



## Description

The HSQD45P0312GE3 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = -30V$   $I_D = -70A$

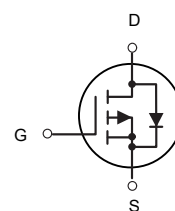
$R_{DS(ON)} < 10m\Omega$  @  $V_{GS} = -10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



P-Channel MOSFET

## Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
HSQD45P0312GE3	TO-252-2L(TO-252AA)	HXY MOSFET	2500

## Absolute Maximum Ratings (TC=25°C unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^{1,6}$	-70	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^{1,6}$	-50	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-200	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	80	mJ
$I_{AS}$	Avalanche Current	-40	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation <sup>4</sup>	90	W
$T_{STG}$	Storage Temperature Range	-55 to 175	°C
$T_J$	Operating Junction Temperature Range	-55 to 175	°C
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup> ( $t \leq 10S$ )	20	°C/W
	Thermal Resistance Junction-ambient <sup>1</sup> (Steady State)	50	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-case <sup>1</sup>	1.6	°C/W



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

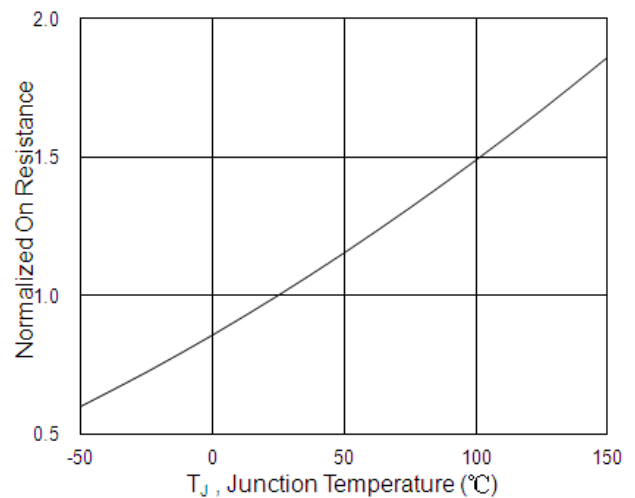
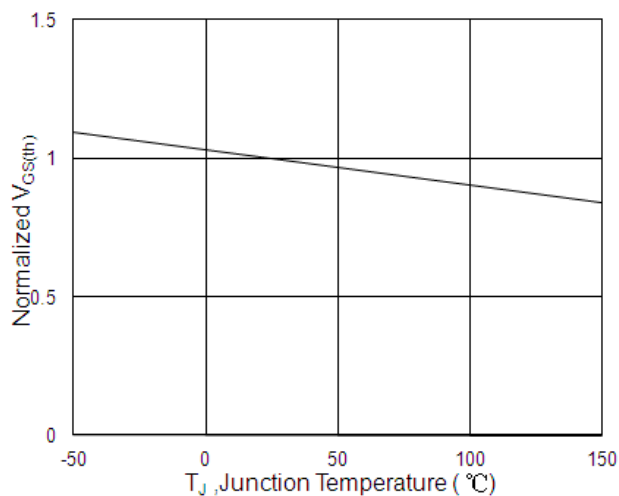
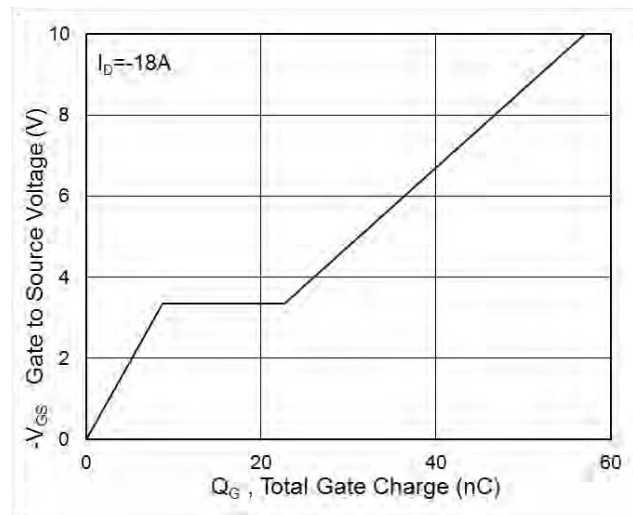
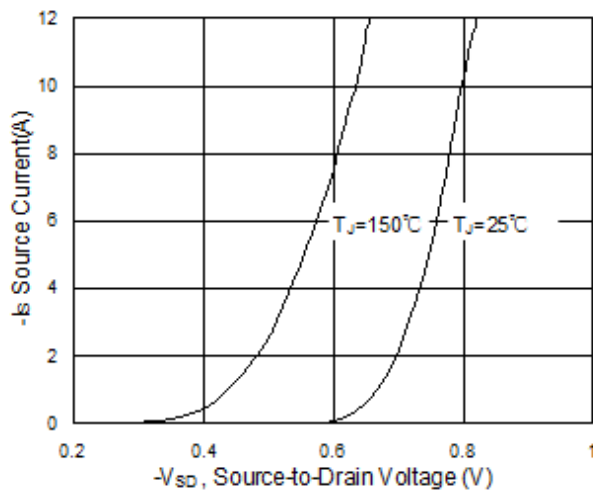
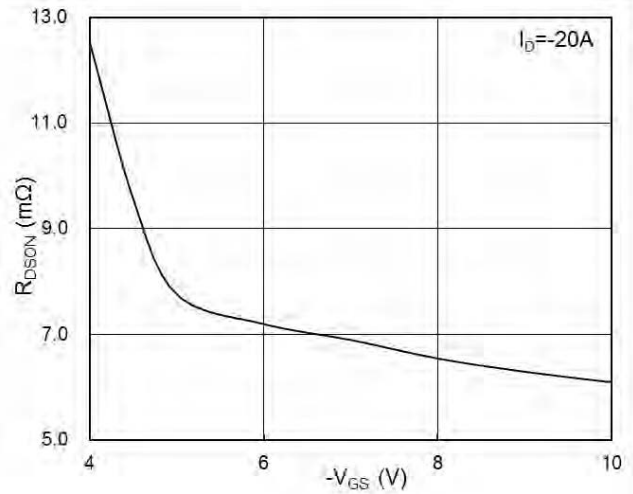
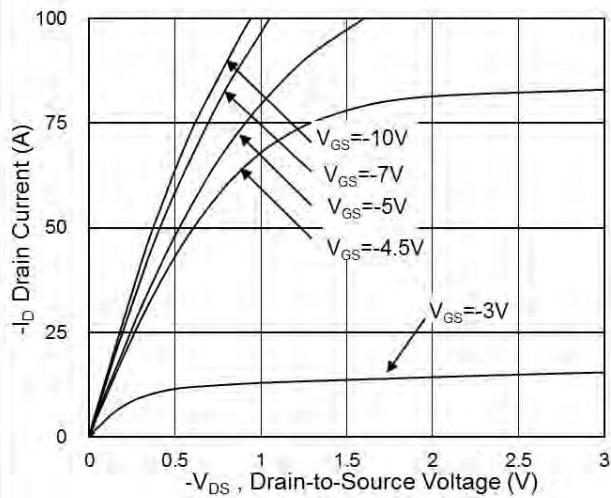
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V$ , $I_D=-250\mu A$	-30	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-10V$ , $I_D=-20A$	---	7	10	$m\Omega$
		$V_{GS}=-4.5V$ , $I_D=-15A$	---	11	18	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$ , $I_D=-250\mu A$	-1.2	---	-2.5	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-24V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$	---	---	-1	$\mu A$
		$V_{DS}=-24V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$	---	---	-5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
$R_g$	Gate Resistance	$V_{DS}=0V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	1.2	---	$\Omega$
$Q_g$	Total Gate Charge (-10V)	$V_{DS}=-15V$ , $V_{GS}=-10V$ $I_D=-18A$	---	60	---	nC
$Q_{gs}$	Gate-Source Charge		---	9	---	
$Q_{gd}$	Gate-Drain Charge		---	15	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V$ $V_{GS}=-10V$ $R_G=3.3\Omega$ , $I_D=-20A$	---	17	---	ns
$T_r$	Rise Time		---	40	---	
$T_{d(off)}$	Turn-Off Delay Time		---	55	---	
$T_f$	Fall Time		---	13	---	
$C_{iss}$	Input Capacitance	$V_{DS}=-25V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	3450	---	pF
$C_{oss}$	Output Capacitance		---	255	---	
$C_{rss}$	Reverse Transfer Capacitance		---	140	---	
$I_S$	Continuous Source Current <sup>1,5</sup>	$V_G=V_D=0V$ , Force Current	---	---	-70	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^\circ\text{C}$	---	---	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F=-20A$ , $di/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$	---	22	---	nS
$Q_{rr}$	Reverse Recovery Charge		---	72	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> 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  $V_{DD}=-50V$ ,  $V_{GS}=-10V$ ,  $L=0.1mH$ ,  $I_{AS}=-40A$
- 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
- 6.The maximum current rating is package limited.



## Typical Characteristics



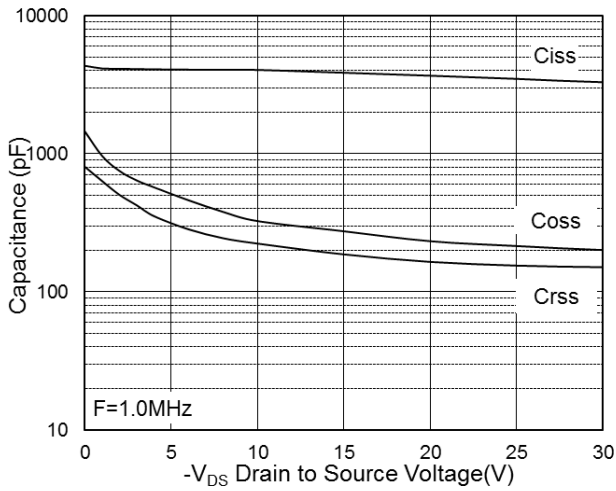


Fig.7 Capacitance

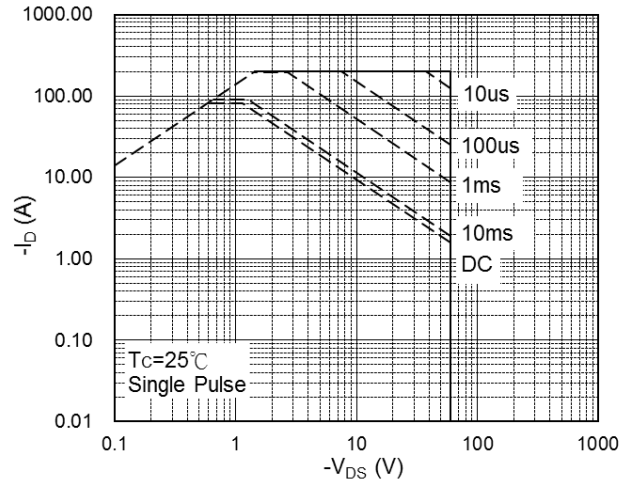


Fig.8 Safe Operating Area

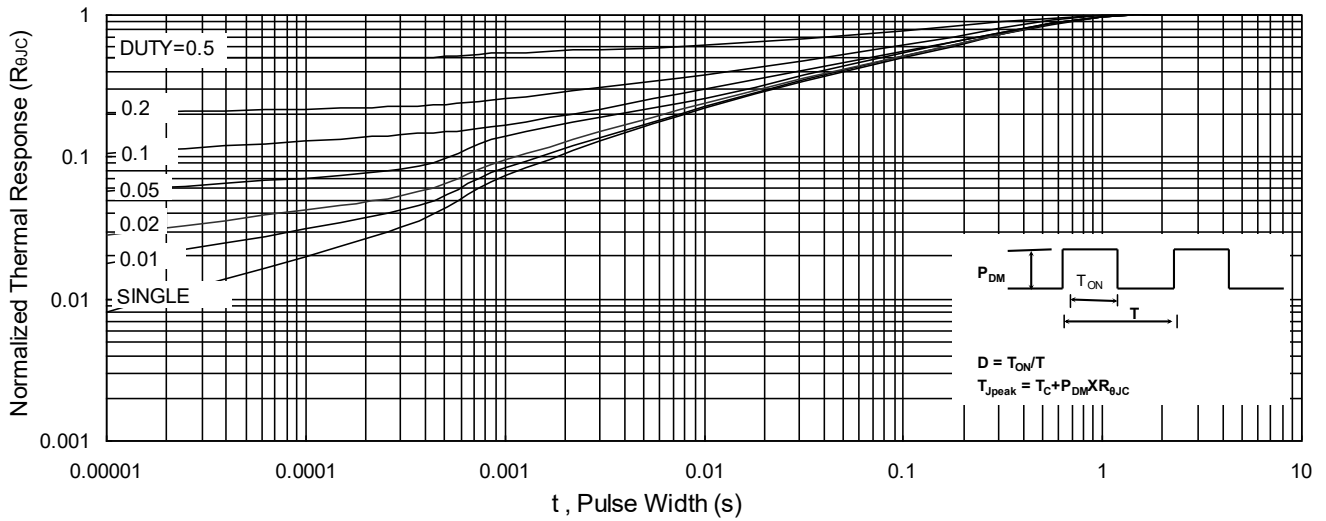


Fig.9 Normalized Maximum Transient Thermal Impedance

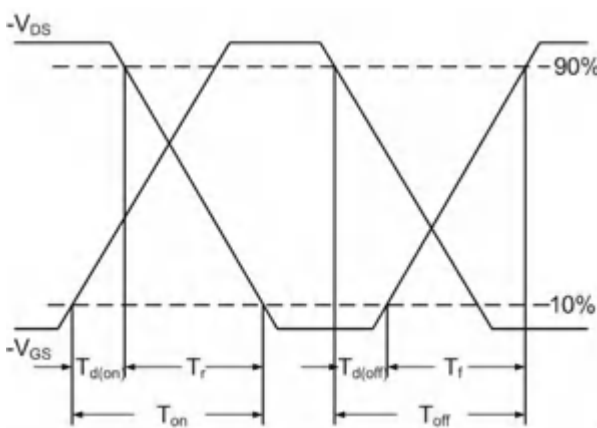


Fig.10 Switching Time Waveform

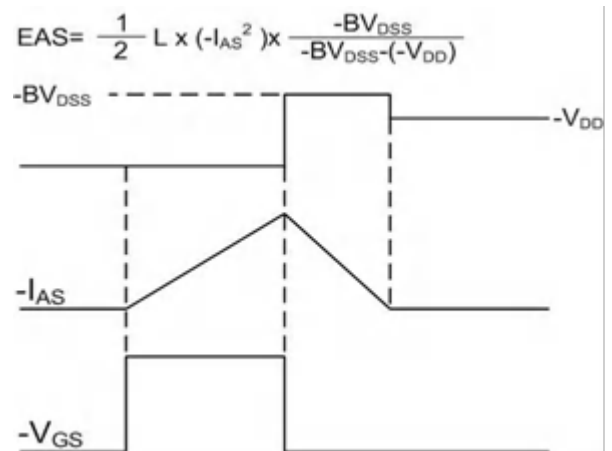
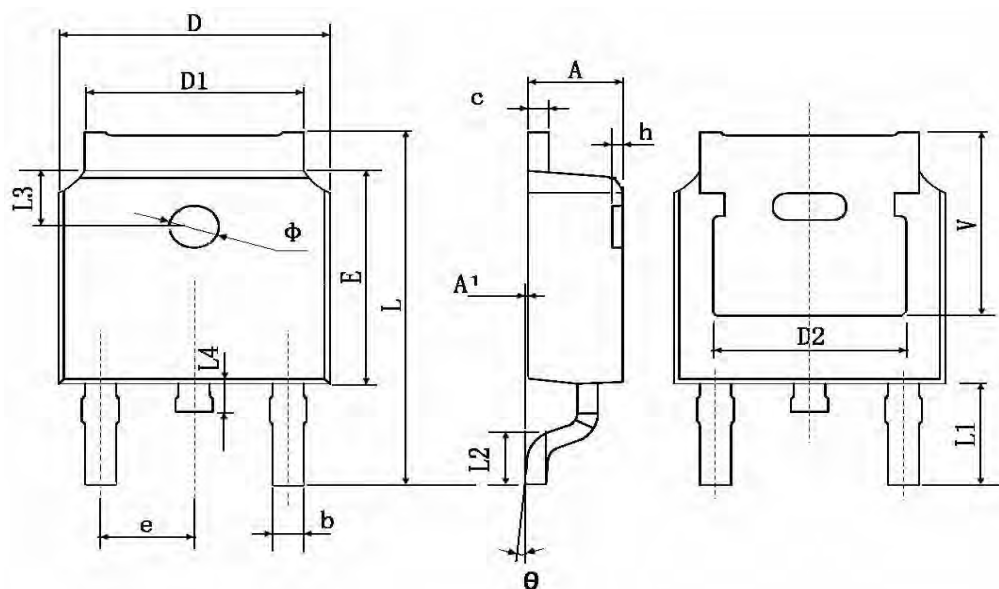


Fig.11 Unclamped Inductive Switching Waveform



## TO-252-2L(TO-252AA) Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



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