



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

Description

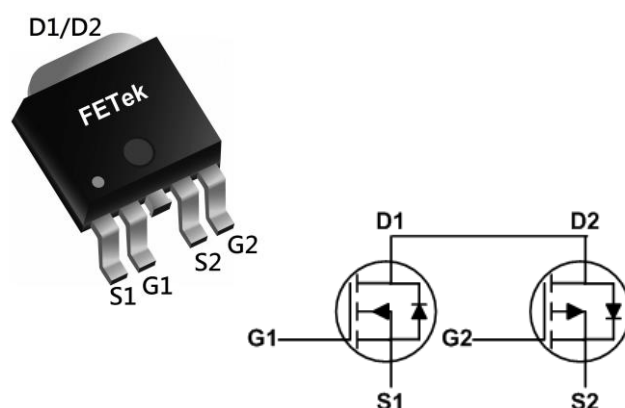
The FKD4903 is the high performance complementary N-ch and P-ch MOSFETs with high cell density, which provide excellent RDS(on) and gate charge for most of the synchronous buck converter applications. The FKD4903 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

Product Summary



BVDSS	RDS(on)	ID
40V	30mΩ	23A
-40V	45mΩ	-20A

TO252 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V _{DS}	Drain-Source Voltage	40	-40	V
V _{GS}	Gate-Source Voltage	±20	±20	V
I _D @T _C =25°C	Continuous Drain Current, V _{GS} @ 10V ¹	23	-20	A
I _D @T _C =100°C	Continuous Drain Current, V _{GS} @ 10V ¹	18	-16	A
I _{DM}	Pulsed Drain Current ²	46	-40	A
EAS	Single Pulse Avalanche Energy ³	28	66	mJ
I _{AS}	Avalanche Current	17.8	-27.2	A
P _D @T _C =25°C	Total Power Dissipation ⁴	25	31.3	W
T _{STG}	Storage Temperature Range	-55 to 150	-55 to 150	°C
T _J	Operating Junction Temperature Range	-55 to 150	-55 to 150	°C

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction-Ambient ¹	---	62	°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	---	5	°C/W

**N-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$, 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	$V_{GS}=10V$, $I_D=12A$	---	---	30	$m\Omega$
		$V_{GS}=4.5V$, $I_D=10A$	---	---	50	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.0	1.5	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.56	---	$mV/^\circ\text{C}$
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	$V_{DS}=5V$, $I_D=12A$	---	8	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	2.6	5.2	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=20V$, $V_{GS}=4.5V$, $I_D=12A$	---	5.5	---	nC
Q_{gs}	Gate-Source Charge		---	1.25	---	
Q_{gd}	Gate-Drain Charge		---	2.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V$, $V_{GS}=10V$, $R_G=3.3\Omega$ $I_D=1A$	---	8.9	---	ns
T_r	Rise Time		---	2.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	41	---	
T_f	Fall Time		---	2.7	---	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $f=1MHz$	---	593	---	pF
C_{oss}	Output Capacitance		---	76	---	
C_{rss}	Reverse Transfer Capacitance		---	56	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	23	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	46	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ\text{C}$	---	---	1.2	V

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ 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 $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=17.8A$
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.

**P-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$, 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
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.012	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V$, $I_D=-8A$	---	---	45	$m\Omega$
		$V_{GS}=-4.5V$, $I_D=-4A$	---	---	70	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=-250\mu A$	-1.0	-1.6	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.32	---	$mV/^\circ\text{C}$
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
gfs	Forward Transconductance	$V_{DS}=-5V$, $I_D=-8A$	---	12.6	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	13	16	Ω
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-20V$, $V_{GS}=-4.5V$, $I_D=-12A$	---	9	---	nC
Q_{gs}	Gate-Source Charge		---	2.54	---	
Q_{gd}	Gate-Drain Charge		---	3.1	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V$, $V_{GS}=-10V$, $R_G=3.3\Omega$, $I_D=-1A$	---	19.2	---	ns
T_r	Rise Time		---	12.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	48.6	---	
T_f	Fall Time		---	4.6	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	1004	---	pF
C_{oss}	Output Capacitance		---	108	---	
C_{rss}	Reverse Transfer Capacitance		---	80	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	-20	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	-40	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^\circ\text{C}$	---	---	-1	V

Note :

1.The data tested by surface mounted on a 1 inch² FR-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 $V_{DD}=-25V$, $V_{GS}=-10V$, $L=0.1mH$, $I_{AS}=-27.2A$ 4.The power dissipation is limited by 150°C junction temperature5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

N-Channel Typical Characteristics

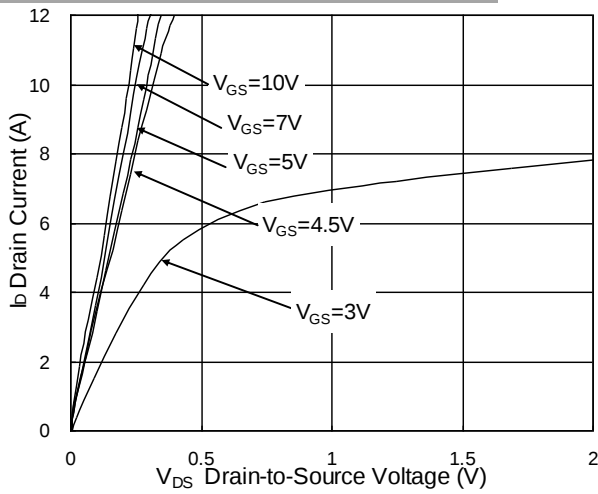


Fig.1 Typical Output Characteristics

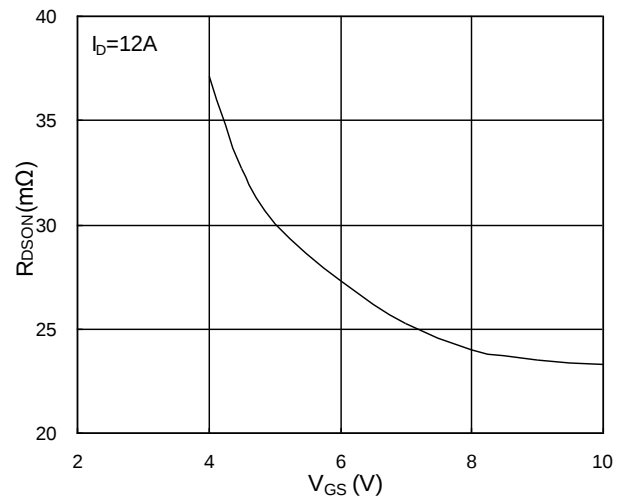


Fig.2 On-Resistance vs. G-S Voltage

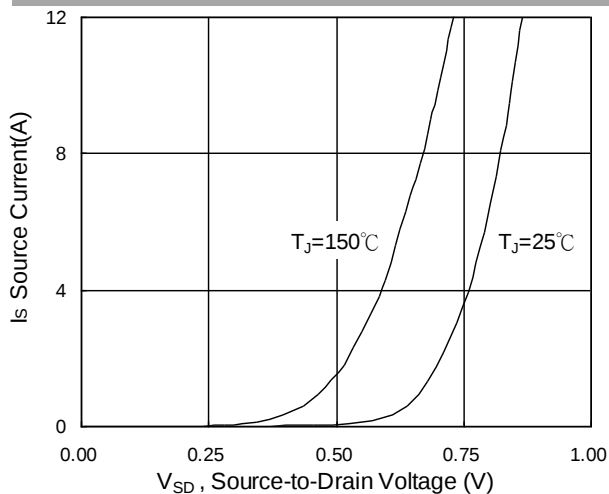


Fig.3 Forward Characteristics of Reverse

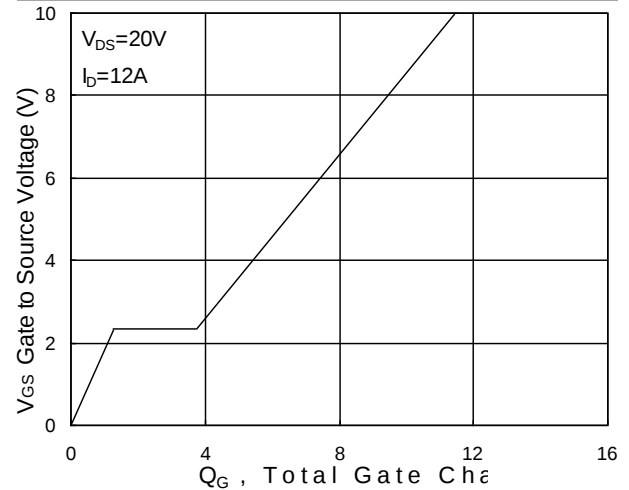


Fig.4 Gate-Charge Characteristics

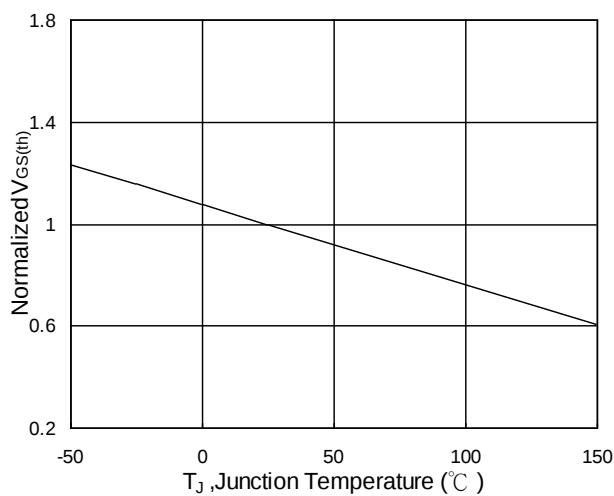


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

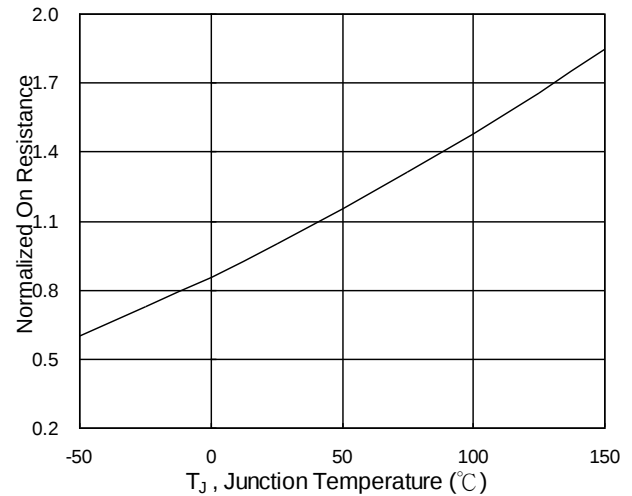


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

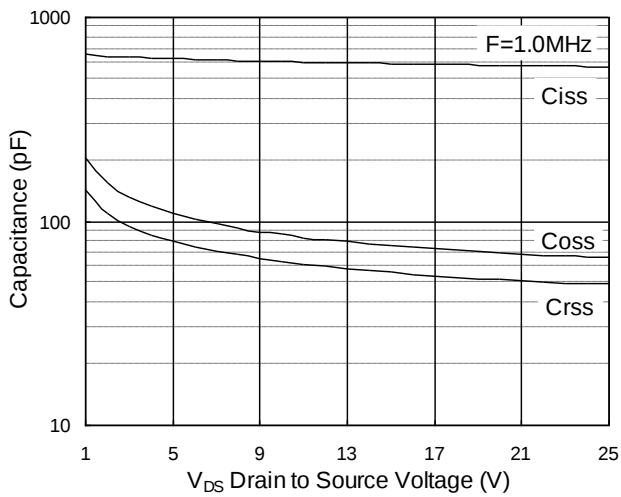


Fig.7 Capacitance

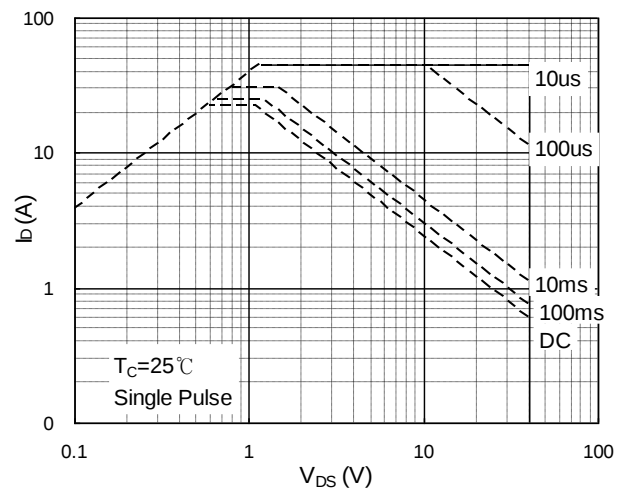


Fig.8 Safe Operating Area

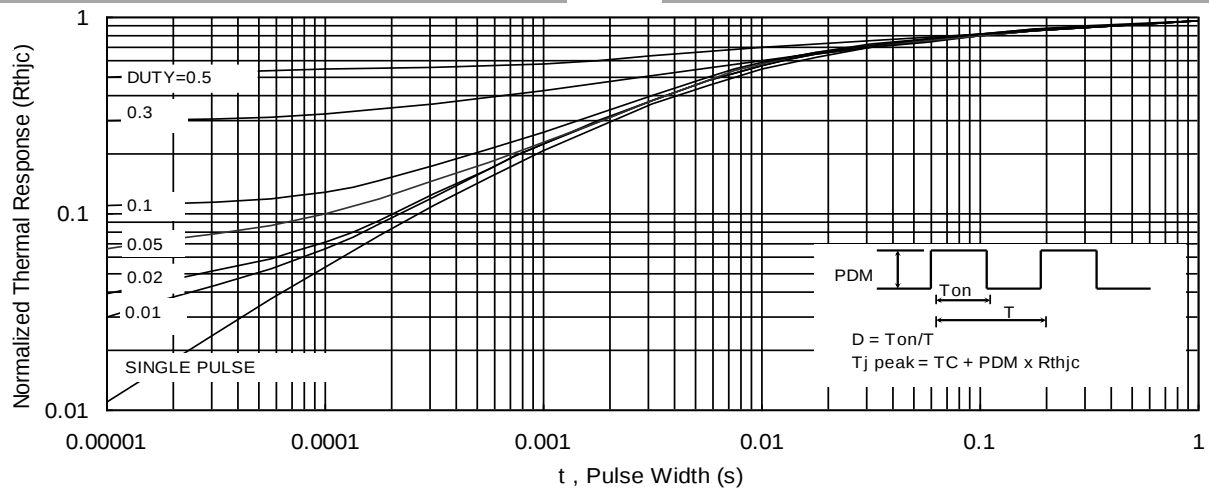


Fig.9 Normalized Maximum Transient Thermal Impedance

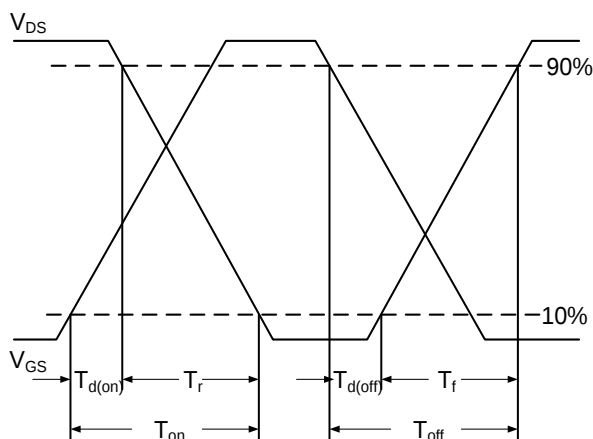


Fig.10 Switching Time Waveform

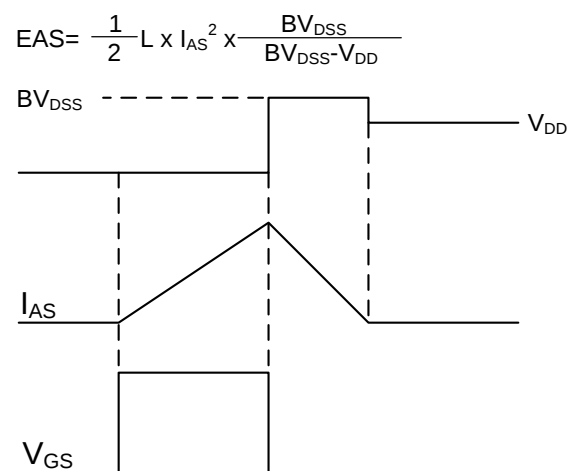
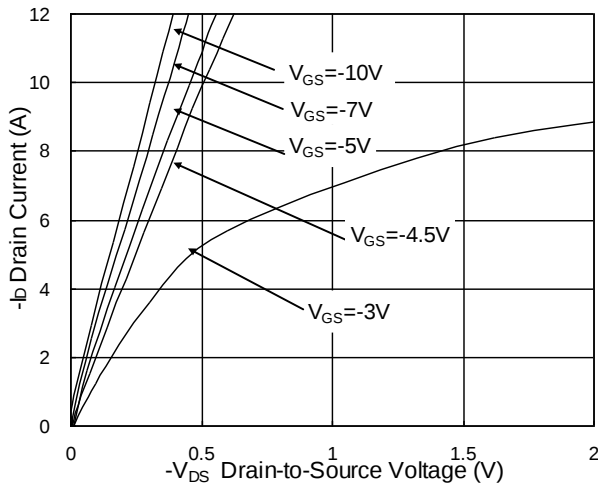
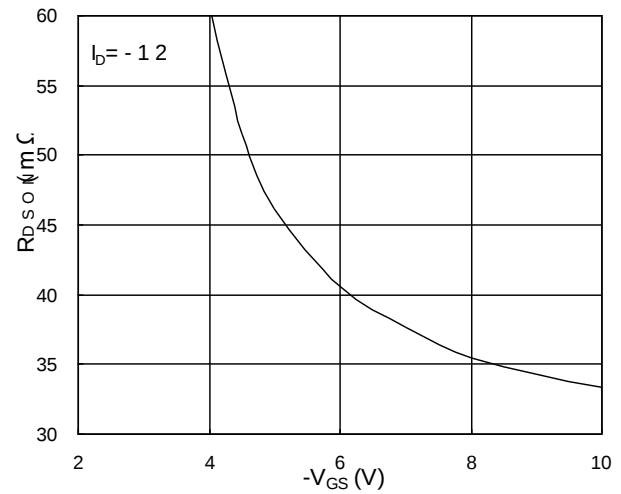
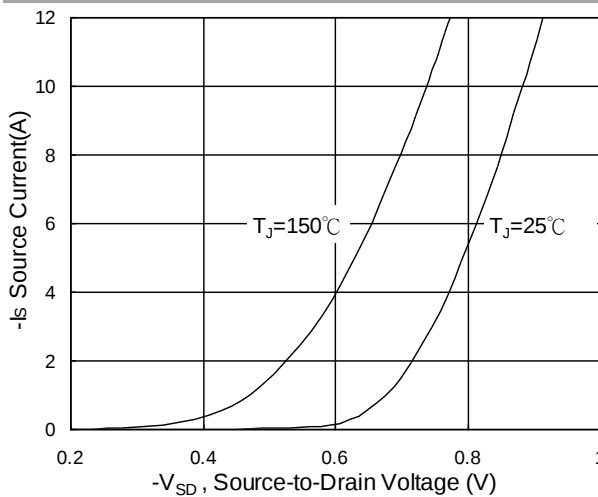
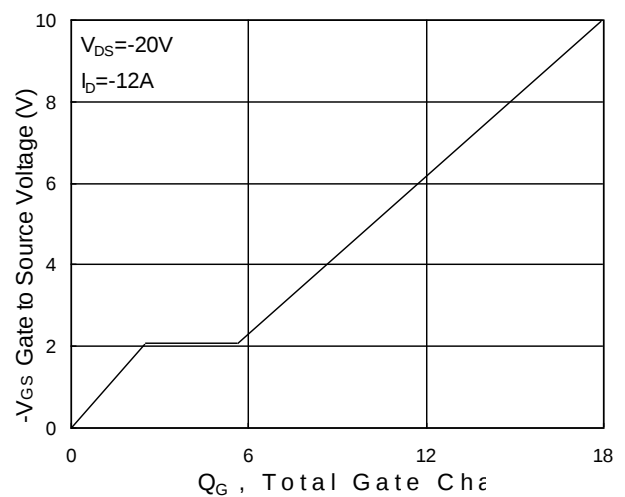
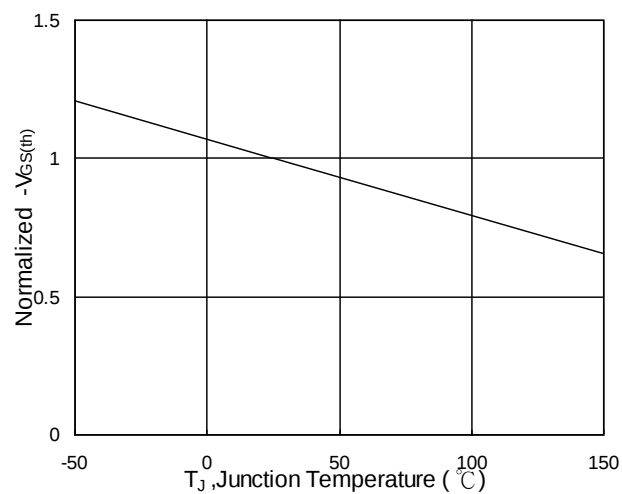
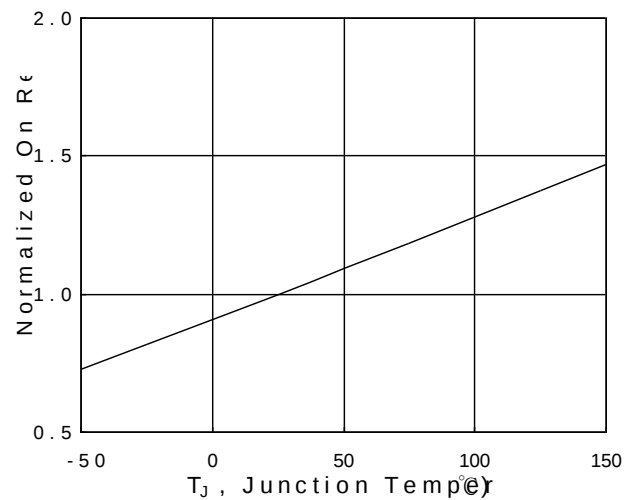


Fig.11 Unclamped Inductive Switching Wave

P-Channel Typical Characteristics

Fig.1 Typical Output Characteristics

Fig.2 On-Resistance v.s Gate-Source

Fig.3 Forward Characteristics of Reverse

Fig.4 Gate-Charge Characteristics

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

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

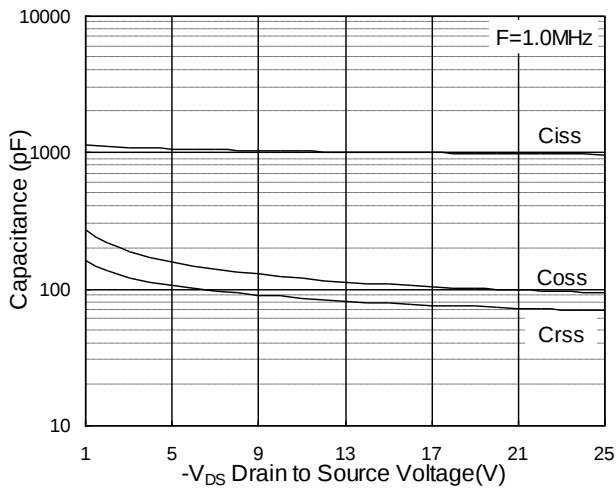


Fig.7 Capacitance

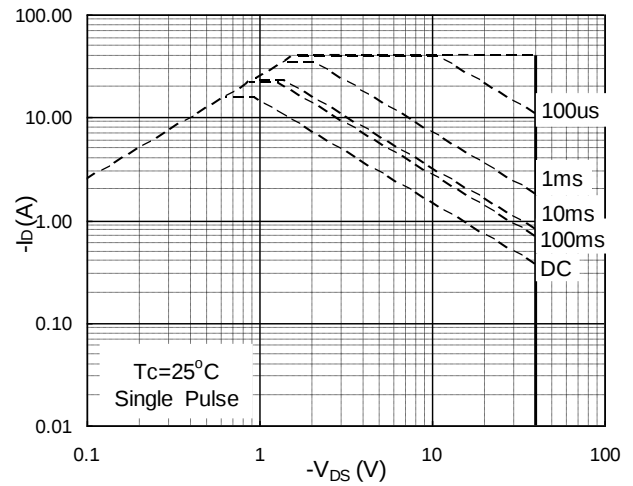


Fig.8 Safe Operating Area

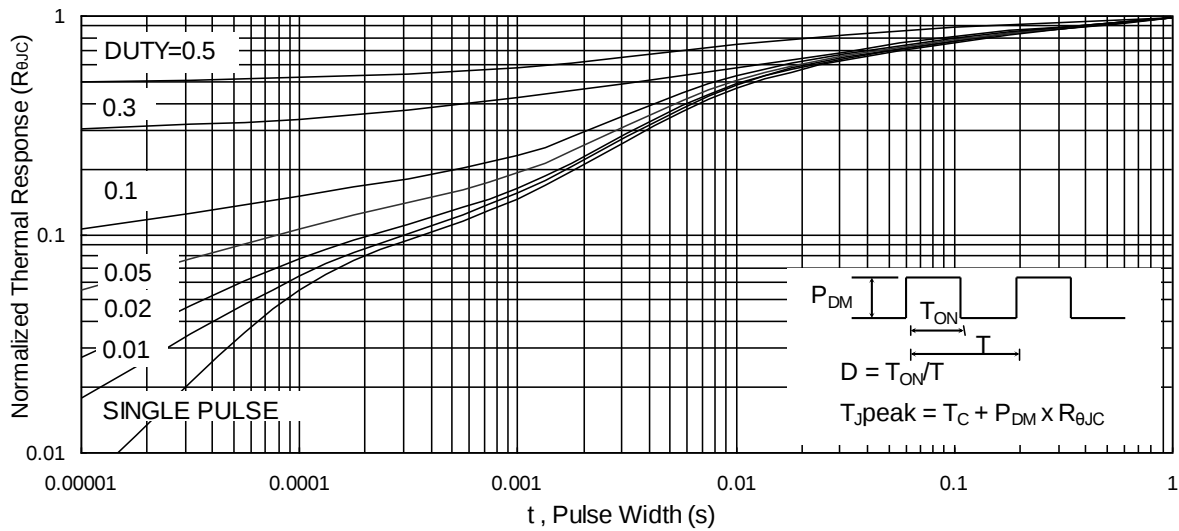


Fig.9 Normalized Maximum Transient Thermal Impedance

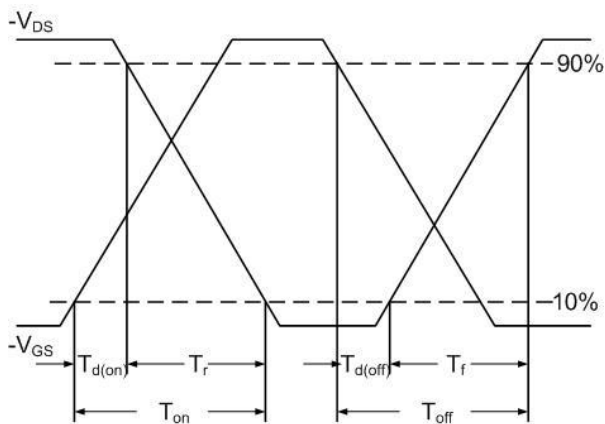


Fig.10 Switching Time Waveform

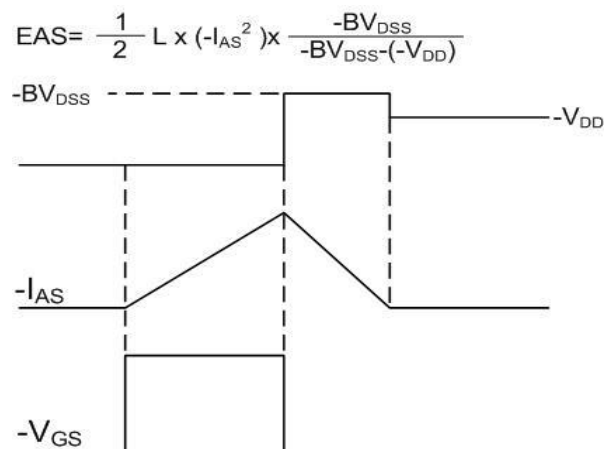


Fig.11 Unclamped Inductive Waveform