

N-Ch and P-Ch Fast Switching MOSFETs
Description

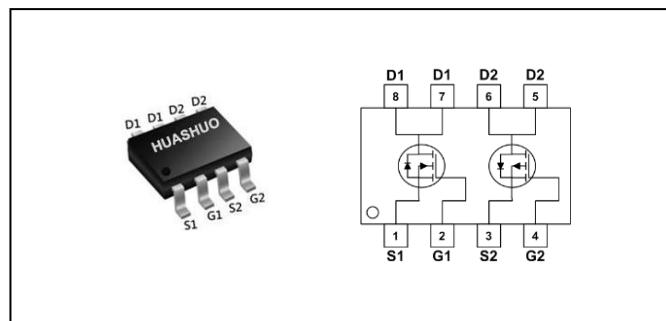
The HSM4614 is the high performance complementary N-ch and P-ch MOSFETs with high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The HSM4614 meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

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

Product Summary

BVDSS	RDSON	ID
40V	18mΩ	7A
-40V	47mΩ	-6A

SOP8 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 _A =25°C	Continuous Drain Current, V _{GS} @ 10V ¹	7	-6	A
I _D @T _A =70°C	Continuous Drain Current, V _{GS} @ 10V ¹	6	-5	A
I _{DM}	Pulsed Drain Current ²	23	-15	A
EAS	Single Pulse Avalanche Energy ³	16.2	30	mJ
P _D @T _A =25°C	Total Power Dissipation ⁴	1.67	1.67	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	---	75	°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	---	30	°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	$\text{V}_{\text{GS}}=0\text{V}$, $\text{I}_D=250\mu\text{A}$	40	---	---	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $\text{I}_D=1\text{mA}$	---	0.034	---	$^{\circ}\text{C}$
$\text{R}_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance ²	$\text{V}_{\text{GS}}=10\text{V}$, $\text{I}_D=5\text{A}$	---	18	24	$\text{m}\Omega$
		$\text{V}_{\text{GS}}=4.5\text{V}$, $\text{I}_D=4\text{A}$	---	21	28	
$\text{V}_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$\text{V}_{\text{GS}}=\text{V}_{\text{DS}}$, $\text{I}_D=250\mu\text{A}$	1.0	1.7	2.5	V
$\Delta \text{V}_{\text{GS}(\text{th})}$	$\text{V}_{\text{GS}(\text{th})}$ Temperature Coefficient		---	-4.56	---	$\text{mV}/^{\circ}\text{C}$
I_{DSs}	Drain-Source Leakage Current	$\text{V}_{\text{DS}}=32\text{V}$, $\text{V}_{\text{GS}}=0\text{V}$, $T_J=25^{\circ}\text{C}$	---	---	1	uA
		$\text{V}_{\text{DS}}=32\text{V}$, $\text{V}_{\text{GS}}=0\text{V}$, $T_J=55^{\circ}\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$\text{V}_{\text{GS}}=\pm 20\text{V}$, $\text{V}_{\text{DS}}=0\text{V}$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$\text{V}_{\text{DS}}=5\text{V}$, $\text{I}_D=5\text{A}$	---	13	---	S
Q_g	Total Gate Charge (4.5V)	$\text{V}_{\text{DS}}=32\text{V}$, $\text{V}_{\text{GS}}=4.5\text{V}$, $\text{I}_D=5\text{A}$	---	9	---	nC
Q_{gs}	Gate-Source Charge		---	2.6	---	
Q_{gd}	Gate-Drain Charge		---	5.1	---	
$\text{T}_{\text{d}(\text{on})}$	Turn-On Delay Time	$\text{V}_{\text{DD}}=20\text{V}$, $\text{V}_{\text{GS}}=10\text{V}$, $\text{R}_G=3.3\Omega$	---	3.1	---	ns
T_r	Rise Time		---	12	---	
$\text{T}_{\text{d}(\text{off})}$	Turn-Off Delay Time		---	23	---	
T_f	Fall Time		---	5.9	---	
C_{iss}	Input Capacitance	$\text{V}_{\text{DS}}=15\text{V}$, $\text{V}_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	---	1020	---	pF
C_{oss}	Output Capacitance		---	97	---	
C_{rss}	Reverse Transfer Capacitance		---	79	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_s	Continuous Source Current ^{1,5}	$\text{V}_G=\text{V}_D=0\text{V}$, Force Current	---	---	6	A
I_{sm}	Pulsed Source Current ^{2,5}		---	---	23	A
V_{SD}	Diode Forward Voltage ²	$\text{V}_{\text{GS}}=0\text{V}$, $\text{I}_s=1\text{A}$, $T_J=25^{\circ}\text{C}$	---	---	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 $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
- 3.The power dissipation is limited by 150°C junction temperature
- 4.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
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	$V_{GS}=0\text{V}$, $I_D=-250\mu\text{A}$	-40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.02	---	$\text{V}/^\circ\text{C}$
$R_{DS(\text{ON})}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10\text{V}$, $I_D=-5\text{A}$	---	47	53	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$, $I_D=-4\text{A}$	---	60	75	
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=-250\mu\text{A}$	-1.0	1.8	-2.5	V
$\Delta V_{GS(\text{th})}$	$V_{GS(\text{th})}$ Temperature Coefficient		---	3.72	---	$\text{mV}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-32\text{V}$, $V_{GS}=0\text{V}$, $T_J=25^\circ\text{C}$	---	---	1	uA
		$V_{DS}=-32\text{V}$, $V_{GS}=0\text{V}$, $T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20\text{V}$, $V_{DS}=0\text{V}$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-5\text{A}$	---	12	---	S
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-20\text{V}$, $V_{GS}=-4.5\text{V}$, $I_D=-6\text{A}$	---	9	---	nC
Q_{gs}	Gate-Source Charge		---	2.5	---	
Q_{gd}	Gate-Drain Charge		---	3.1	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15\text{V}$, $V_{GS}=-10\text{V}$, $R_G=3.3\Omega$, $I_D=-1\text{A}$	---	19	---	ns
T_r	Rise Time		---	12	---	
$T_{d(off)}$	Turn-Off Delay Time		---	48	---	
T_f	Fall Time		---	5	---	
C_{iss}	Input Capacitance	$V_{DS}=-15\text{V}$, $V_{GS}=0\text{V}$, $f=1\text{MHz}$	---	1004	---	pF
C_{oss}	Output Capacitance		---	104	---	
C_{rss}	Reverse Transfer Capacitance		---	80	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_s	Continuous Source Current ^{1,5}	$V_G=V_D=0\text{V}$, Force Current	---	---	-6	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	-15	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0\text{V}$, $I_s=-1\text{A}$, $T_J=25^\circ\text{C}$	---	---	-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 $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.



HUASHUO
SEMICONDUCTOR

N-Channel Typical Characteristics

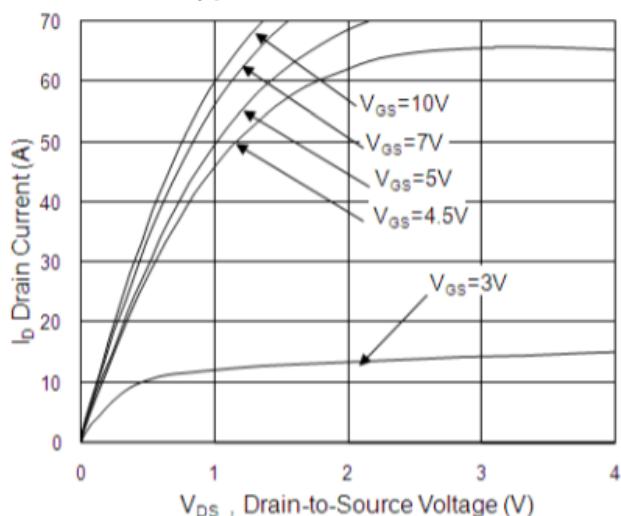


Fig.1 Typical Output Characteristics

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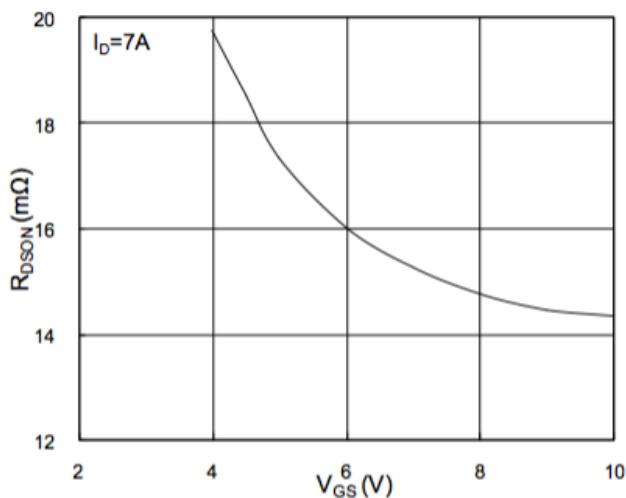


Fig.2 On-Resistance vs. G-S Voltage

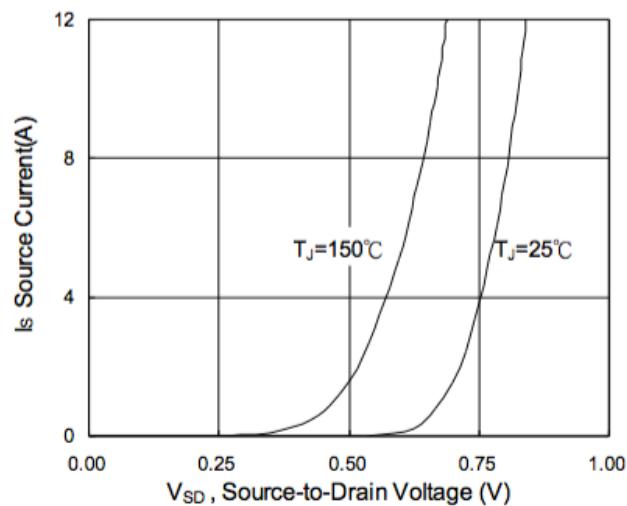


Fig.3 Forward Characteristics of Reverse

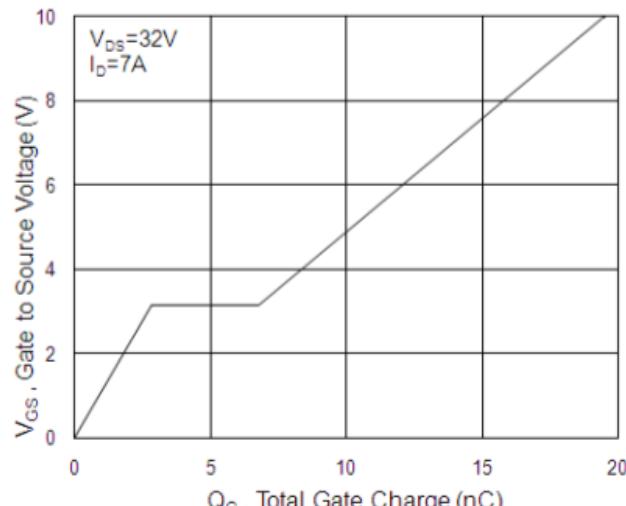


Fig.4 Gate-Charge Characteristics

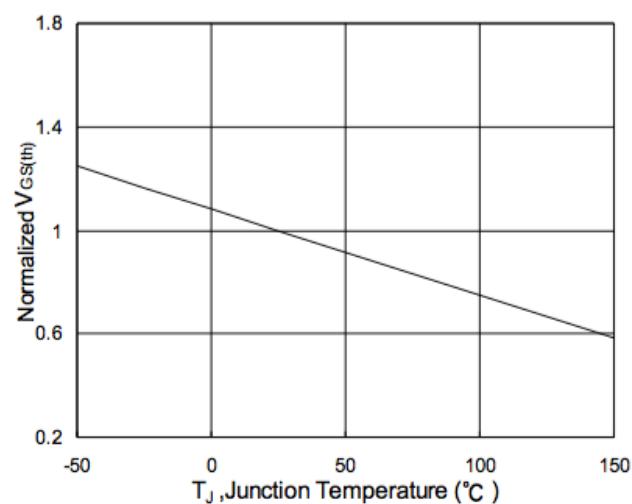


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

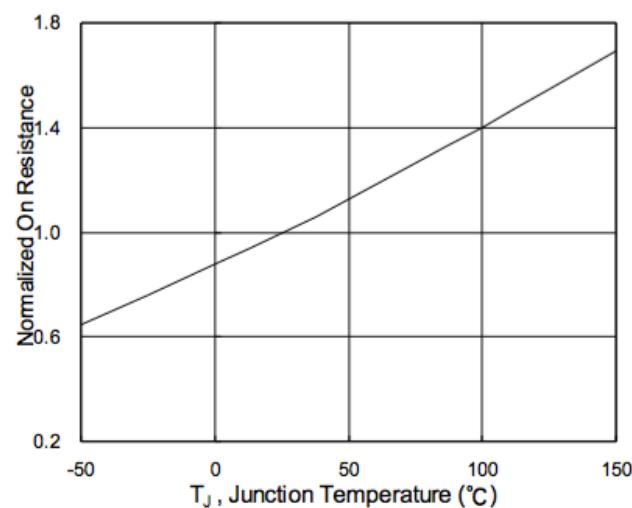


Fig.6 Normalized $R_{DS(on)}$ vs. T_J



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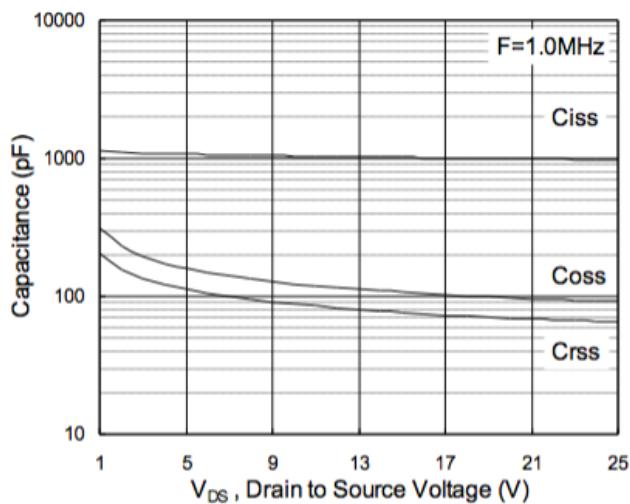


Fig.7 Capacitance

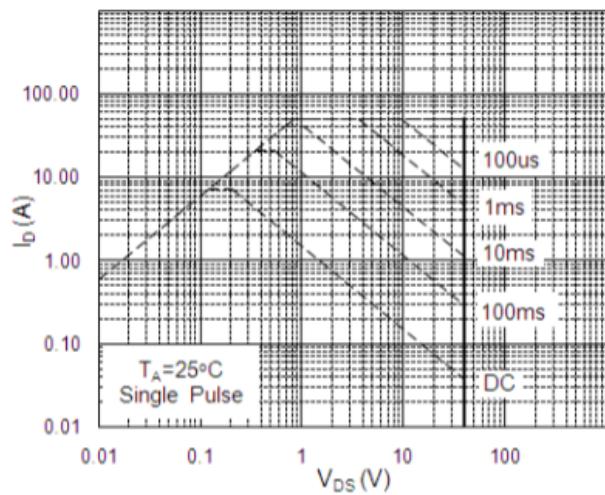


Fig.8 Safe Operating Area

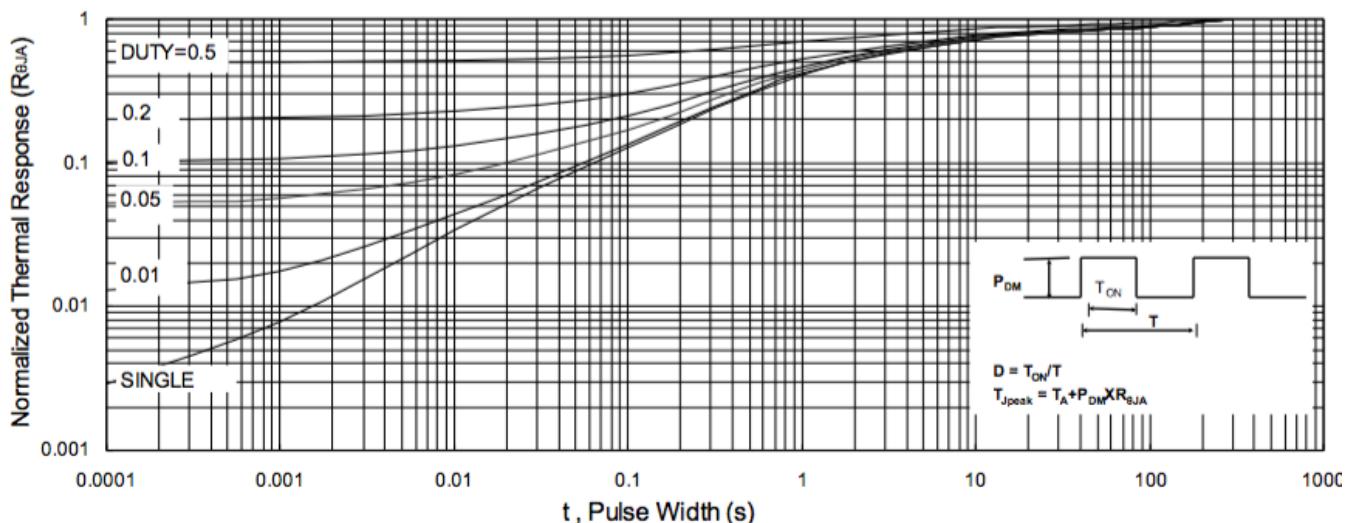


Fig.9 Normalized Maximum Transient Thermal Impedance

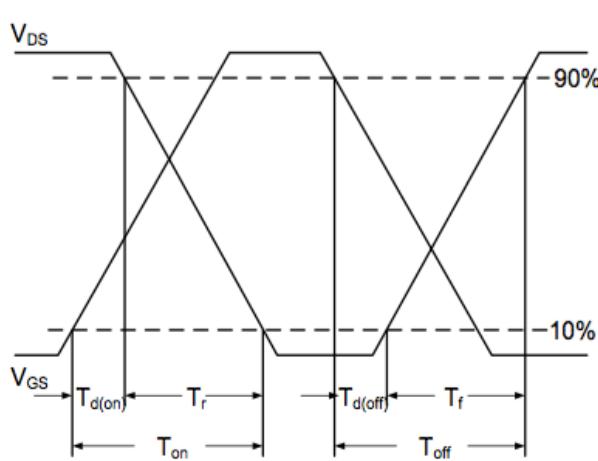


Fig.10 Switching Time Waveform

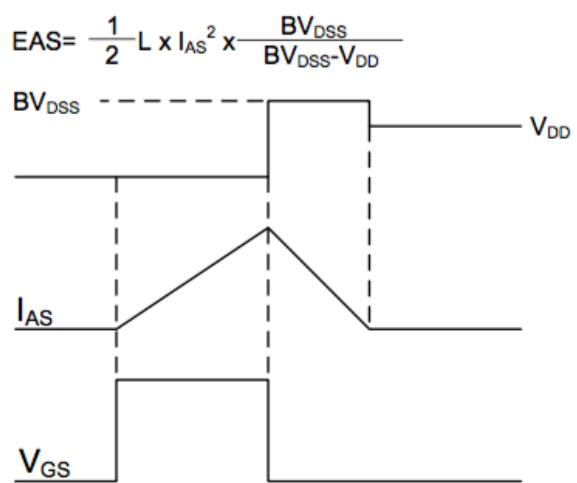


Fig.11 Unclamped Inductive Switching



P-Channel Typical Characteristics

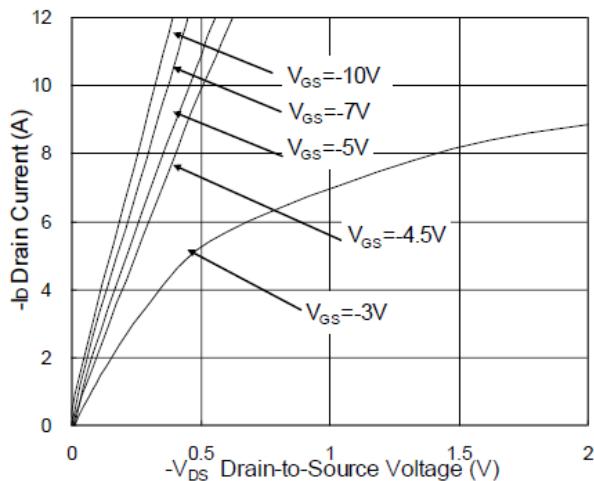


Fig.1 Typical Output Characteristics

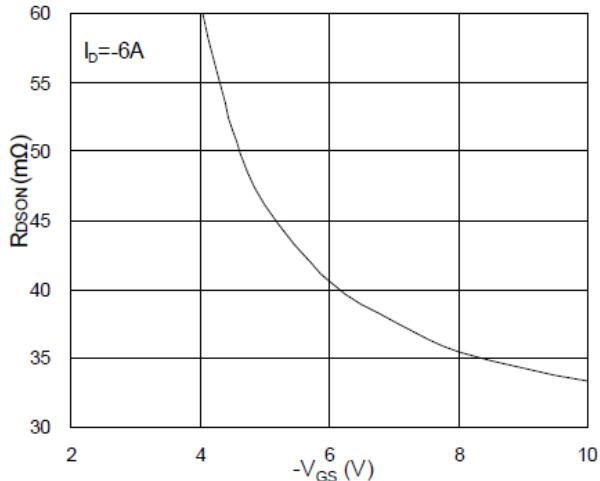


Fig.2 On-Resistance v.s Gate-Source

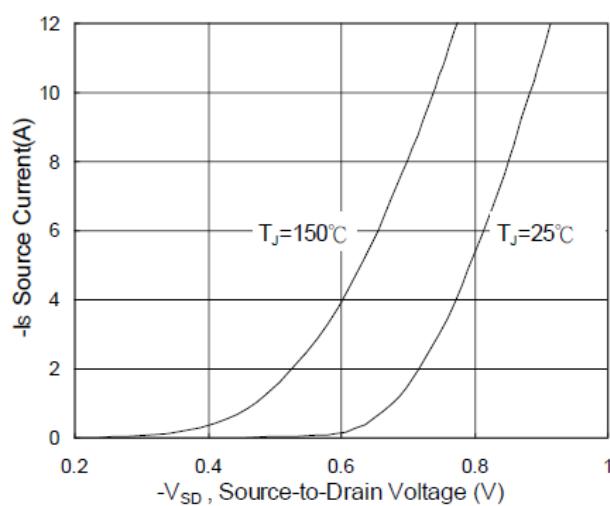


Fig.3 Forward Characteristics of Reverse

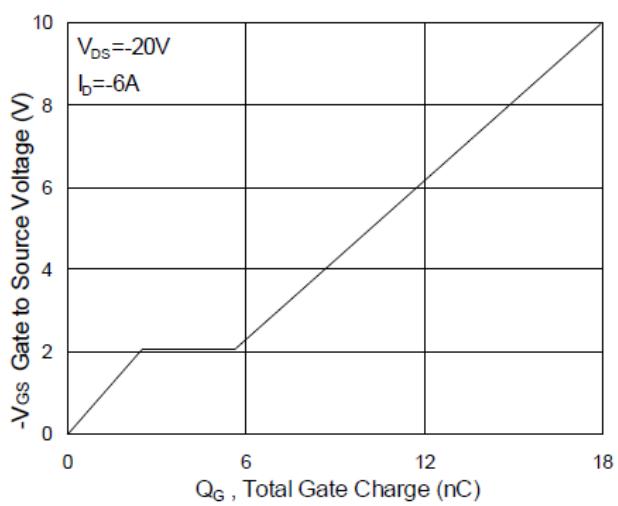


Fig.4 Gate-Charge Characteristics

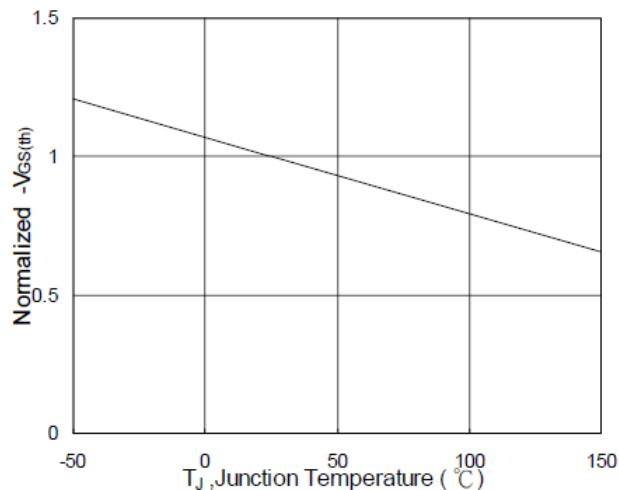


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

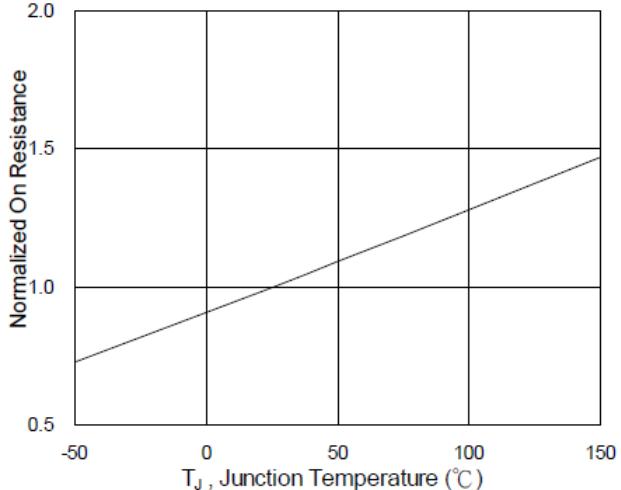


Fig.6 Normalized $R_{DS(on)}$ v.s T_J



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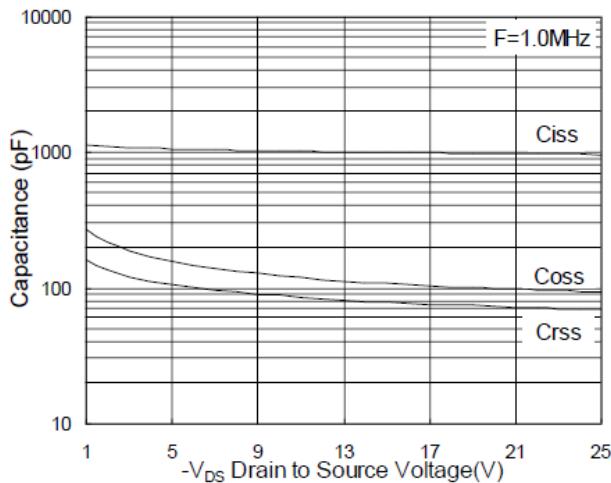


Fig.7 Capacitance

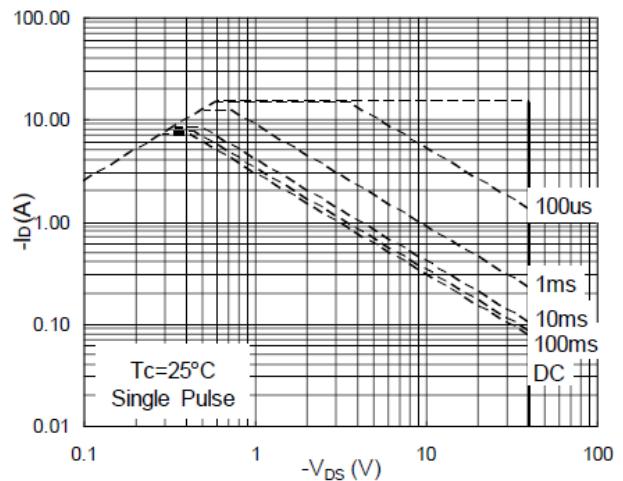


Fig.8 Safe Operating Area

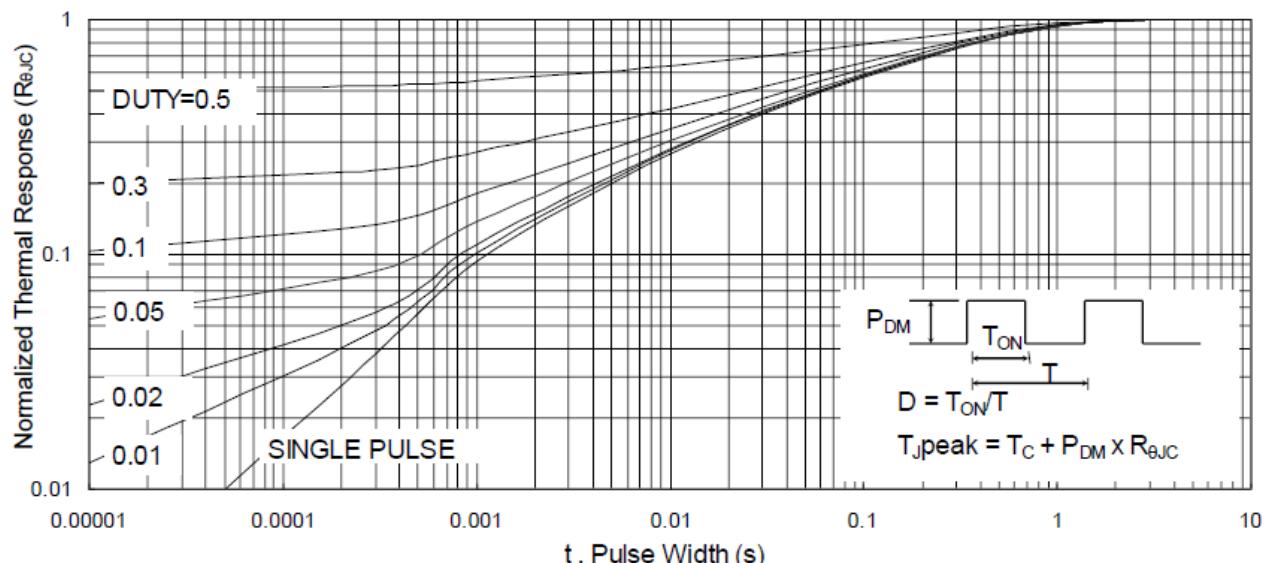


Fig.9 Normalized Maximum Transient Thermal Impedance

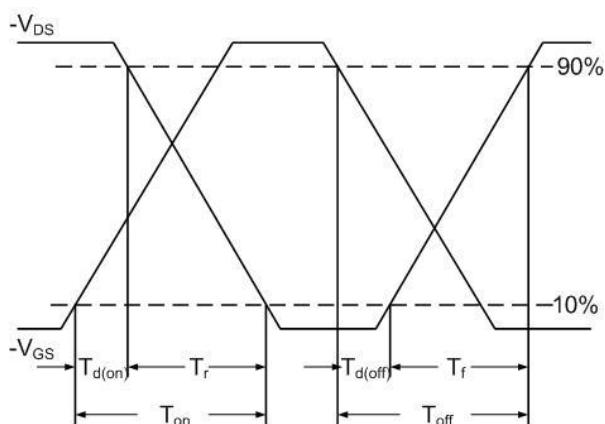


Fig.10 Switching Time Waveform

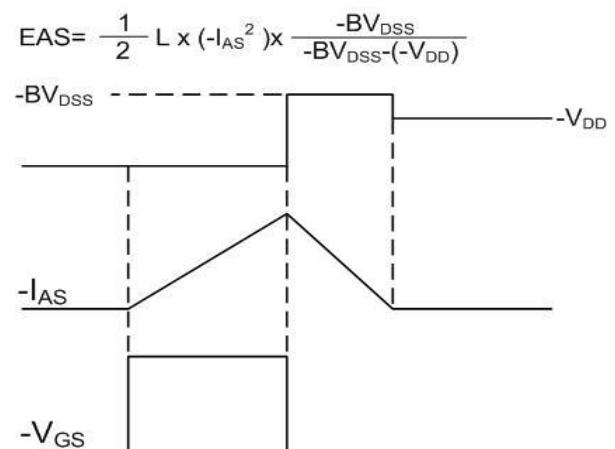


Fig.11 Unclamped Inductive Waveform



Ordering Information

Part Number	Package code	Packaging
HSM4614	SOP-8	2500/Tape&Reel

