

Description

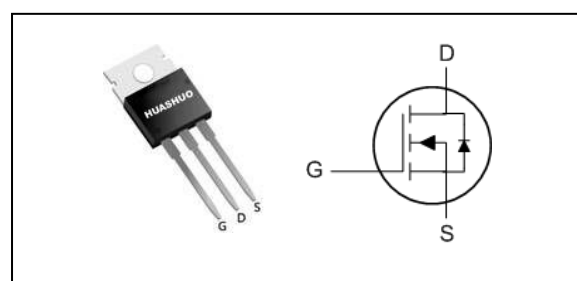
The HSP4016 is the high cell density trenched N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The HSP4016 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

V_{DS}	40	V
$R_{DS(ON),TYP}$	4.9	m Ω
I_D	90	A

TO-220 Pin Configuration

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_{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	88	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	---	1.45	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$B_{V_{DS}}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=30A$	---	4.9	6.5	$m\Omega$
		$V_{GS}=4.5V, I_D=20A$	---	6.4	8.5	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	---	2.5	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=32V, V_{GS}=0V, T_J=25^\circ C$	---	---	1	μA
		$V_{DS}=32V, V_{GS}=0V, T_J=55^\circ C$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=30A$	---	50	---	S
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	---	
Q_{gd}	Gate-Drain Charge		---	12	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V, V_{GS}=10V, R_G=3.3\Omega$ $I_D=20A$	---	10	---	ns
T_r	Rise Time		---	33	---	
$T_{d(off)}$	Turn-Off Delay Time		---	55	---	
T_f	Fall Time		---	14	---	
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1MHz$	---	3416	---	pF
C_{oss}	Output Capacitance		---	281	---	
C_{rss}	Reverse Transfer Capacitance		---	210	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
T_{rr}	Reverse Recovery Time	$I_f=30A, di/dt=100A/\mu s, T_J=25^\circ C$	---	4.5	---	nS
Q_{rr}	Reverse Recovery Charge		---	0.5	---	nC
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	90	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=1A, T_J=25^\circ C$	---	---	1	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 $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=47A$
- 4.The power dissipation is limited by 150 $^\circ\text{C}$ 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

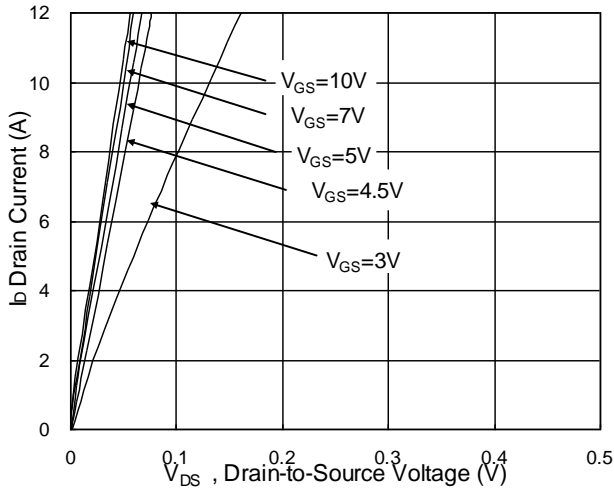


Fig.1 Typical Output Characteristics

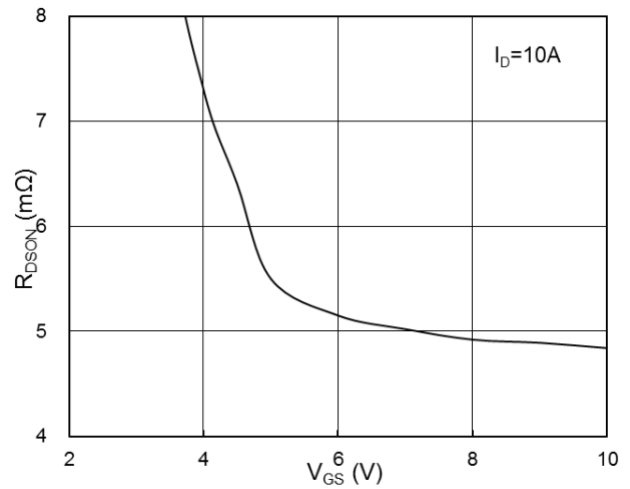


Fig.2 On-Resistance vs. G-S Voltage

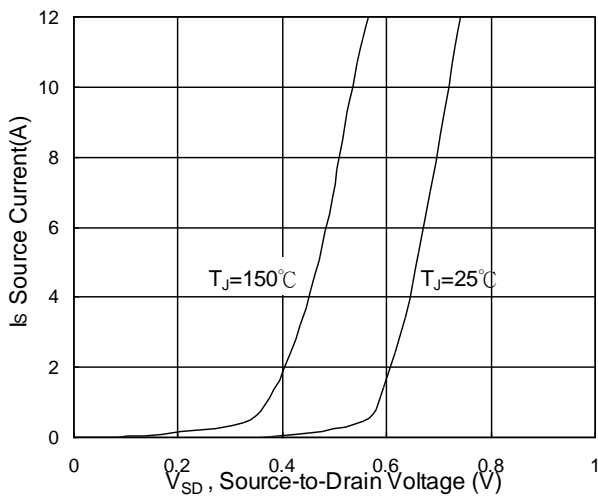


Fig.3 Forward Characteristics of Reverse

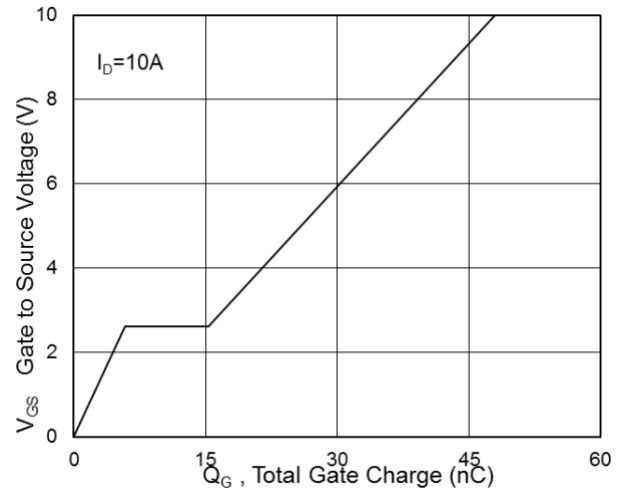


Fig.4 Gate-Charge Characteristics

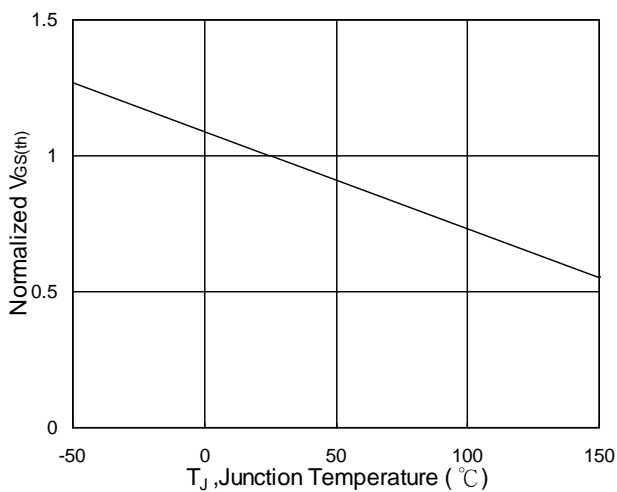


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

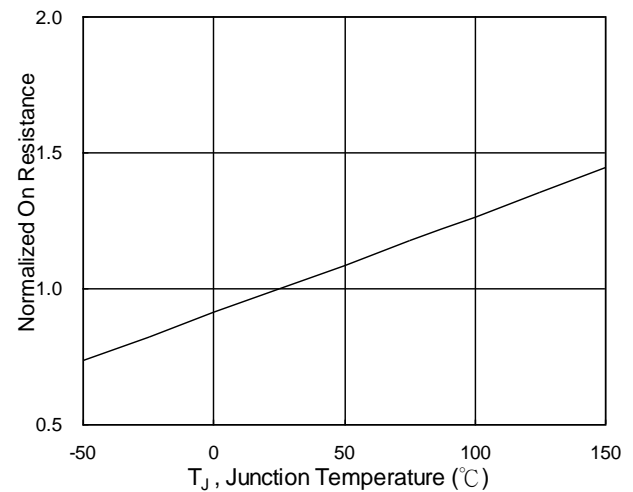


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

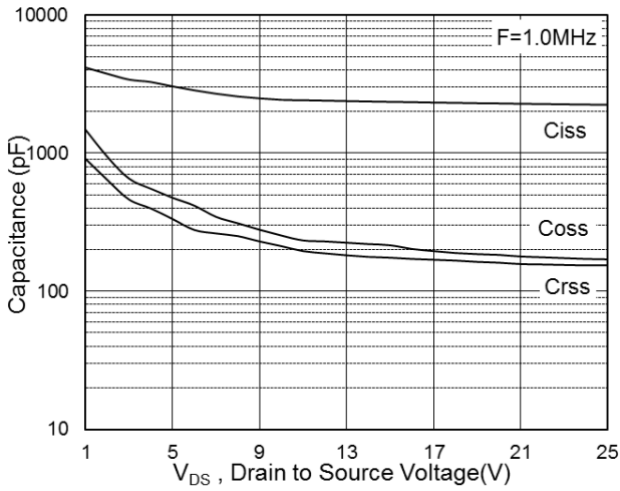


Fig.7 Capacitance

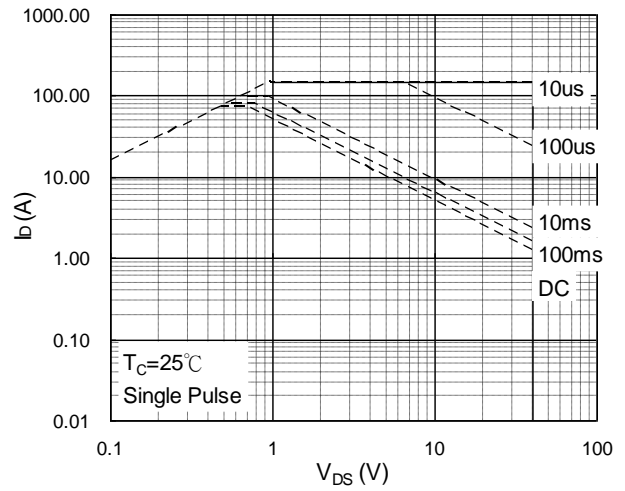


Fig.8 Safe Operating Area

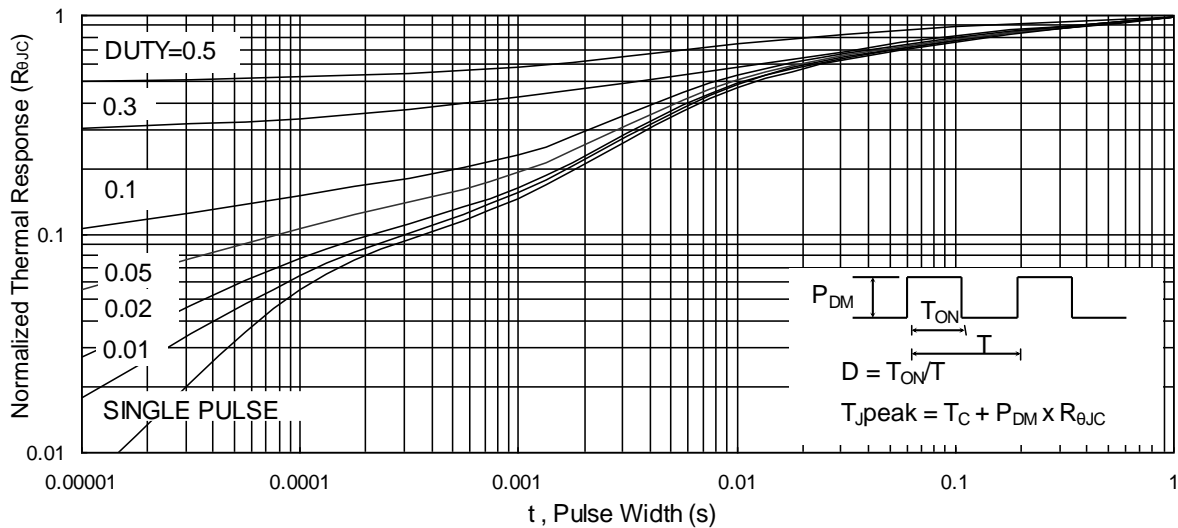


Fig.9 Normalized Maximum Transient Thermal Impedance

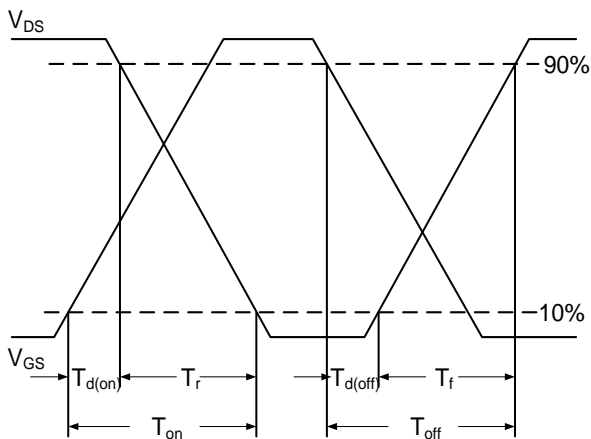


Fig.10 Switching Time Waveform

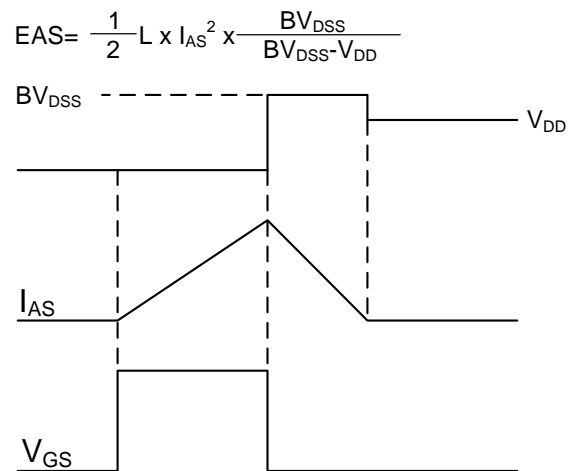


Fig.11 Unclamped Inductive Switching Wave