

30V Dual Asymmetric N-Channel MOSFET

Description:

- Advanced Trench MOS Technology
- Low Gate Charge
- Low $R_{DS(ON)}$
- 100% EAS Guaranteed
- Green Device Available

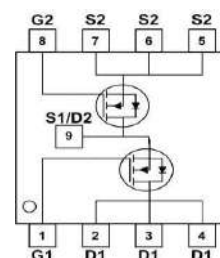
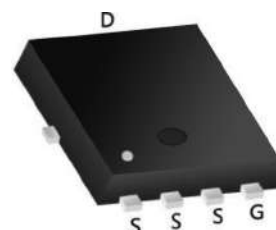
Applications:

- Power Management in Desktop Computer or DC/DC Converters.
- Isolated DC/DC Converters in Telecom and Industrial.

Product Summary

BVDSS	RDSON	ID
30V	5.2mΩ	50A
30V	3.9mΩ	60A

PRPAK5X6 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		Die1	Die2	
V_{DS}	Drain-Source Voltage	30	30	V
V_{GS}	Gate-Source Voltage	±20	±20	V
$I_D@T_C=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	50	60	A
$I_D@T_C=100^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	31	38	A
I_{DM}	Pulsed Drain Current ²	100	120	A
EAS	Single Pulse Avalanche Energy ³	61.3	80	mJ
I_{AS}	Avalanche Current	35	40	A
$P_D@T_C=25^{\circ}C$	Total Power Dissipation ⁴	21	22	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. D1	Typ. D2	Max. D1	Max. D2	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	50	50	65	65	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	4.6	4.4	6	5.8	°C/W

Die1 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	$V_{GS}=0V$, $I_D=250\mu A$	30	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V$, $I_D=20A$	---	4.5	5.2	$m\Omega$
		$V_{GS}=4.5V$, $I_D=15A$	---	7.2	9	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	1.7	2.2	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=30V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=30V$, $V_{GS}=0V$, $T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=20A$	---	65	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1\text{MHz}$	0.8	1.7	2.6	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=15V$, $V_{GS}=10V$, $I_D=20A$	---	9	---	nC
Q_{gs}	Gate-Source Charge		---	2.8	---	
Q_{gd}	Gate-Drain Charge		---	3.6	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V$, $V_{GS}=10V$, $R_G=3\Omega$ $I_D=20A$	---	7	---	ns
T_r	Rise Time		---	18.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	19.5	---	
T_f	Fall Time		---	3.4	---	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	1113	---	pF
C_{oss}	Output Capacitance		---	436	---	
C_{rss}	Reverse Transfer Capacitance		---	55	---	

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
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 $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=35A$
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.

Die2 N-Channel Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	30	---	---	V
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =20A	---	3.2	3.9	mΩ
		V _{GS} =4.5V, I _D =15A	---	4.9	6.1	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250μA	1.2	1.7	2.2	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =30V, V _{GS} =0V, T _J =25°C	---	---	1	μA
		V _{DS} =30V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =20A	---	75	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	0.7	1.65	2.6	Ω
Q _g	Total Gate Charge (4.5V)	V _{DS} =15V, V _{GS} =4.5V, I _D =20A	---	14.7	---	nC
Q _{gs}	Gate-Source Charge		---	5.8	---	
Q _{gd}	Gate-Drain Charge		---	3.5	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =15V, V _{GS} =10V, R _G =3Ω I _D =20A	---	7.5	---	ns
T _r	Rise Time		---	20.2	---	
T _{d(off)}	Turn-Off Delay Time		---	21.6	---	
T _f	Fall Time		---	4.4	---	
C _{iss}	Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	1476	---	pF
C _{oss}	Output Capacitance		---	556	---	
C _{rss}	Reverse Transfer Capacitance		---	70	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	30	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1	V

Note :

- The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=40A
- The power dissipation is limited by 150°C junction temperature
- 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 (Die1)

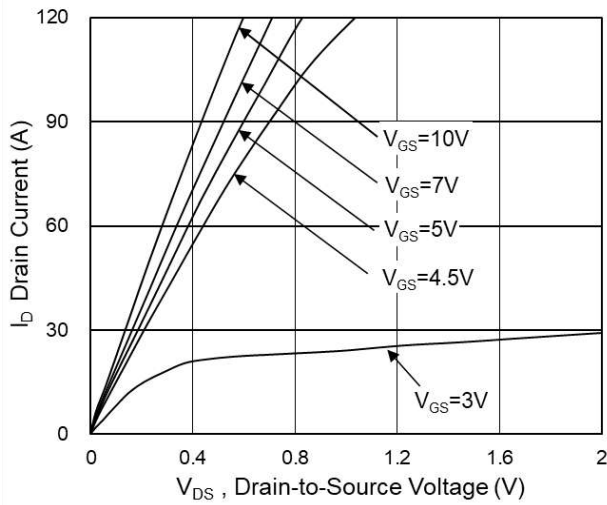


Fig.1 Typical Output Characteristics

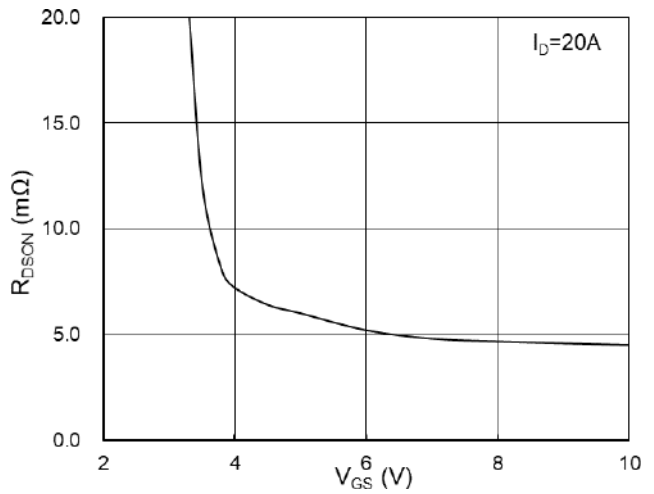


Fig.2 On-Resistance vs G-S Voltage

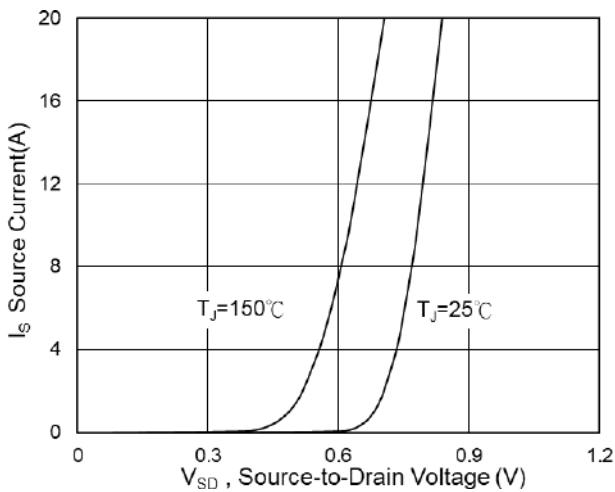


Fig.3 Source Drain Forward Characteristics

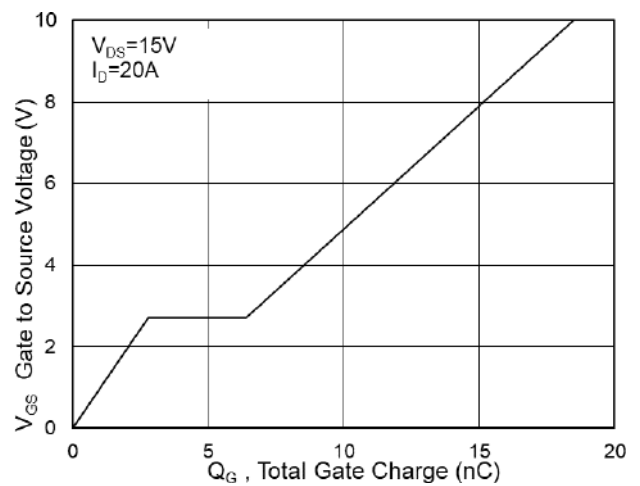


Fig.4 Gate-Charge Characteristics

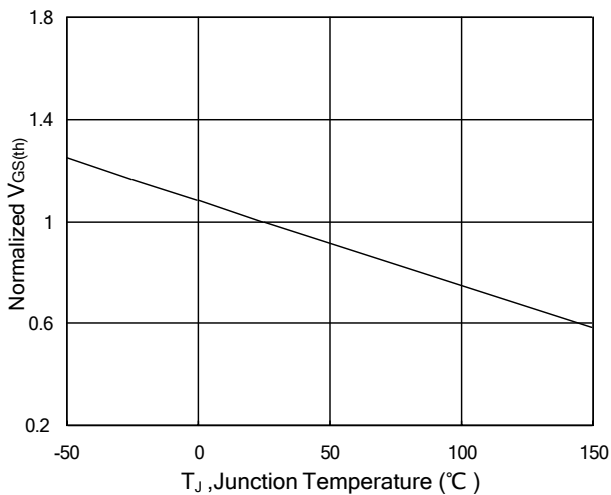


Fig.5 Normalized $V_{GS(th)}$ vs T_J

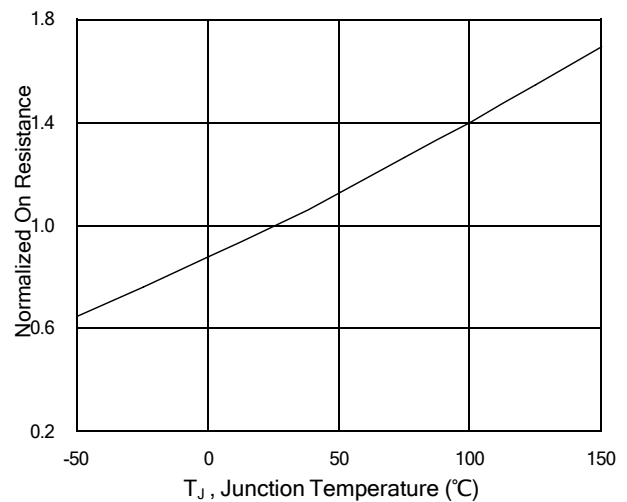


Fig.6 Normalized $R_{DS(on)}$ vs T_J

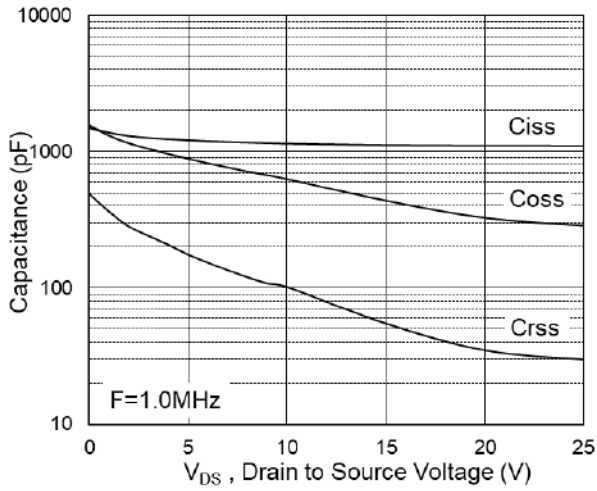


Fig.7 Capacitance

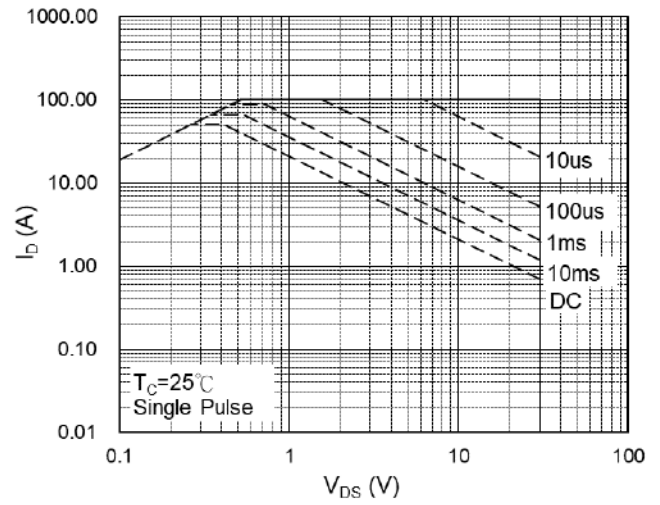


Fig.8 Safe Operating Area

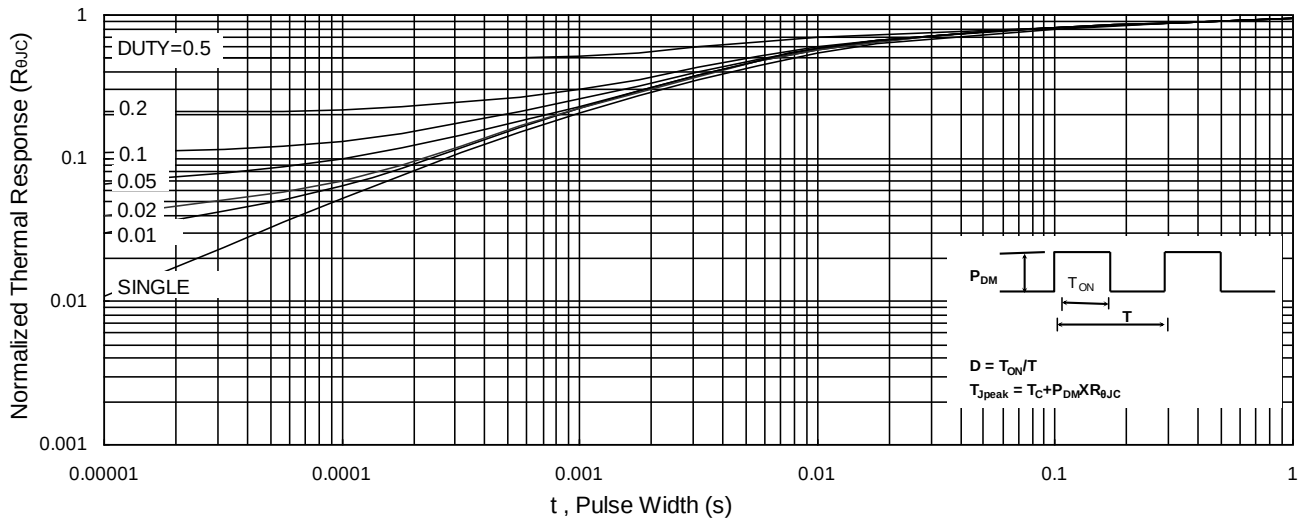


Fig.9 Normalized Maximum Transient Thermal Impedance

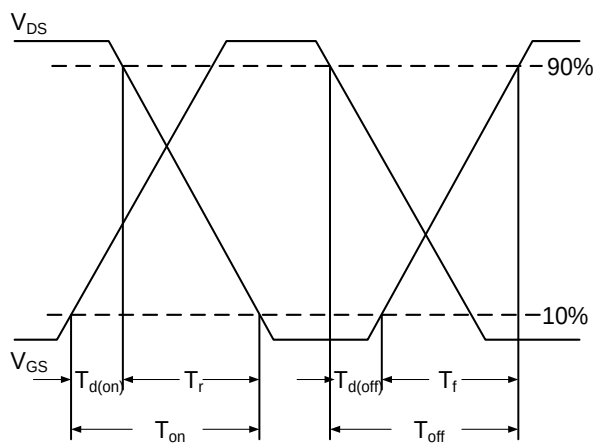


Fig.10 Switching Time Waveform

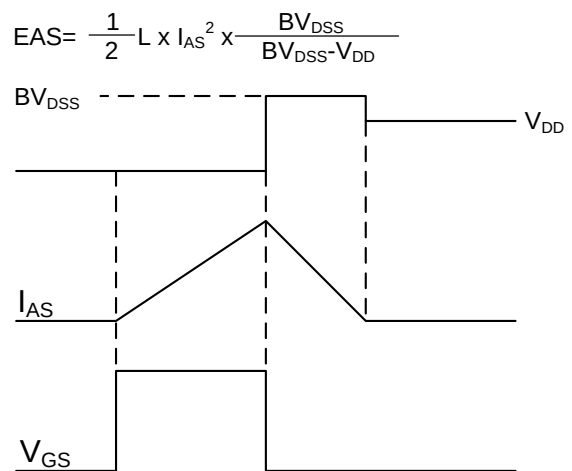


Fig.11 Unclamped Inductive Switching Waveform

N-Channel Typical Characteristics (Die2)

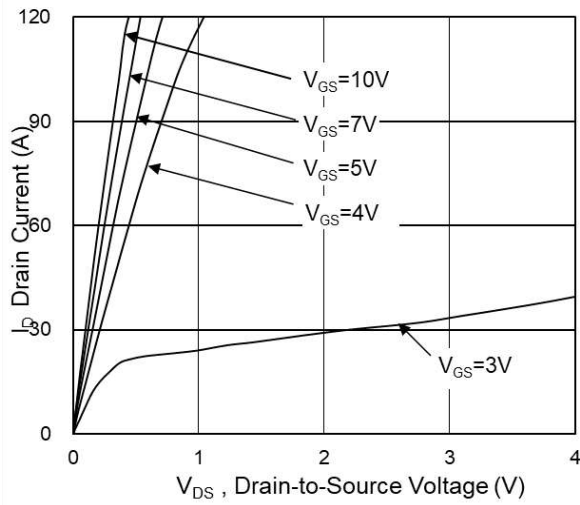


Fig.1 Typical Output Characteristics

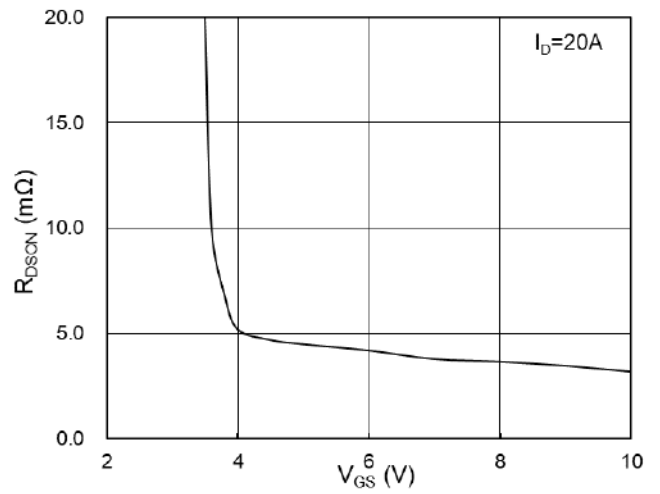


Fig.2 On-Resistance vs G-S Voltage

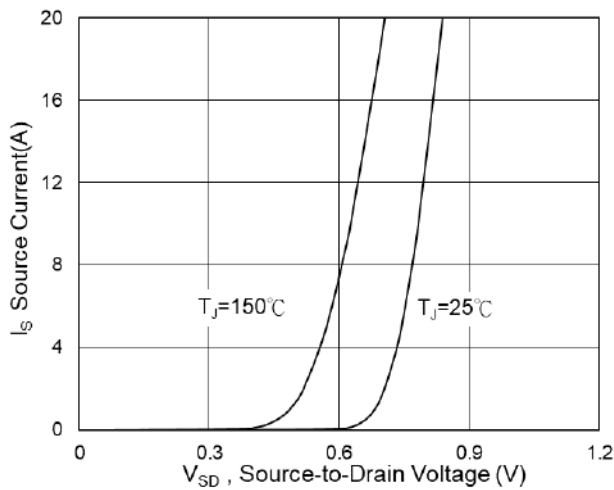


Fig.3 Source Drain Forward Characteristics

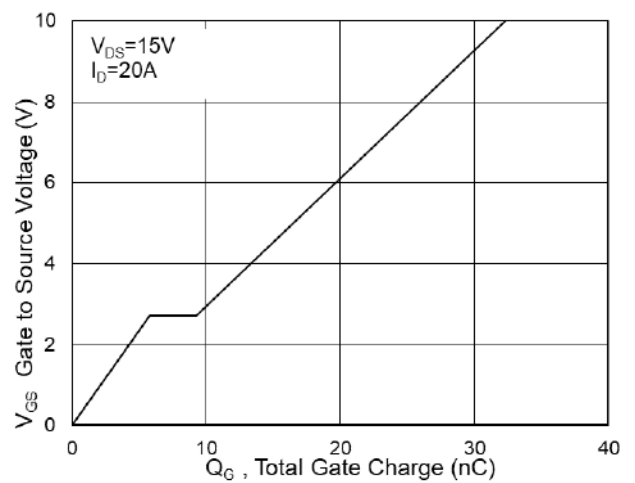


Fig.4 Gate-Charge Characteristics

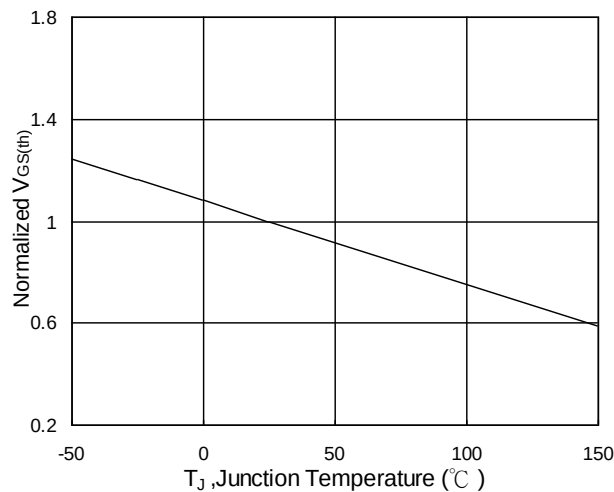


Fig.5 Normalized $V_{GS(th)}$ vs T_J

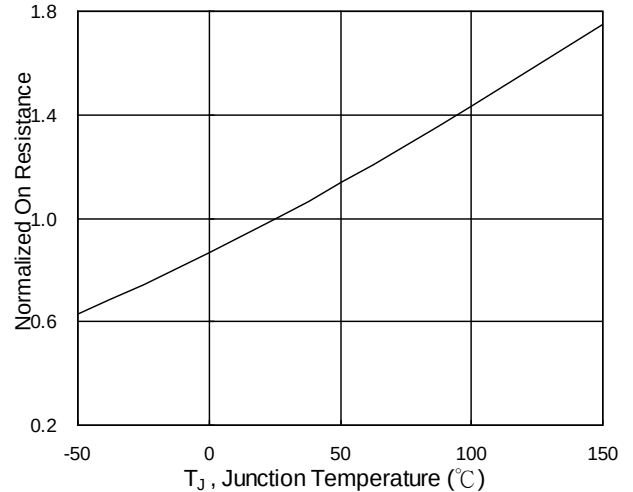


Fig.6 Normalized $R_{DS(on)}$ vs T_J

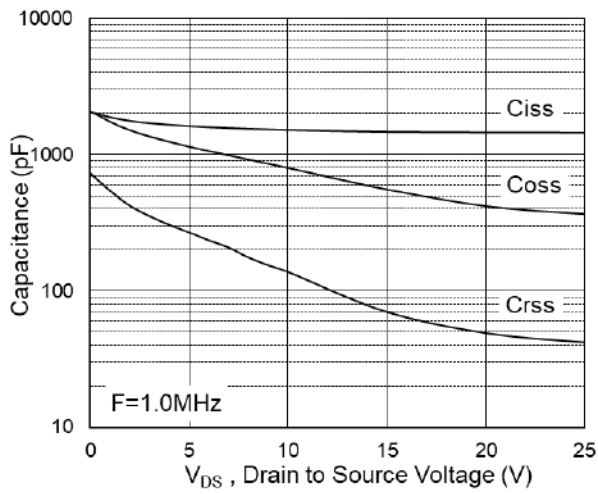


Fig.7 Capacitance

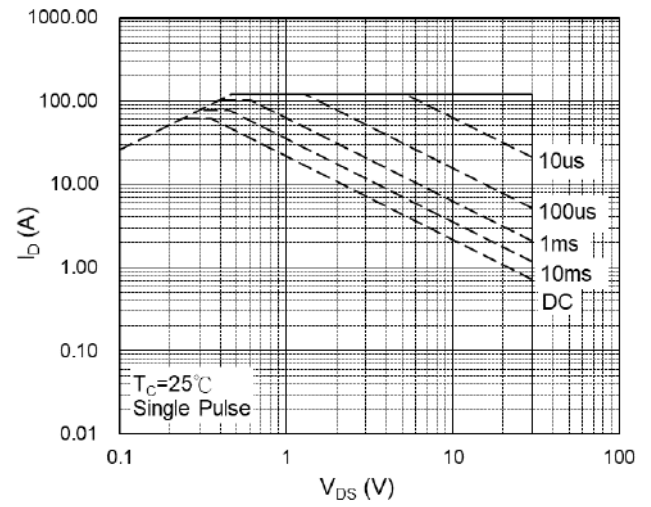


Fig.8 Safe Operating Area

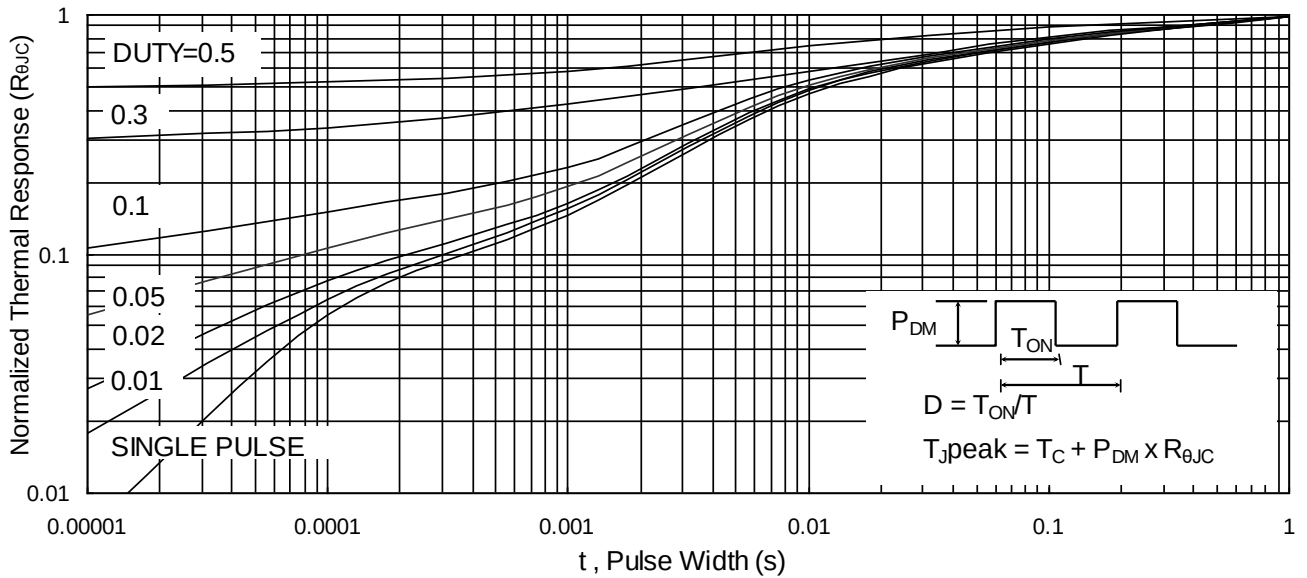


Fig.9 Normalized Maximum Transient Thermal Impedance

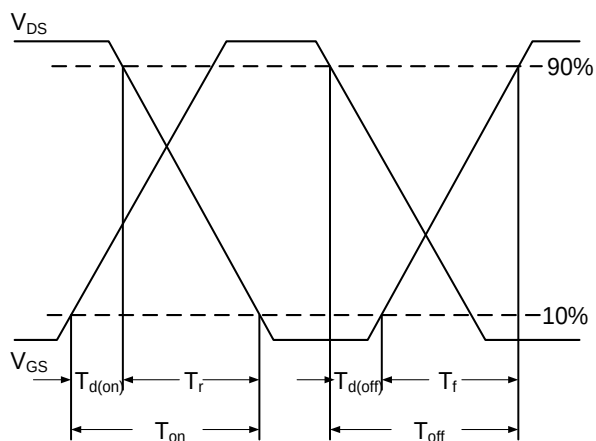


Fig.10 Switching Time Waveform

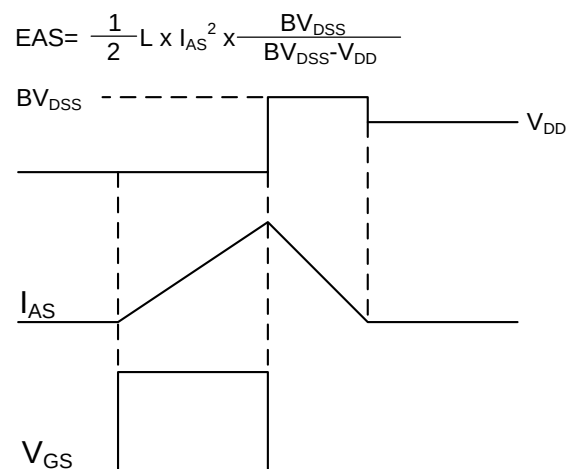


Fig.11 Unclamped Inductive Switching Wave