

General Description

The HSM4113 is the high cell density trench P-ch MOSFETs, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The HSM4113 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

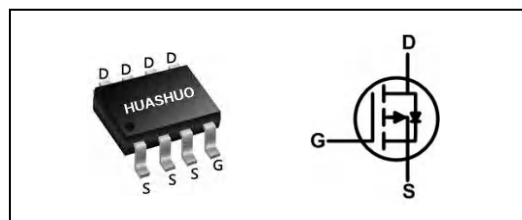
Product Summary

V_{DS}	-40	V
$R_{DS(ON),max}$	40	m Ω
I_D	-7.5	A

Features

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

SOP8 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, $-V_{GS} @ -10V^1$	-7.5	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $-V_{GS} @ -10V^1$	-5.7	A
I_{DM}	Pulsed Drain Current ²	-15	A
EAS	Single Pulse Avalanche Energy ³	36	mJ
I_{AS}	Avalanche Current	-27.2	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	3.1	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	---	85	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	40	$^\circ C/W$

P-Ch 40V 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	$V_{GS}=0V, I_D=-250\mu A$	-40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.012	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V, I_D=-6A$	---	---	40	$m\Omega$
		$V_{GS}=-4.5V, I_D=-3A$	---	---	70	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.5	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.32	---	$mV/^\circ\text{C}$
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	$V_{DS}=-5V, I_D=-6A$	---	12	---	S
R_g	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	13	---	Ω
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-20V, V_{GS}=-4.5V, I_D=-6A$	---	9	---	nC
Q_{gs}	Gate-Source Charge		---	2.54	---	
Q_{gd}	Gate-Drain Charge		---	3.1	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-1A$	---	19.2	---	ns
T_r	Rise Time		---	12.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	48.6	---	
T_f	Fall Time		---	4.6	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	---	1004	---	pF
C_{oss}	Output Capacitance		---	108	---	
C_{rss}	Reverse Transfer Capacitance		---	80	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	-7.5	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	-15	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1	V

Note :

- 1.The data tested by surface mounted on a 1 inch²FR-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 $V_{DD}=-25V, V_{GS}=-10V, L=0.1\text{mH}, I_{AS}=-27.2A$
- 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.

P-Ch 40V Fast Switching MOSFETs

P-Channel Typical Characteristics

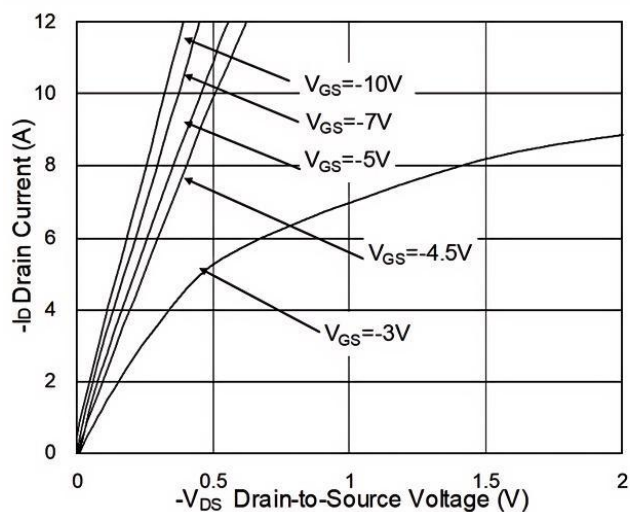


Fig.1 Typical Output Characteristics

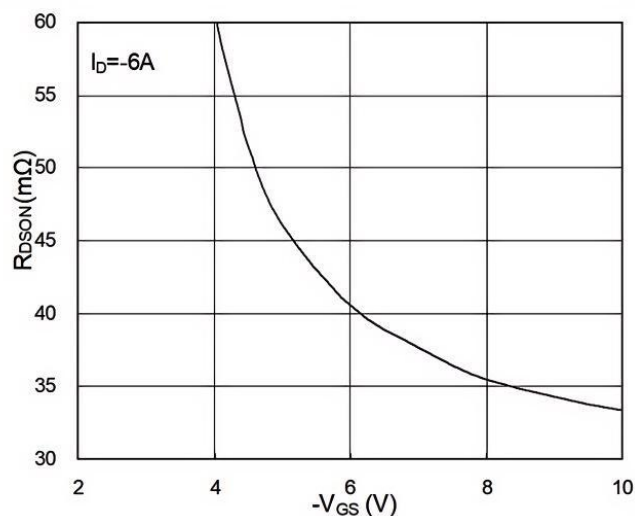


Fig.2 On-Resistance v.s Gate-Source

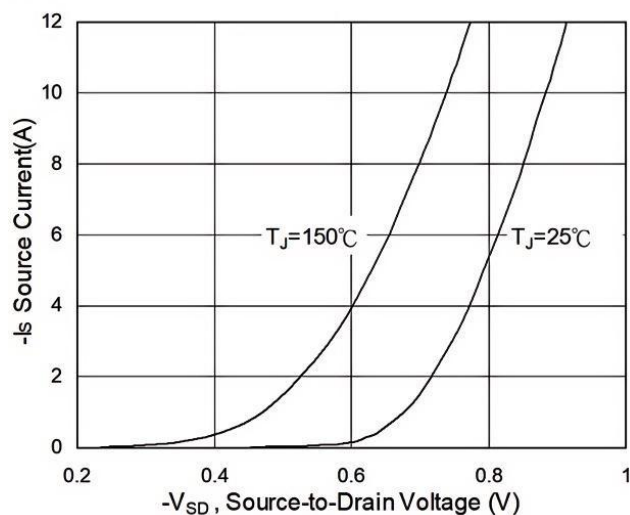


Fig.3 Forward Characteristics of Reverse

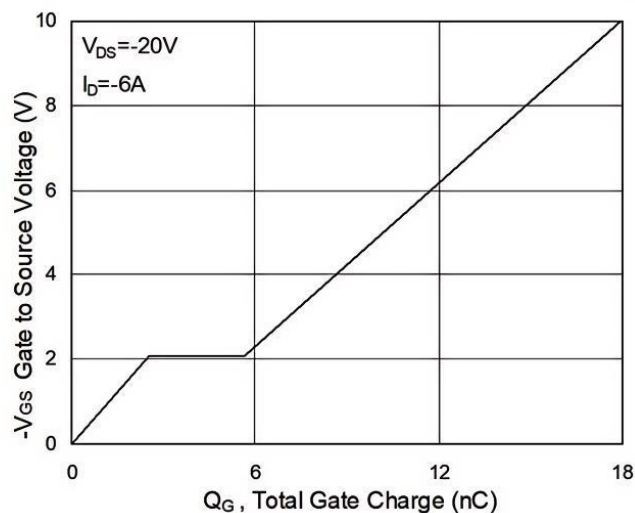


Fig.4 Gate-Charge Characteristics

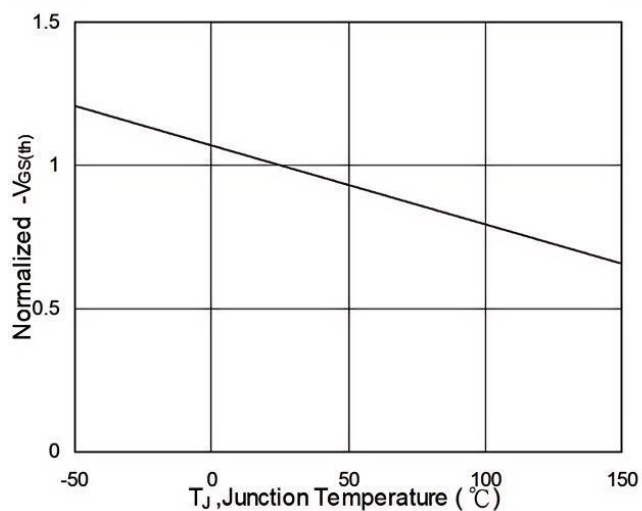


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

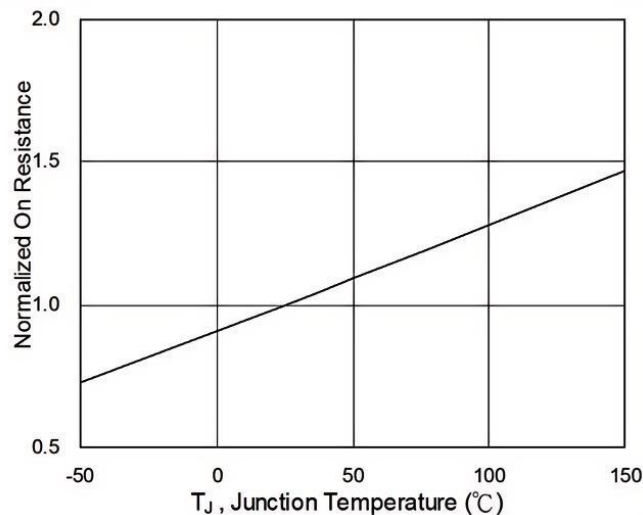


Fig.6 Normalized $R_{DS(on)}$ v.s T_J



P-Ch 40V Fast Switching MOSFETs

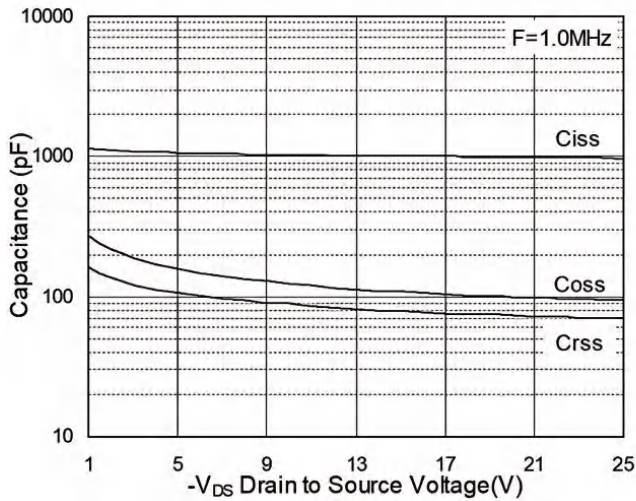


Fig.7 Capacitance

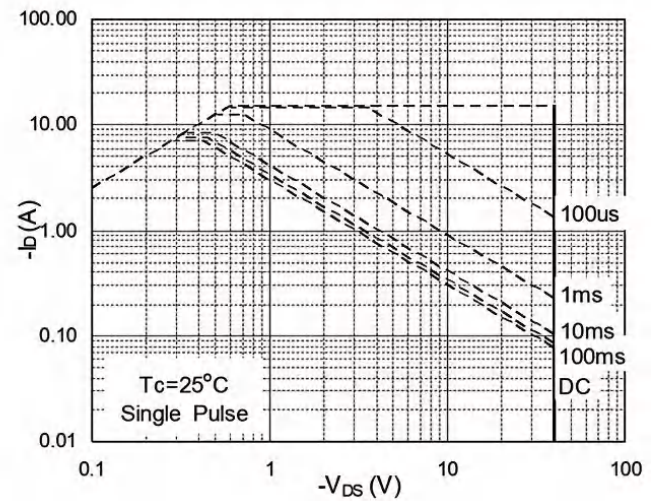


Fig.8 Safe Operating Area

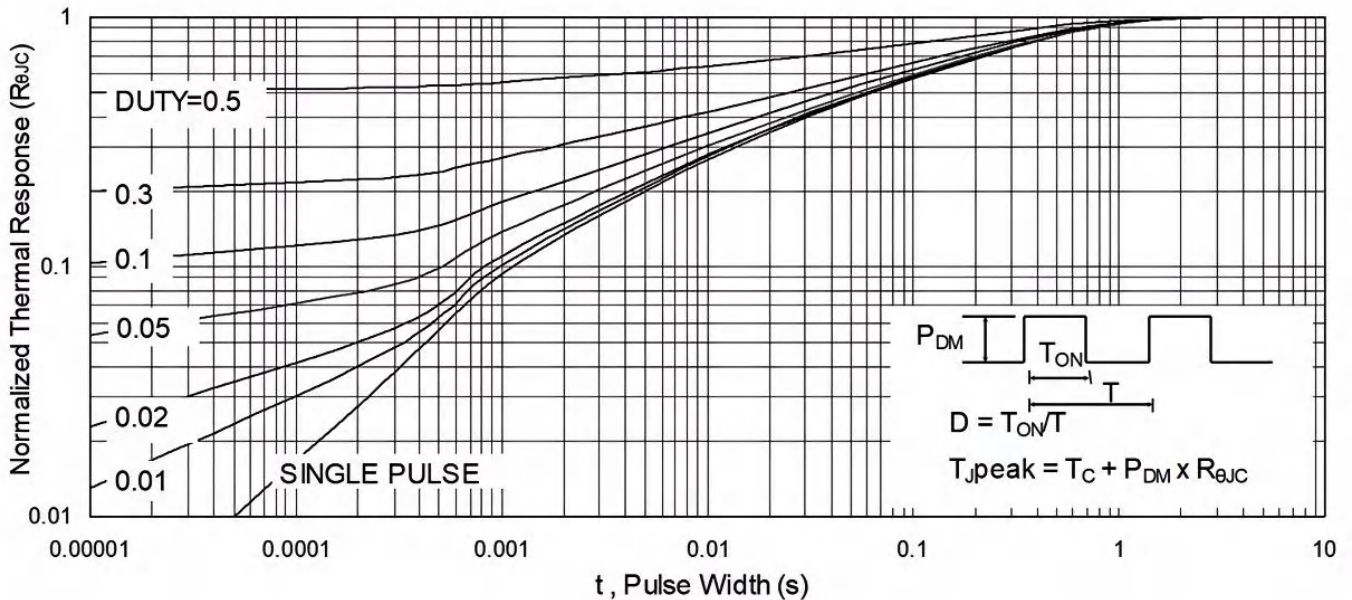


Fig.9 Normalized Maximum Transient Thermal Impedance

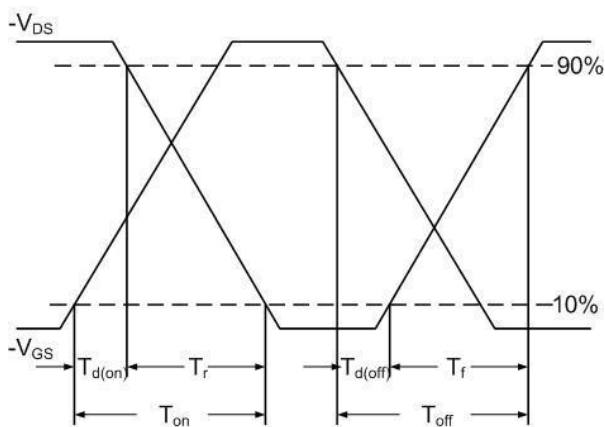


Fig.10 Switching Time Waveform

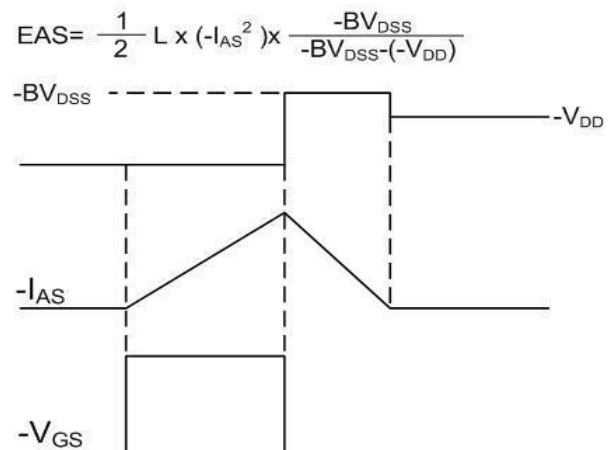
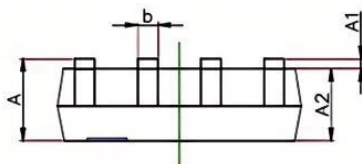
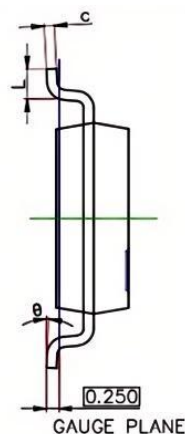
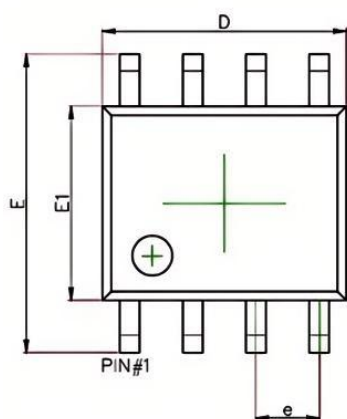


Fig.11 Unclamped Inductive Waveform

Ordering Information

Part Number	Package code	Packaging
HSM4113	SOP-8	2500/Tape&Reel

SOP-8 Package Outline



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
C	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

HSM4113 Marking:

