

General Description

The HSP0016 is the high cell density trench N-ch MOSFETs, which provide excellent $R_{DS(on)}$ and gate charge for most of the synchronous buck converter applications.

The HSP0016 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

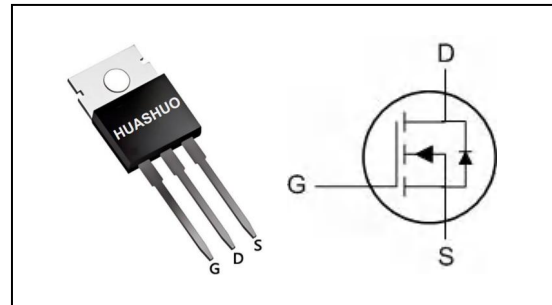
Features

- Super Low Gate Charge
- Excellent $C_{dv/dt}$ effect decline
- Green Device Available
- Advanced high cell density Trench Technology

Product Summary

V_{DS}	100	V
$R_{DS(ON),max}$	47	m Ω
I_D	27	A

TO-220 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	100	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	27	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	17	A
$I_D@T_A=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	4.2	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	3.3	A
I_{DM}	Pulsed Drain Current ²	54	A
EAS	Single Pulse Avalanche Energy ³	36.5	mJ
I_{AS}	Avalanche Current	27	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	87	W
$P_D@T_A=25^\circ C$	Total Power Dissipation ⁴	2	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	---	1.44	$^\circ C/W$



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	100	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1mA$	---	0.098	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V, I_D=20A$	---	---	47	$m\Omega$
		$V_{GS}=4.5V, I_D=15A$	---	---	50	
$V_{GS(th)}$	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		---	-5.52	---	$mV/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=80V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	10	μA
		$V_{DS}=80V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	100	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V, I_D=20A$	---	28.7	---	S
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	---	1.6	---	Ω
Q_g	Total Gate Charge (10V)	$V_{DS}=80V, V_{GS}=10V, I_D=20A$	---	60	---	nC
Q_{gs}	Gate-Source Charge		---	9.7	---	
Q_{gd}	Gate-Drain Charge		---	11.8	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=50V, V_{GS}=10V, R_G=3.3\Omega$ $I_D=20A$	---	10.4	---	ns
T_r	Rise Time		---	46	---	
$T_{d(off)}$	Turn-Off Delay Time		---	54	---	
T_f	Fall Time		---	10	---	
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1MHz$	---	3848	---	pF
C_{oss}	Output Capacitance		---	137	---	
C_{rss}	Reverse Transfer Capacitance		---	82	---	

Diode Characteristics

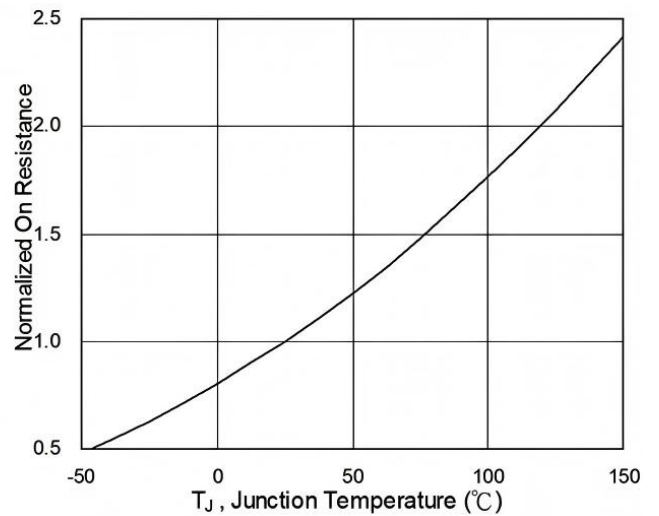
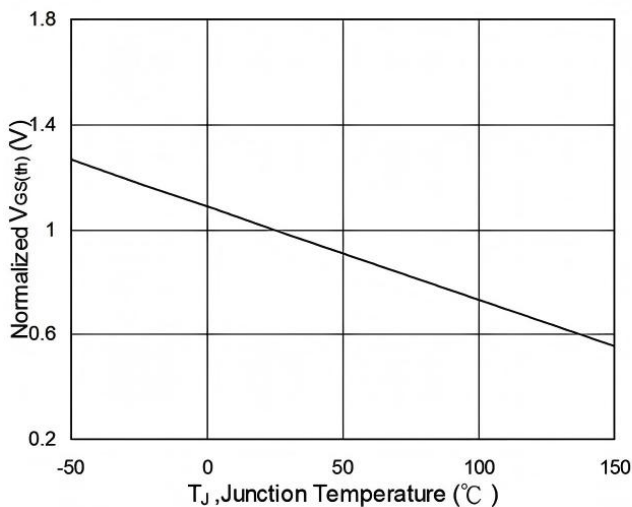
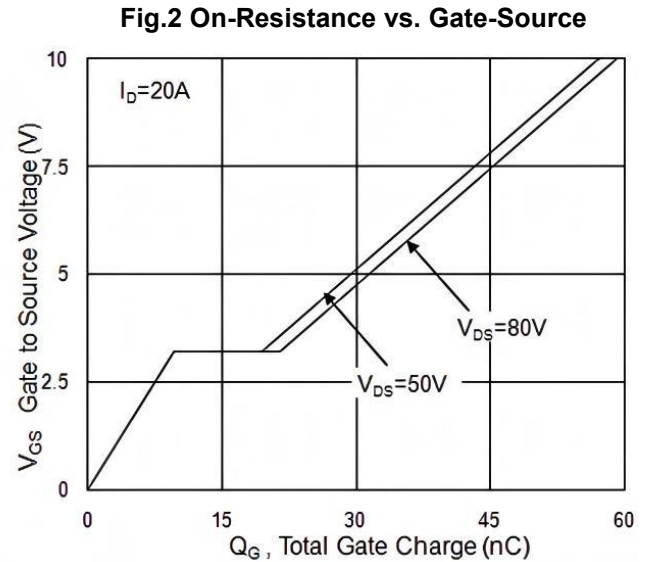
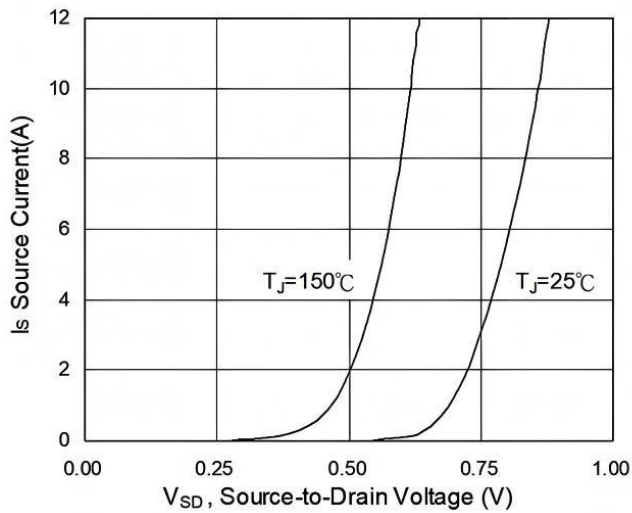
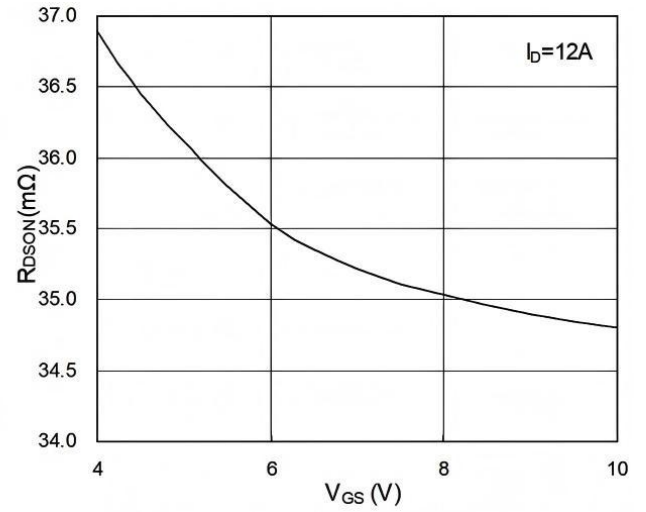
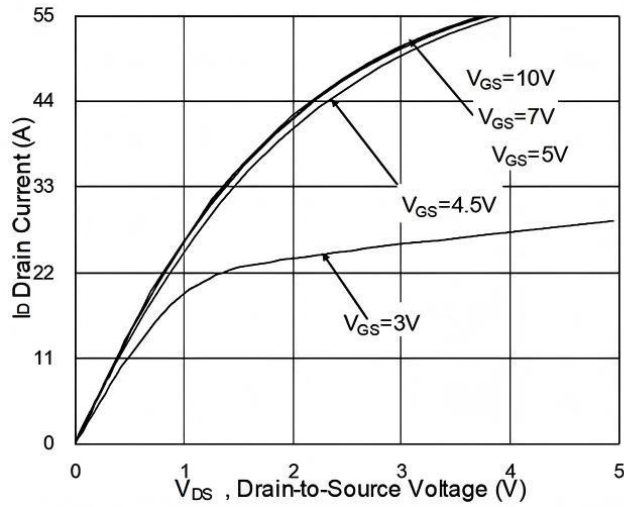
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	27	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	54	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1.2	V
t_{rr}	Reverse Recovery Time	$IF=20A, dI/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	30	---	nS
Q_{rr}	Reverse Recovery Charge		---	37	---	nC

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 $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=27A$
- 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.



Typical Characteristics



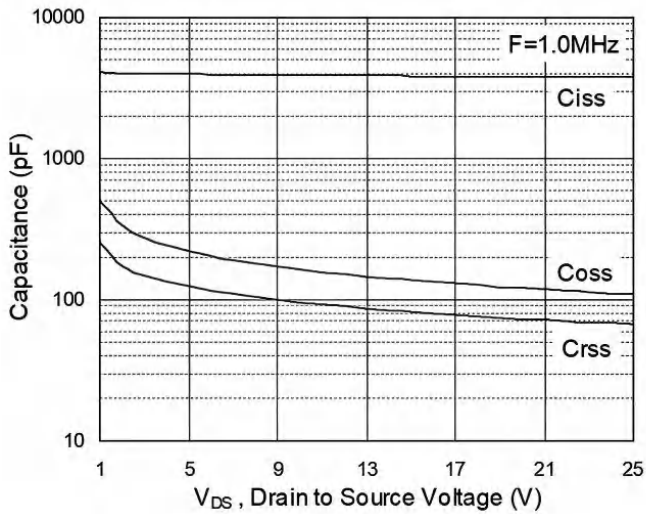


Fig.7 Capacitance

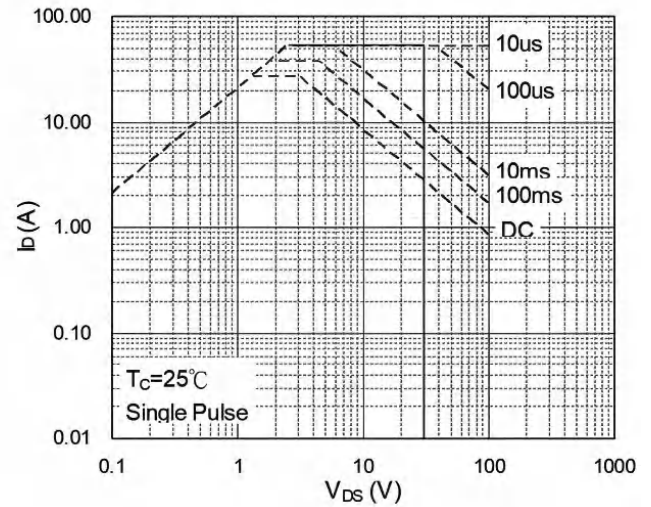


Fig.8 Safe Operating Area

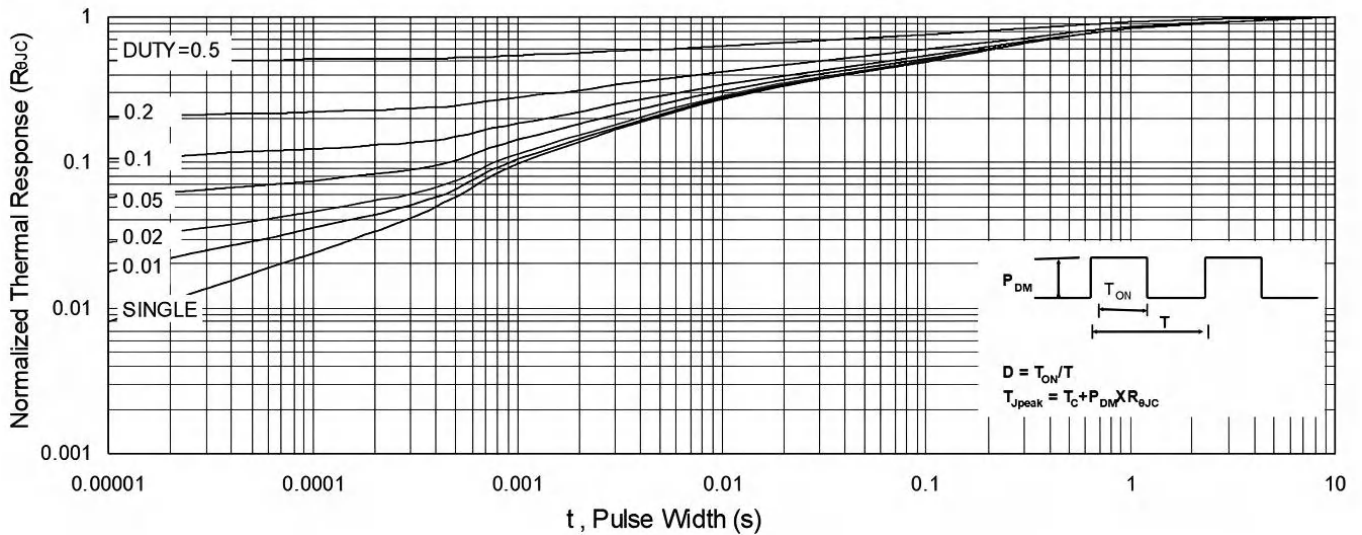


Fig.9 Normalized Maximum Transient Thermal Impedance

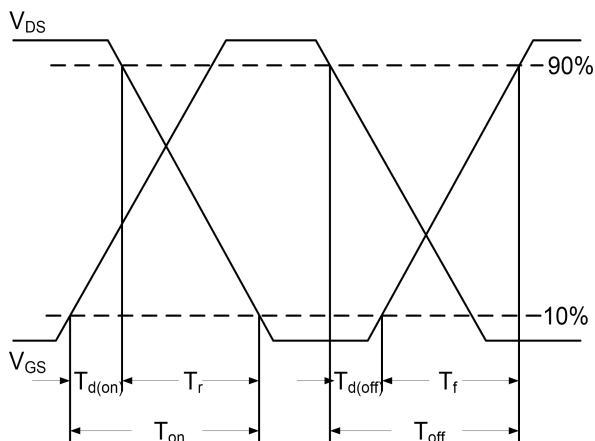


Fig.10 Switching Time Waveform

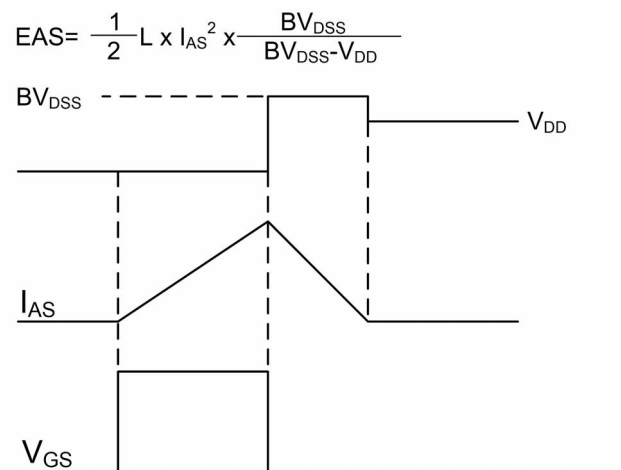


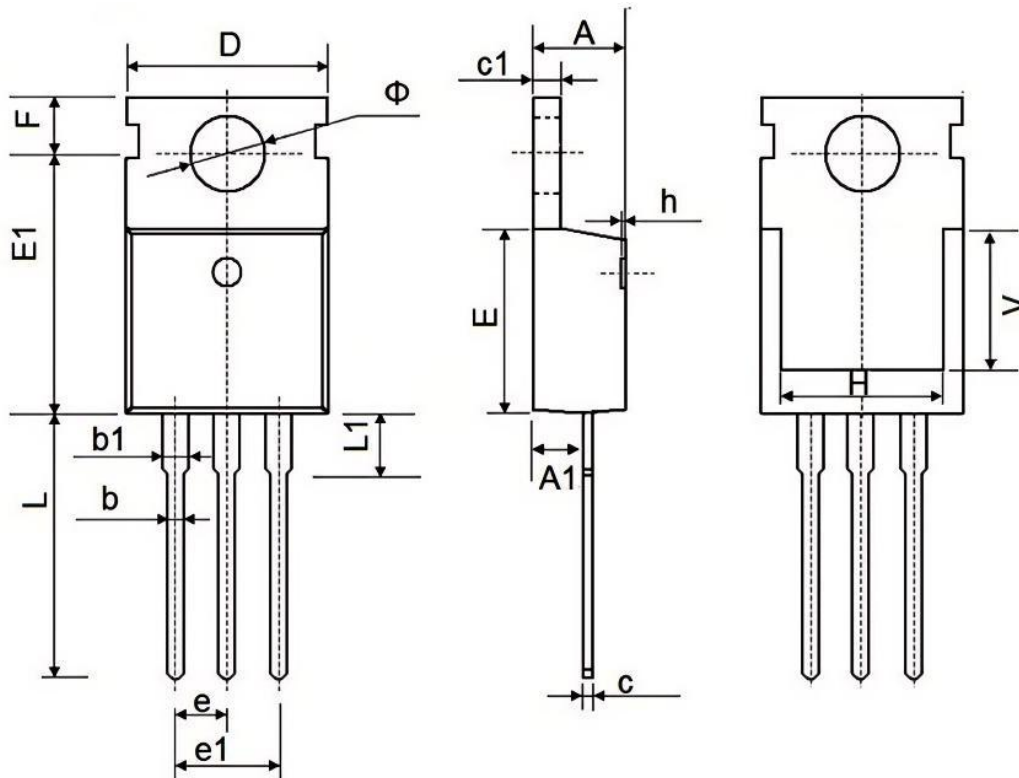
Fig.11 Unclamped Inductive Switching Waveform



Ordering Information

Part Number	Package code	Packaging
HSP0016	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



HSP0016 Marking:

