

General Description

- 100% UIS Tested
- Advance SGT MOS Technology
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

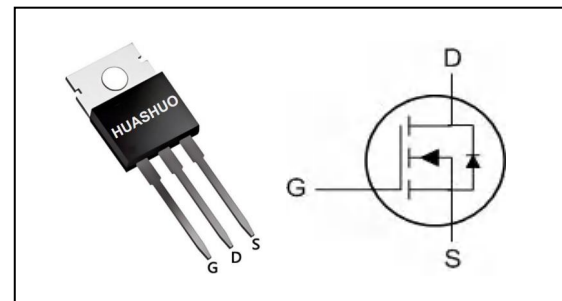
Product Summary

V_{DS}	40	V
$R_{DS(ON),max}$	1.8	m Ω
I_D	210	A

Applications

- SMPS Synchronous Rectification
- DC/DC Converters
- ORING

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
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V ^{1,6}	210	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V ^{1,6}	152	A
I_{DM}	Pulsed Drain Current ²	400	A
EAS	Single Pulse Avalanche Energy ³	400	mJ
I_{AS}	Avalanche Current	40	A
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation ⁴	178	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	50	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	0.7	$^\circ\text{C/W}$



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
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=20A$	---	1.5	1.8	$m\Omega$
		$V_{GS}=4.5V, I_D=20A$	---	2.0	2.6	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.6	2.2	V
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	$V_{DS}=5V, I_D=20A$	---	53	---	S
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	1.0	---	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=15V, V_{GS}=10V, I_D=20A$	---	45	---	nC
Q_{gs}	Gate-Source Charge		---	12	---	
Q_{gd}	Gate-Drain Charge		---	18.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=20A$	---	18.5	---	ns
T_r	Rise Time		---	9	---	
$T_{d(off)}$	Turn-Off Delay Time		---	58.5	---	
T_f	Fall Time		---	32	---	
C_{iss}	Input Capacitance	$V_{DS}=20V, V_{GS}=0V, f=1\text{MHz}$	---	3972	---	pF
C_{oss}	Output Capacitance		---	1119	---	
C_{rss}	Reverse Transfer Capacitance		---	82	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,6}	$V_G=V_D=0V$, Force Current	---	---	150	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 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 $V_{DD}=25V, V_{GS}=10V, L=0.5mH, I_{AS}=40A$
- 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.
- 6.Package limitation current is 210A.

Typical Characteristics

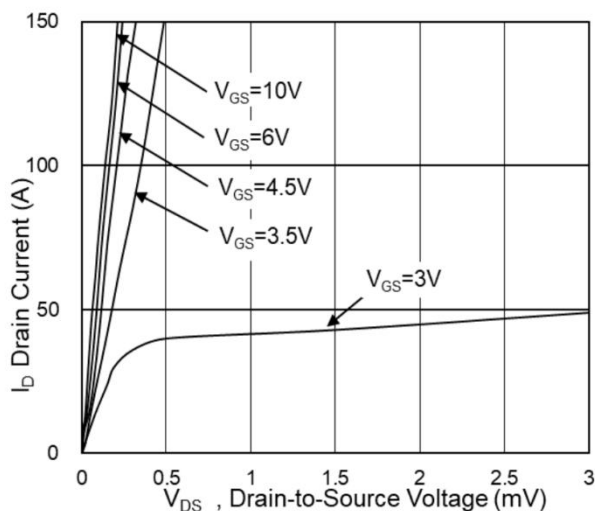


Fig.1 Typical Output Characteristics

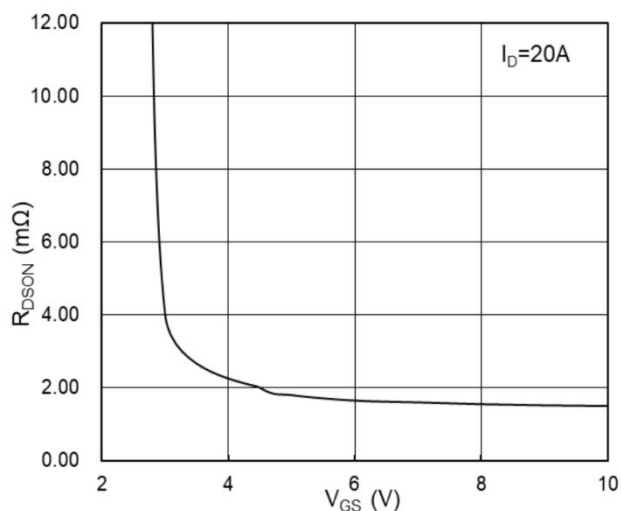


Fig.2 On-Resistance vs G-S Voltage

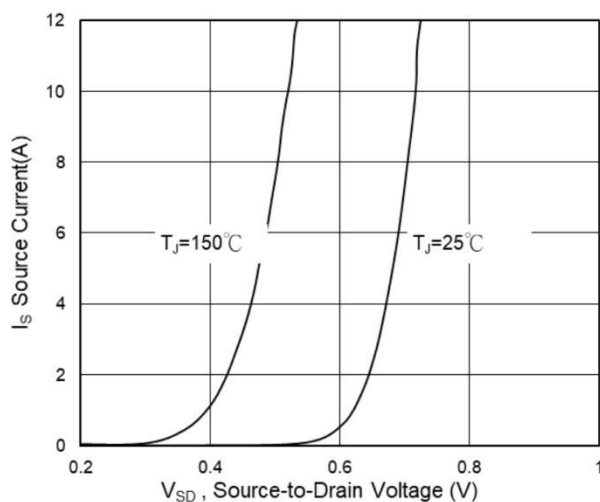


Fig.3 Source Drain Forward Characteristics

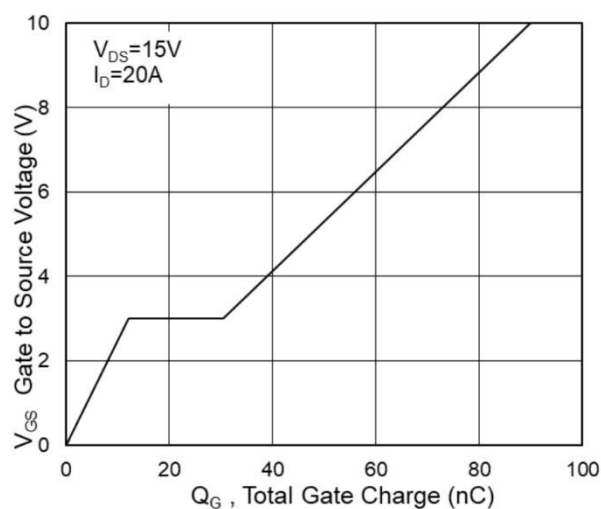


Fig.4 Gate-Charge Characteristics

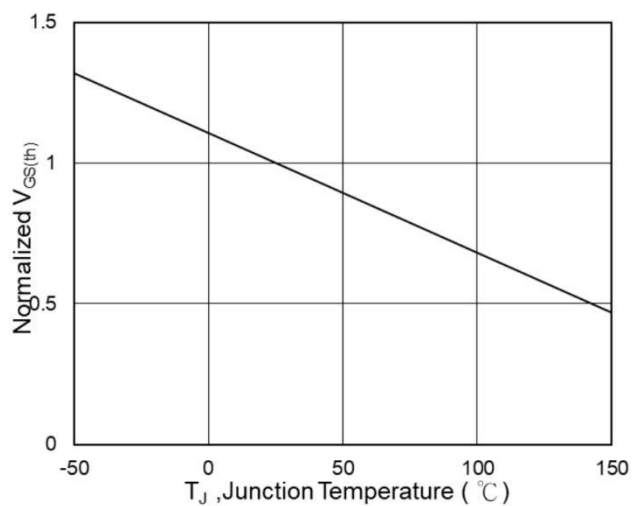


Fig.5 Normalized $V_{GS(th)}$ vs T_J

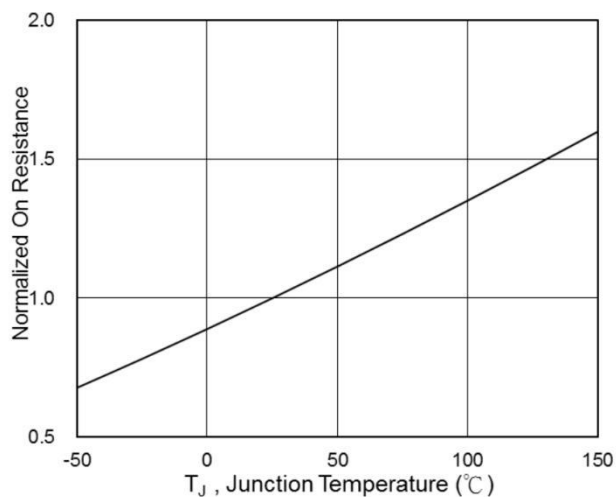


Fig.6 Normalized $R_{DS(on)}$ vs T_J

N-Ch 40V Fast Switching MOSFETs

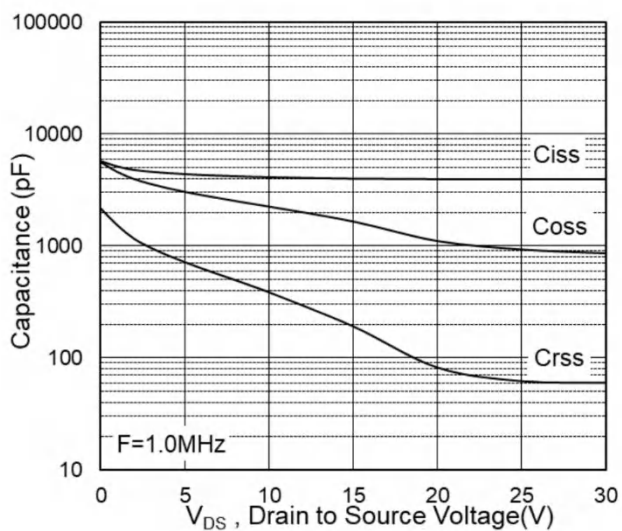


Fig.7 Capacitance

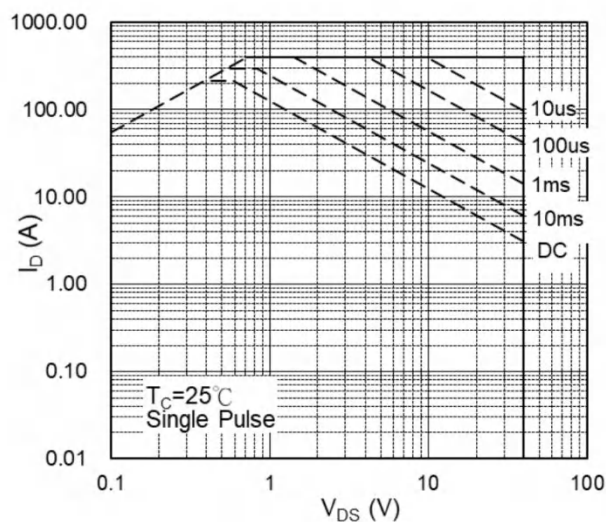


Fig.8 Safe Operating Area

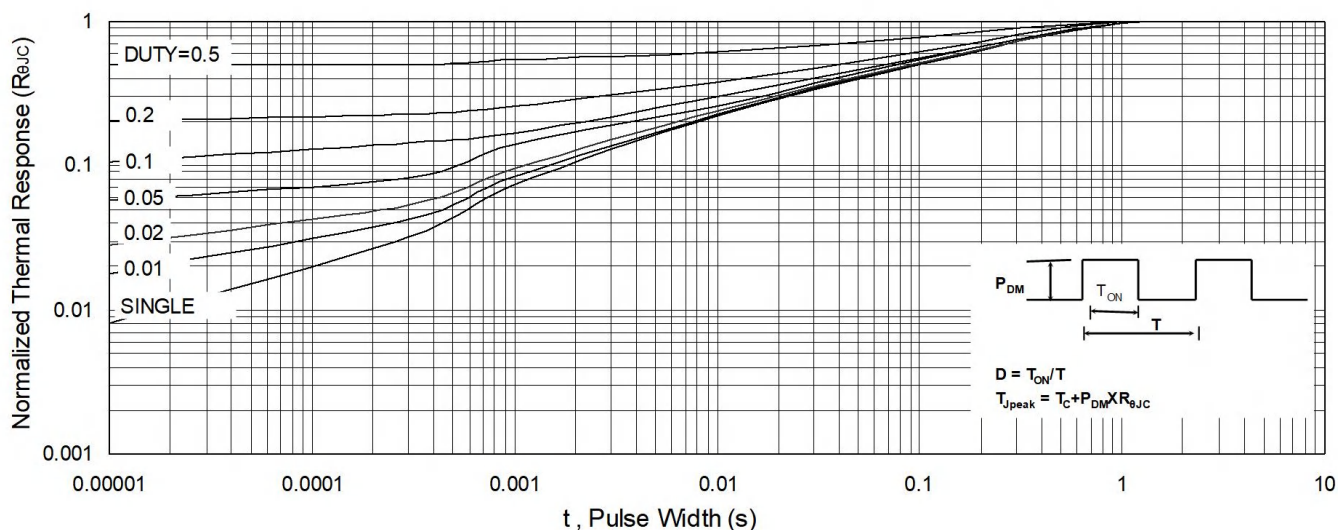


Fig.9 Normalized Maximum Transient Thermal Impedance

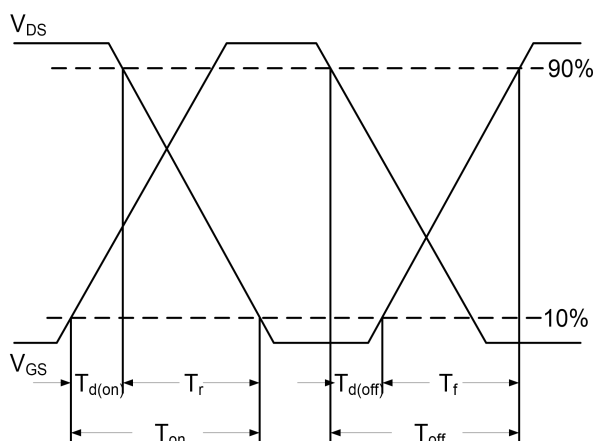


Fig.10 Switching Time Waveform

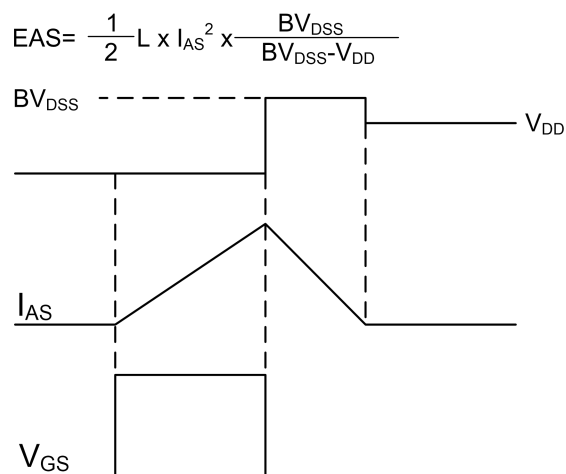
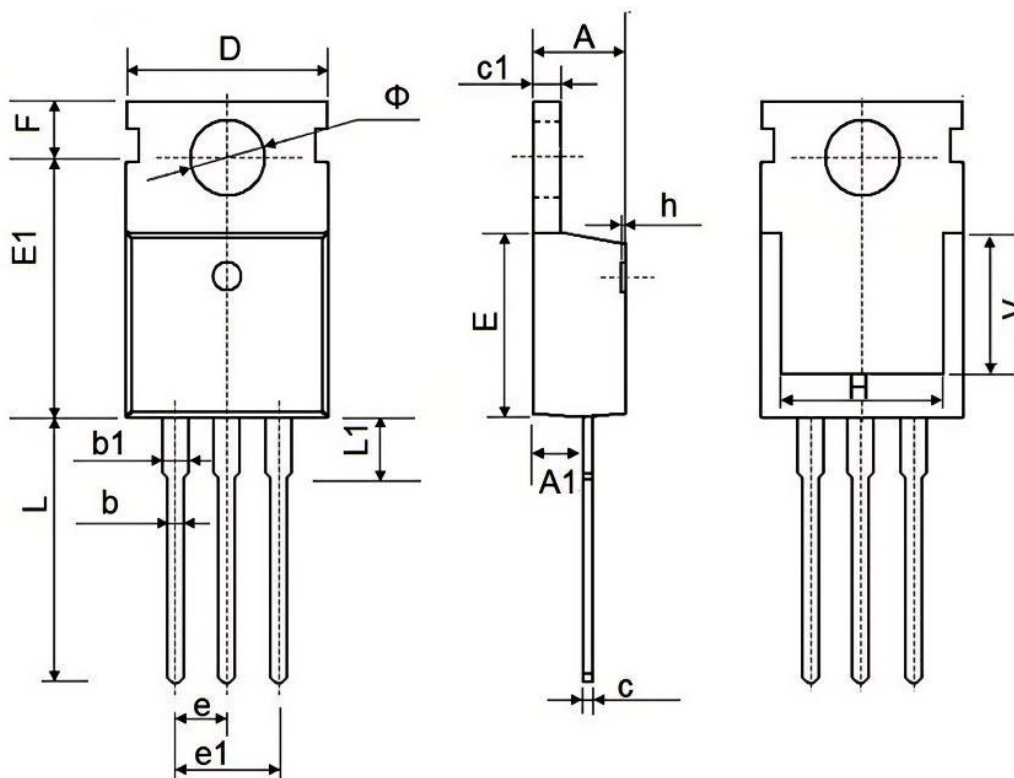


Fig.11 Unclamped Inductive Switching Waveform

Ordering Information

Part Number	Package code	Packaging
HSP4048	TO-220	1000/Box

TO-220 Package Outline



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	2.200	2.600	0.087	0.102
b	0.700	0.950	0.028	0.037
b1	1.170	1.410	0.046	0.056
C	0.450	0.650	0.018	0.026
c1	1.200	1.400	0.047	0.055
D	9.600	10.400	0.378	0.409
E	8.8500	9.750	0.348	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.750	14.300	0.502	0.563
L1	2.850	3.950	0.112	0.156
V	7.500 REF.		0.295 REF.	
Φ	3.400	4.000	0.134	0.157

HSP4048 Marking:

