



Features

- Advanced Trench MOS Technology
- 100% EAS Guaranteed
- Green Device Available

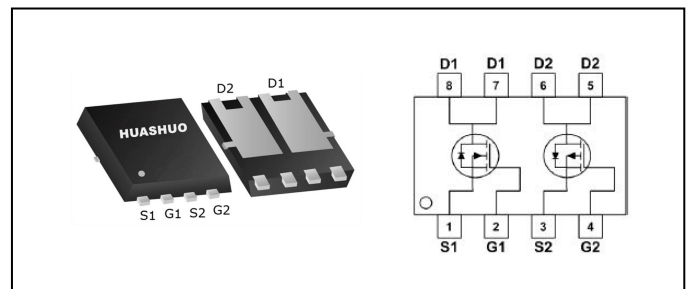
Product Summary

BVDSS	RDSON	ID
60V	38mΩ	5.5A
-60V	75mΩ	-4A

Applications

- Synchronous Rectification
- Motor Control.
- High Current, High Speed Switching
- Portable equipment application.

PRPAK3*3 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D@T_A=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	5.5	-4	A
$I_D@T_A=70^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	4	-3.2	A
I_{DM}	Pulsed Drain Current ²	20	-14	A
EAS	Single Pulse Avalanche Energy ³	22	29	mJ
I_{AS}	Avalanche Current	21	-24	A
$P_D@T_A=25^{\circ}C$	Total Power Dissipation ⁴	2	2	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^{\circ}C$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^{\circ}C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	85	$^{\circ}C/W$



N-Channel 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	$V_{GS}=0V$, $I_D=250\mu A$	60	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V$, $I_D=5A$	---	38	50	$m\Omega$
		$V_{GS}=4.5V$, $I_D=4A$	---	45	70	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.0	1.7	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.56	---	$mV/^{\circ}C$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=48V$, $V_{GS}=0V$, $T_J=25^{\circ}C$	---	---	1	μA
		$V_{DS}=48V$, $V_{GS}=0V$, $T_J=55^{\circ}C$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=4A$	---	28	---	S
Q_g	Total Gate Charge (4.5V)	$V_{DS}=48V$, $V_{GS}=4.5V$, $I_D=4A$	---	19	---	nC
Q_{gs}	Gate-Source Charge		---	2.5	---	
Q_{gd}	Gate-Drain Charge		---	4.1	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=30V$, $V_{GS}=10V$, $R_G=3.3\Omega$ $I_D=4A$	---	3	---	ns
T_r	Rise Time		---	34	---	
$T_{d(off)}$	Turn-Off Delay Time		---	22	---	
T_f	Fall Time		---	6	---	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $f=1MHz$	---	1031	---	pF
C_{oss}	Output Capacitance		---	66	---	
C_{rss}	Reverse Transfer Capacitance		---	46	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	2.5	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^{\circ}C$	---	---	1.2	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 $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=21A$
- 4.The power dissipation is limited by $150^{\circ}C$ 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	$V_{GS}=0V, I_D=-250\mu A$	-60	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V, I_D=-3A$	---	75	100	$m\Omega$
		$V_{GS}=-4.5V, I_D=-3A$	---	90	120	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.7	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.32	---	$mV/^\circ C$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-48V, V_{GS}=0V, T_J=25^\circ C$	---	---	1	μA
		$V_{DS}=-48V, V_{GS}=0V, T_J=55^\circ C$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V, I_D=-3A$	---	15	---	S
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	---	13.5	---	Ω
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-48V, V_{GS}=-4.5V, I_D=-3A$	---	9.7	---	nC
Q_{gs}	Gate-Source Charge		---	3.1	---	
Q_{gd}	Gate-Drain Charge		---	2.9	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-1A$	---	29	---	ns
T_r	Rise Time		---	20	---	
$T_{d(off)}$	Turn-Off Delay Time		---	61	---	
T_f	Fall Time		---	7	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1MHz$	---	1444	---	pF
C_{oss}	Output Capacitance		---	98	---	
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	---	---	-2.5	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=-1A, T_J=25^\circ C$	---	---	-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 $V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-24A$
- 4.The power dissipation is limited by $150^\circ C$ 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.



N-Ch and P-Ch Fast Switching MOSFETs

N-Channel Typical Characteristics

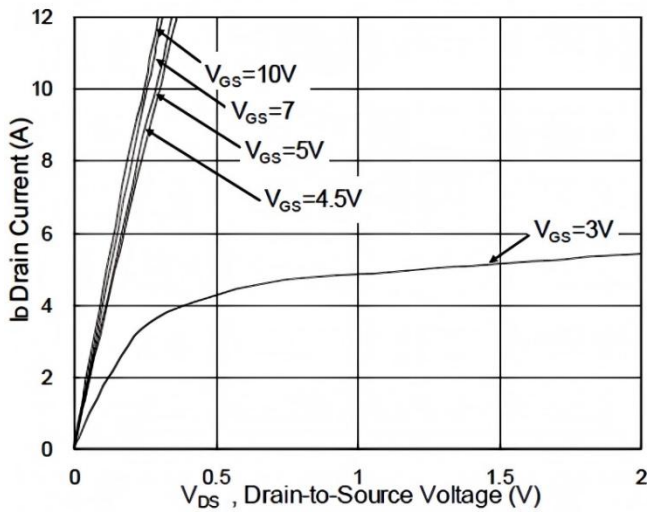


Fig.1 Typical Output Characteristics

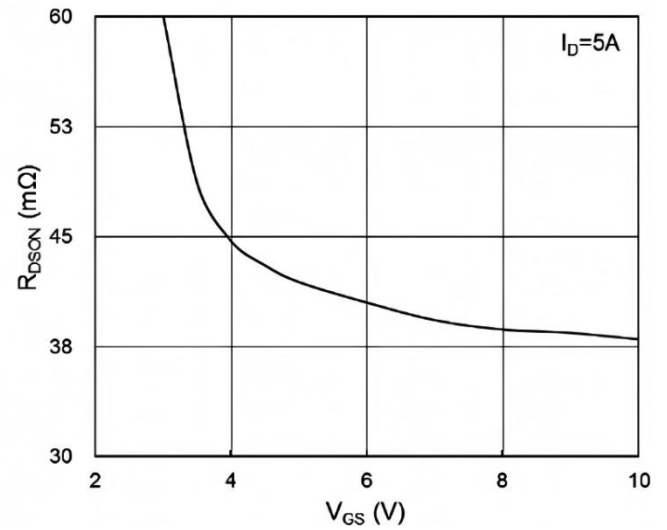


Fig.2 On-Resistance vs. G-S Voltage

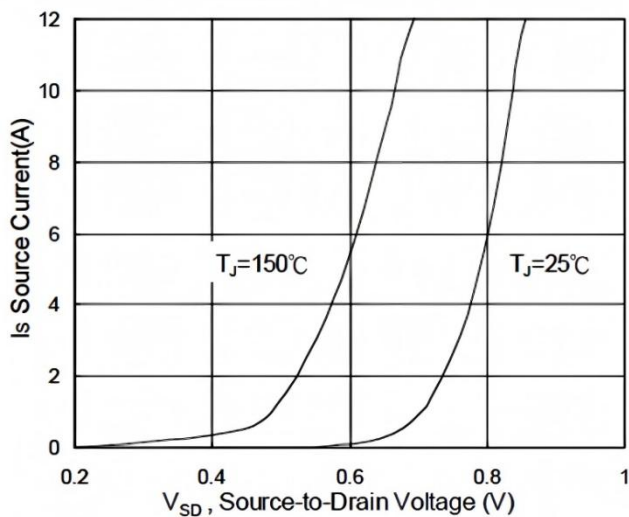


Fig.3 Forward Characteristics of Reverse

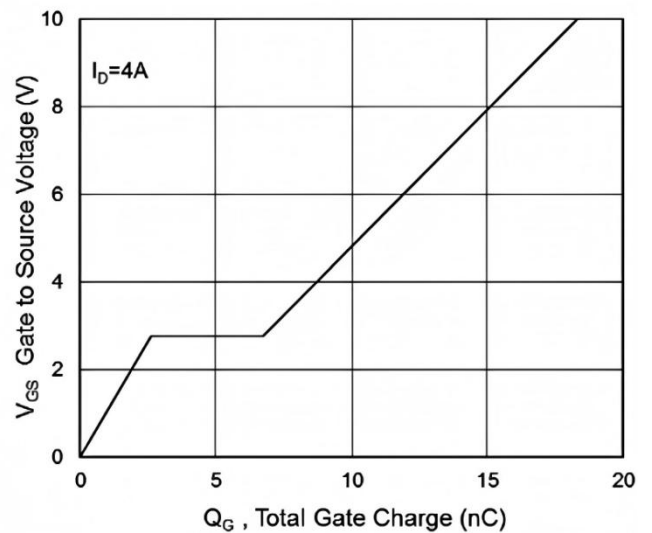


Fig.4 Gate-Charge Characteristics

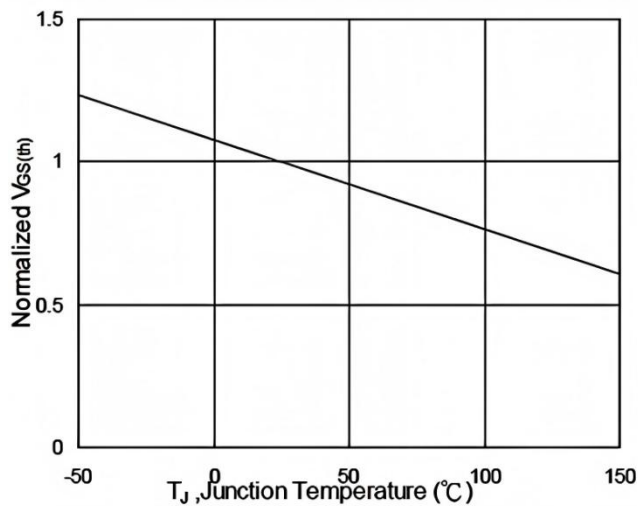


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

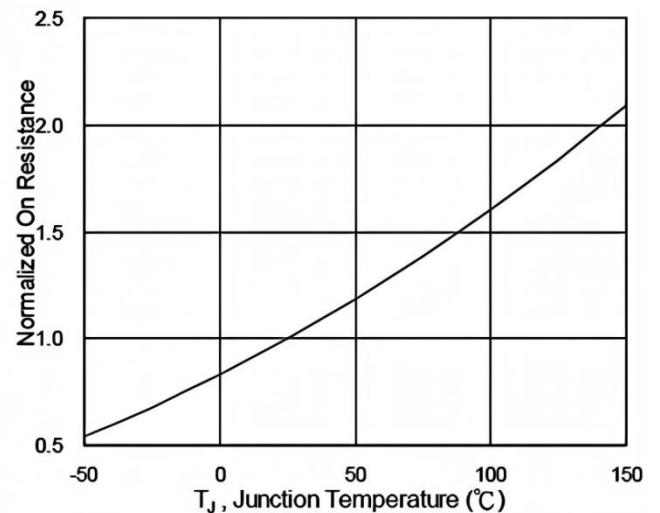


Fig.6 Normalized $R_{DS(on)}$ vs. T_J



N-Ch and P-Ch Fast Switching MOSFETs

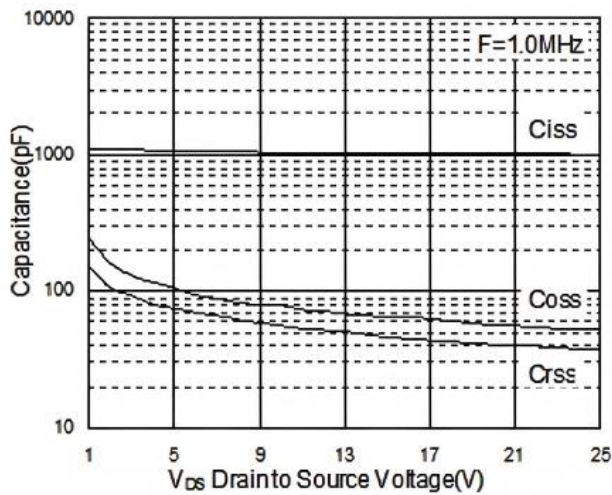


Fig.7 Capacitance

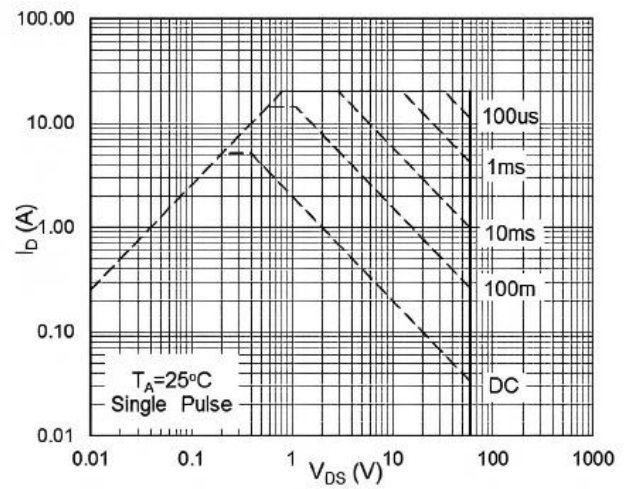


Fig.8 Safe Operating Area

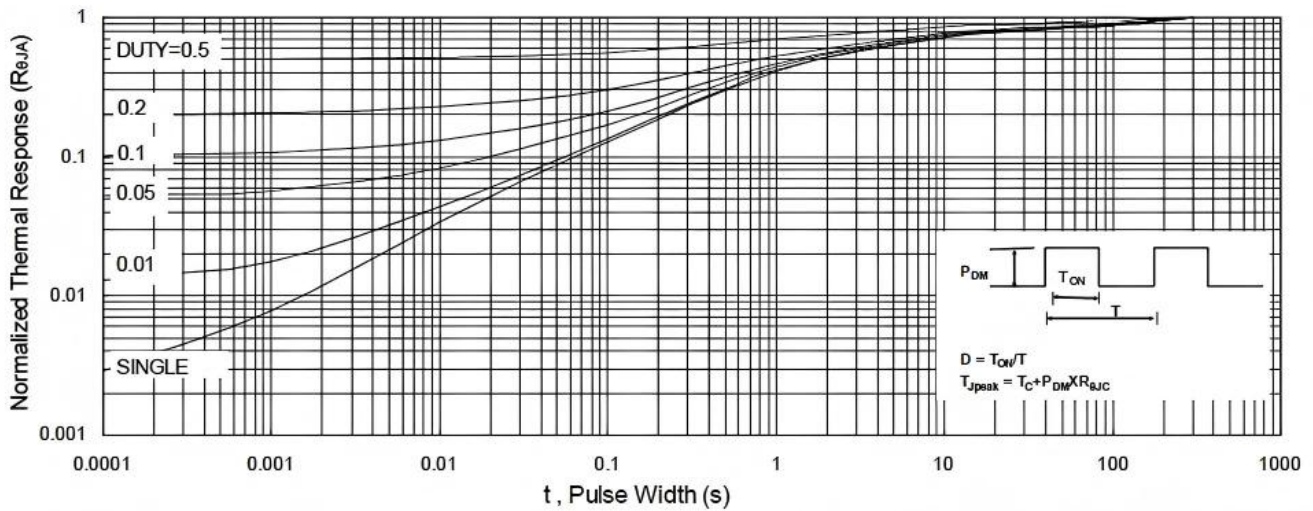


Fig.9 Normalized Maximum Transient Thermal Impedance

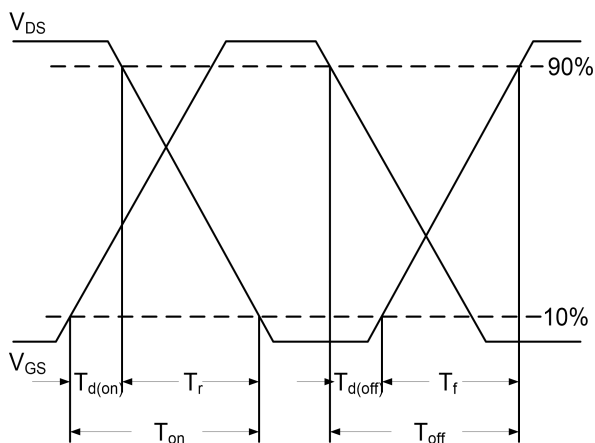


Fig.10 Switching Time Waveform

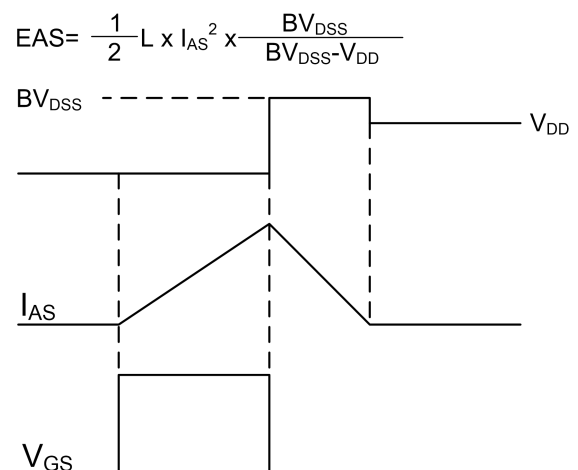


Fig.11 Unclamped Inductive Switching Wave



N-Ch and P-Ch Fast Switching MOSFETs

P-Channel Typical Characteristics

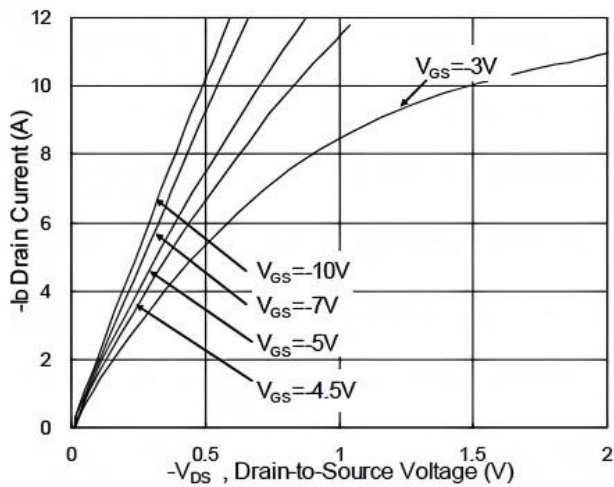


Fig.1 Typical Output Characteristics

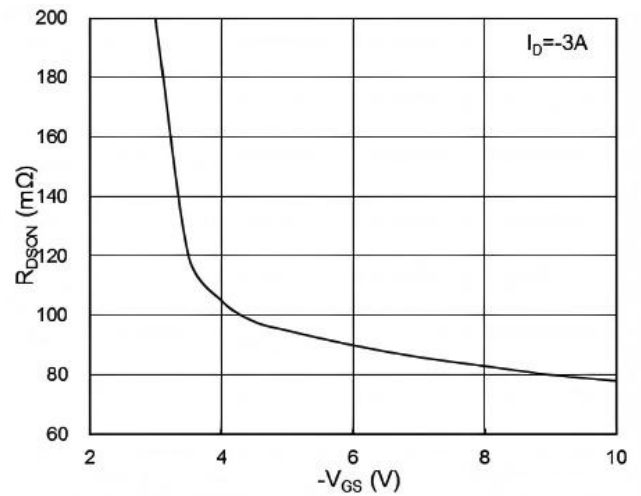


Fig.2 On-Resistance v.s Gate-Source

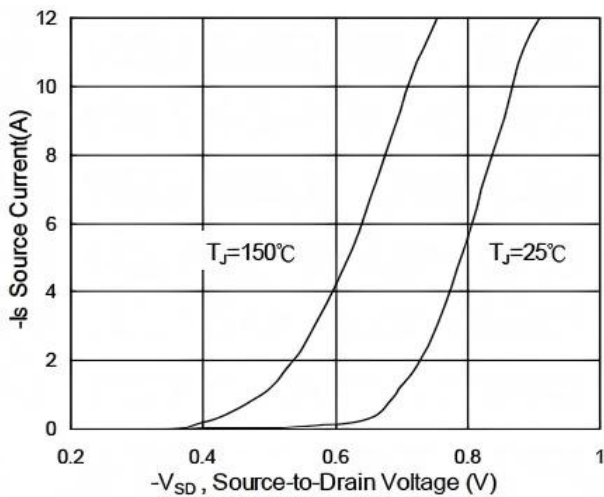


Fig.3 Forward Characteristics of Reverse

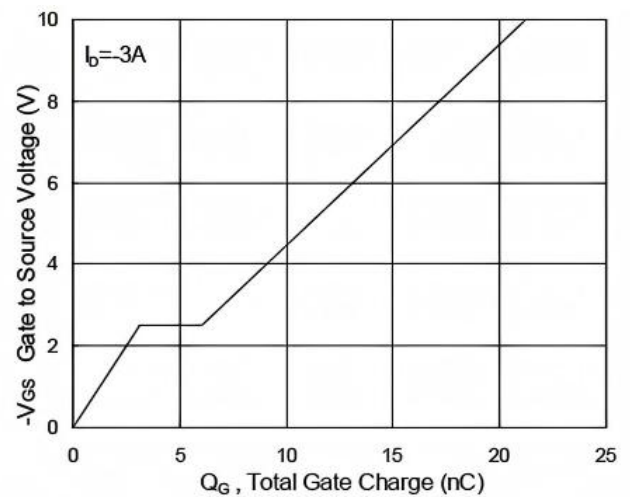


Fig.4 Gate-Charge Characteristics

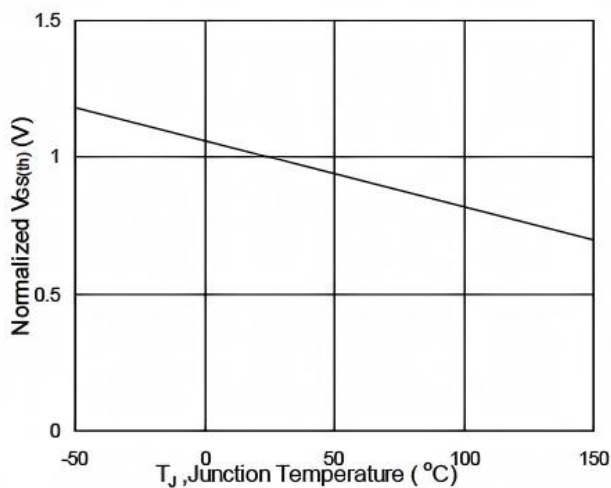


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

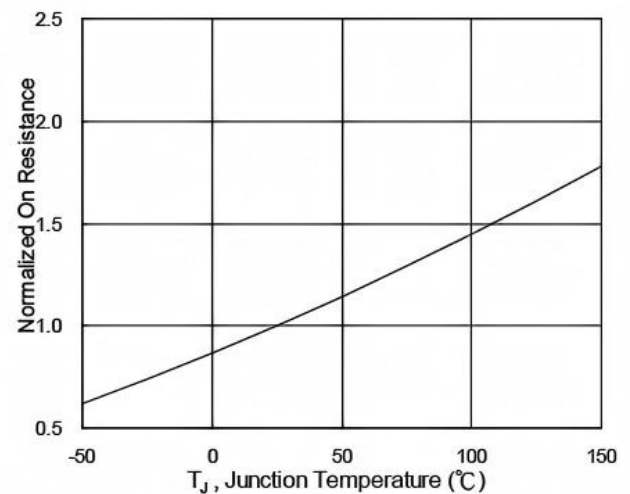


Fig.6 Normalized $R_{DS(on)}$ v.s T_J



N-Ch and P-Ch Fast Switching MOSFETs

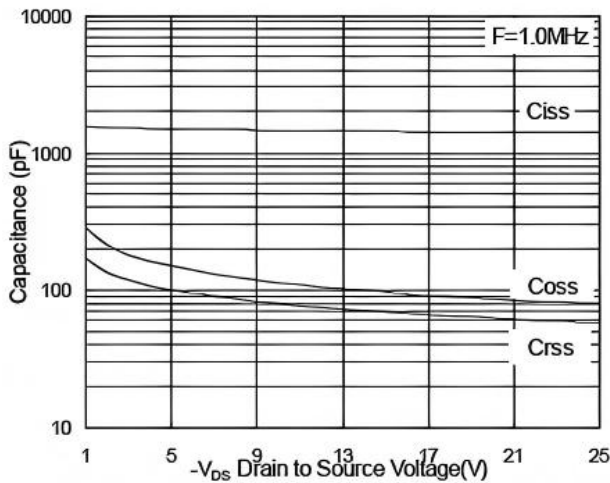


Fig.7 Capacitance

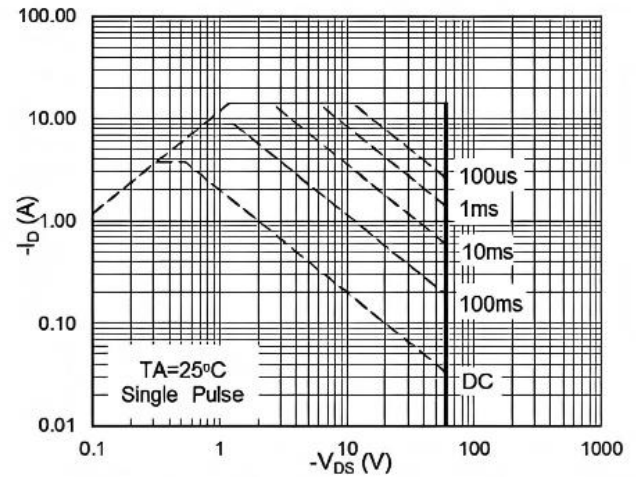


Fig.8 Safe Operating Area

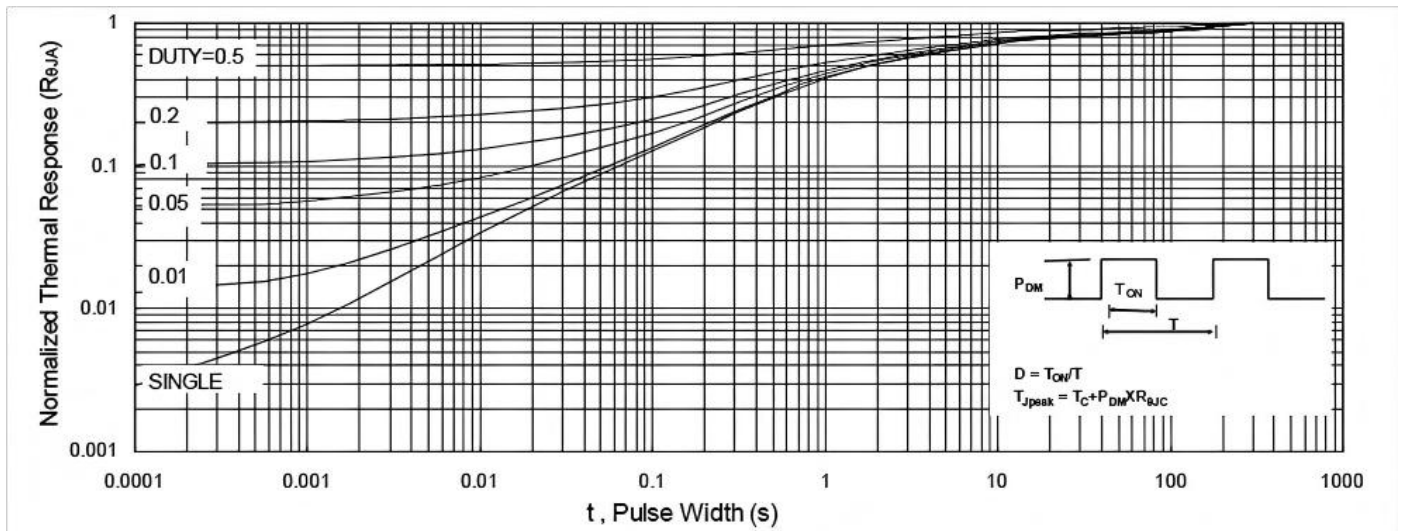


Fig.9 Normalized Maximum Transient Thermal Impedance

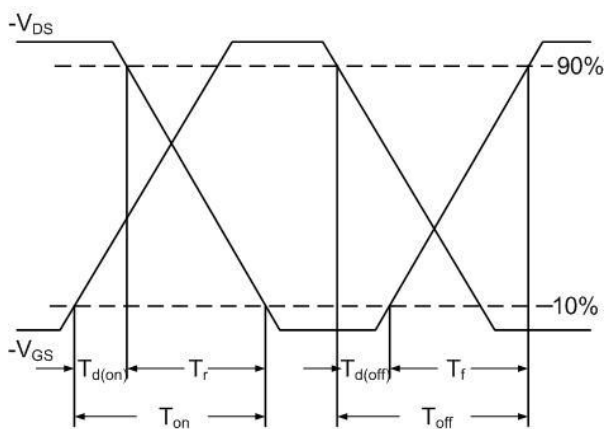


Fig.10 Switching Time Waveform

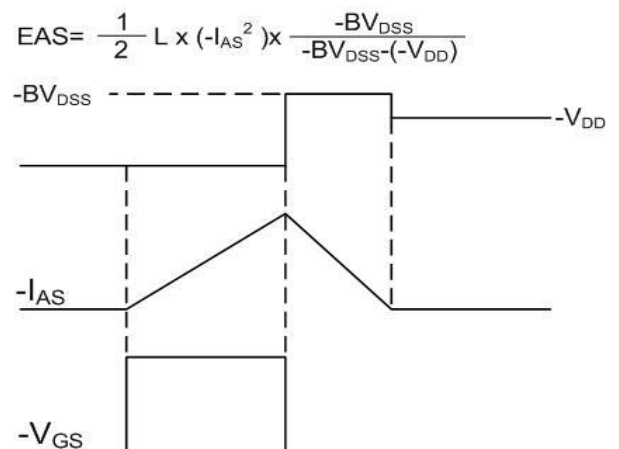


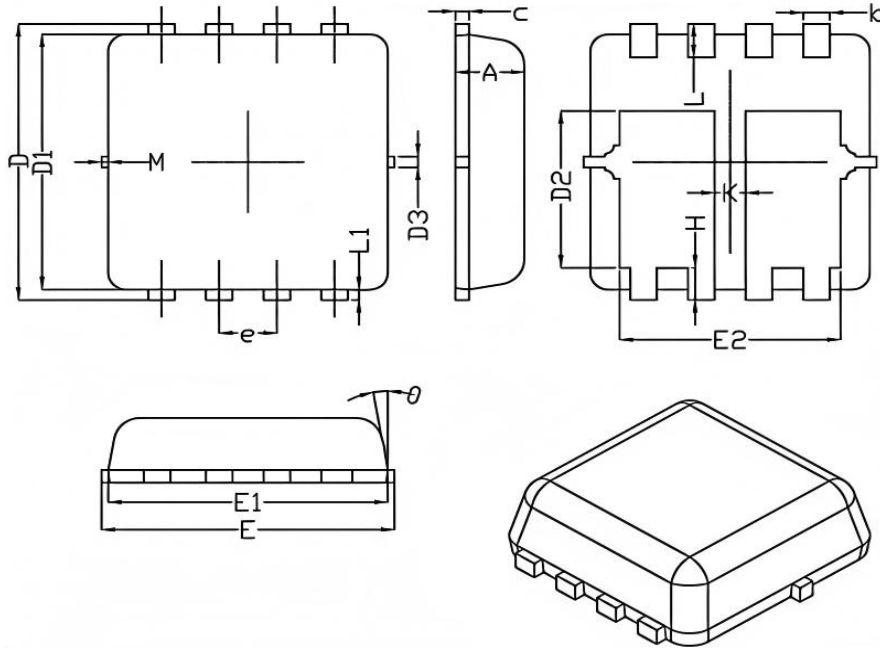
Fig.11 Unclamped Inductive Waveform



Ordering Information

Part Number	Package code	Packaging
HSBB6903	PRPAK3*3	3000/Tape&Reel

PRPAK3*3 Dual Package Outline



SYMBOL	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.70	0.75	0.80
b	0.25	0.30	0.35
C	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
D3	---	0.13	---
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	---	0.13	---
K	0.30	---	---
θ	---	10°	12°
M	*	*	0.15
*Not specified			



HSBB6903 Marking:

