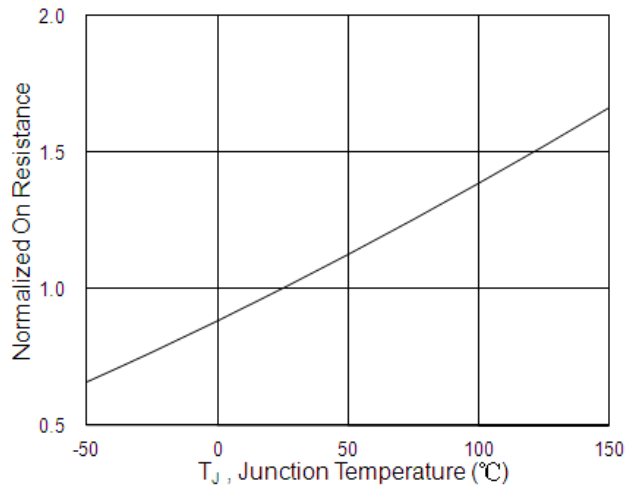


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

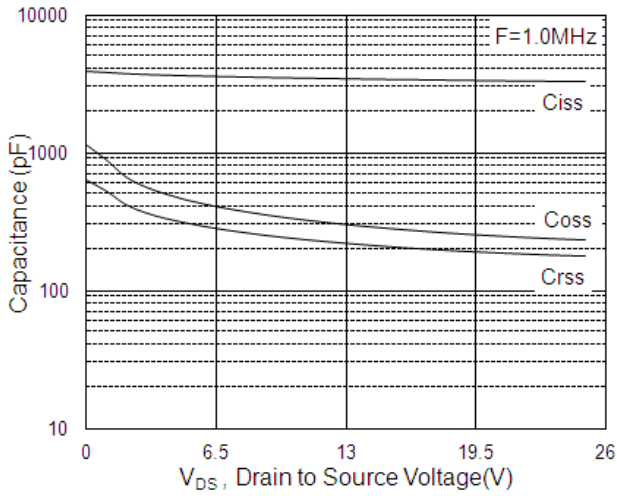


Fig.7 Capacitance

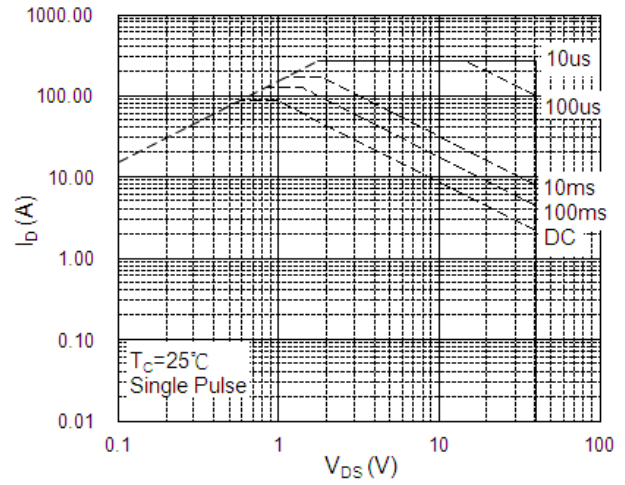


Fig.8 Safe Operating Area

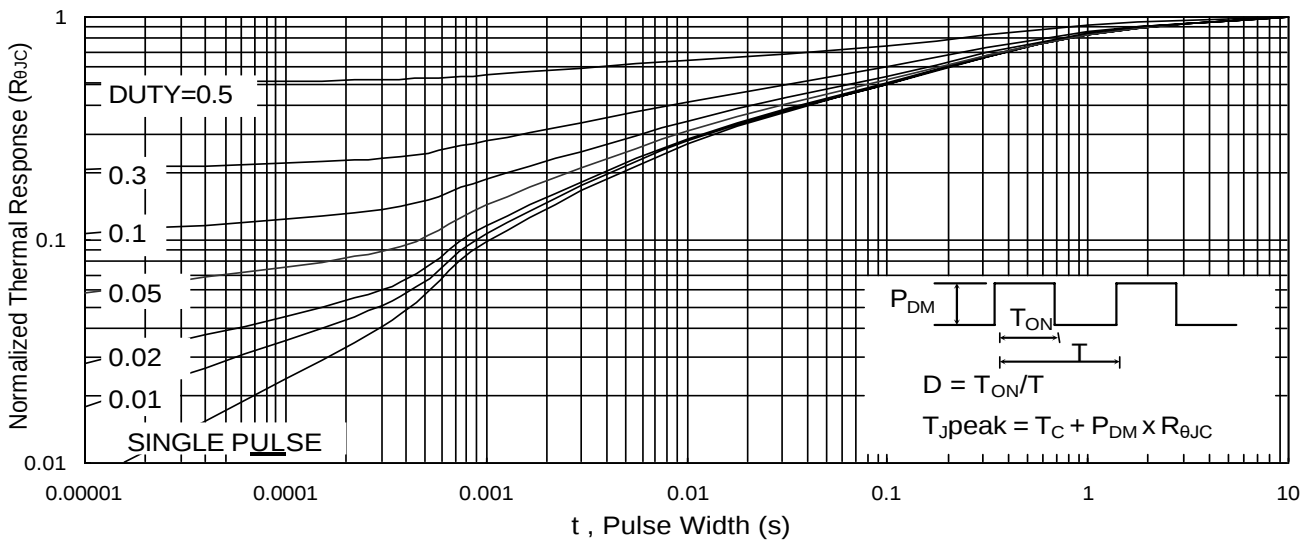


Fig.9 Normalized Maximum Transient Thermal Impedance

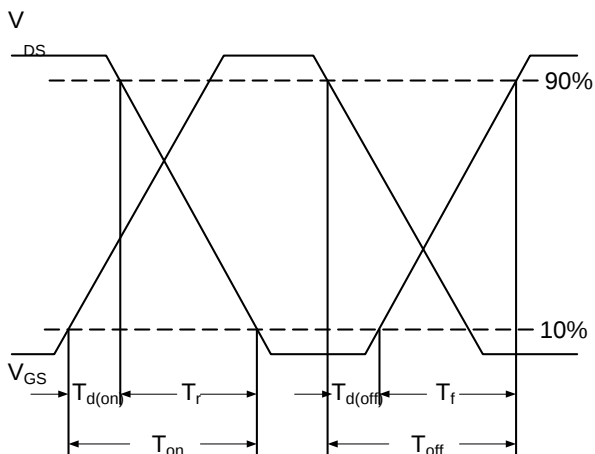


Fig.10 Switching Time Waveform

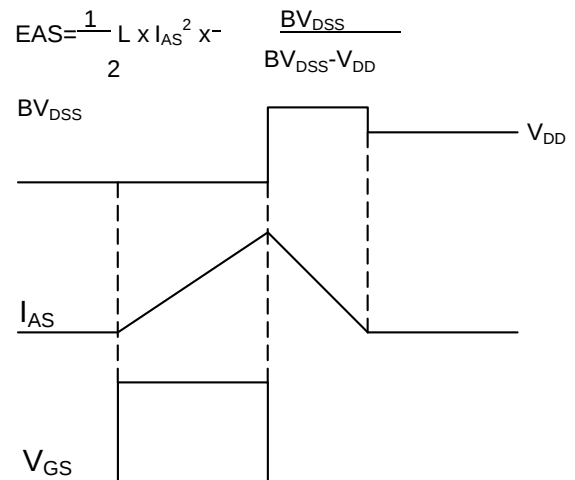
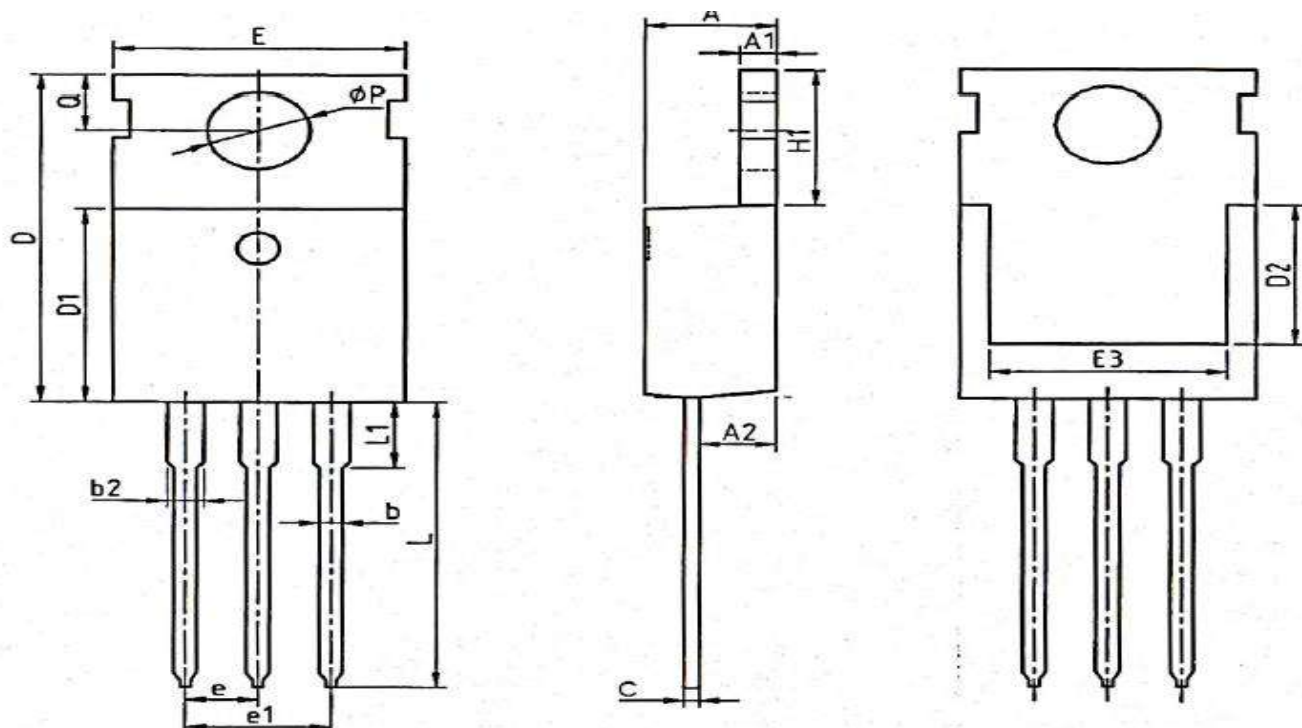


Fig.11 Unclamped Inductive Switching Waveform

TO-220_3L Package Outline



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	3.556	4.826	0.14	0.19
A1	0.508	1.4	0.02	0.055
A2	2.032	2.921	0.08	0.115
b	0.381	1.016	0.015	0.04
b2	1.143	1.778	0.045	0.07
c	0.356	0.61	0.014	0.024
D	14.224	16.51	0.56	0.65
D1	8.382	9.017	0.33	0.355
D2	5.5	-	0.216	-
E	9.652	10.668	0.38	0.42
E3	6.858	-	0.27	-
e	2.540 BSC		0.100 BSC	
e1	5.080 BSC		0.200 BSC	
H1	5.842	6.858	0.23	0.27
L	12.7	14.732	0.5	0.58
L1	-	4.06	-	0.16
Q	2.54	3.048	0.1	0.12