



## Description

The HXY30G20NF 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

$V_{DS} = 30V$   $I_D = 16A$

$R_{DS(ON)} < 20m\Omega$  @  $V_{GS}=10V$

$V_{DS} = -30V$   $I_D = -14A$

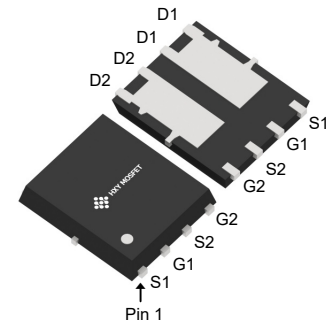
$R_{DS(ON)} < 30m\Omega$  @  $V_{GS}=10V$

## Application

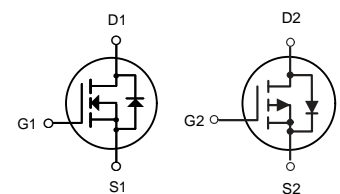
Battery protection

Load switch

Uninterruptible power supply



DFN5X6B-8L



N-Channel

P-Channel

## Ordering Information

Product ID	Pack	Brand	Qty(PCS)
HXY30G20NF	DFN5X6B-8L	HXY MOSFET	5000

## Absolute Maximum Ratings ( $T_C=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
$V_{DS}$	Drain-Source Voltage	30	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$I_D@T_C=25^{\circ}C$	Continuous Drain Current, $V_{GS}$ @ 10V	16	-14	A
$I_D@T_C=100^{\circ}C$	Continuous Drain Current, $V_{GS}$ @ 10V	10	-10	A
$I_{DM}$	Pulsed Drain Current	46	-40	A
EAS	Single Pulse Avalanche Energy	28	66	mJ
$P_D@T_C=25^{\circ}C$	Total Power Dissipation	15	21.3	W
$P_D@T_A=100^{\circ}C$	Total Power Dissipation	5	4.8	W
$T_{STG}$	Storage Temperature Range	-55 to 150	-55 to 150	$^{\circ}C$
$T_J$	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	---	45	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case	---	5	$^{\circ}C/W$



**N-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	$V_{GS}=0V$ , $I_D=250\mu A$	30	---	---	V
$\Delta BV_{DSS}/\Delta T$	BVDSS Temperature Coefficient	Reference to $25^{\circ}\text{C}$ , $I_D=1\text{mA}$	---	0.023	---	$V/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V$ , $I_D=10A$	---	14	20	$\text{m}\Omega$
		$V_{GS}=4.5V$ , $I_D=6A$	---	20	25	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$ , $I_D=250\mu A$	1.0	---	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.2	---	$\text{mV}/^{\circ}\text{C}$
$I_{DSS}$	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
$g_{fs}$	Forward Transconductance	$V_{DS}=5V$ , $I_D=10A$	---	14	---	S
$R_g$	Gate Resistance	$V_{DS}=0V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	2.3	---	$\Omega$
$Q_g$	Total Gate Charge (4.5V)	$V_{DS}=20V$ , $V_{GS}=4.5V$ , $I_D=10A$	---	5	---	nC
$Q_{gs}$	Gate-Source Charge		---	1.11	---	
$Q_{gd}$	Gate-Drain Charge		---	2.61	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=12V$ , $V_{GS}=10V$ , $R_G=3.3\Omega$ $I_D=6A$	---	7.7	---	ns
$T_r$	Rise Time		---	46	---	
$T_{d(off)}$	Turn-Off Delay Time		---	11	---	
$T_f$	Fall Time		---	3.6	---	
$C_{iss}$	Input Capacitance	$V_{DS}=15V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	416	---	pF
$C_{oss}$	Output Capacitance		---	62	---	
$C_{rss}$	Reverse Transfer Capacitance		---	51	---	
$I_S$	Continuous Source Current <sup>1,5</sup>	$V_G=V_D=0V$ , Force Current	---	---	16	A
$I_{SM}$	Pulsed Source Current <sup>2,5</sup>		---	---	30	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V$ , $I_S=1A$ , $T_J=25^{\circ}\text{C}$	---	---	1.2	V

Note :

- 1.The data tested by surface mounted on a 1 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  $V_{DD}=25V$  ,  $V_{GS}=10V$  ,  $L=0.1\text{mH}$  ,  $I_{AS}=12.7A$
- 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.



**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	$V_{GS}=0V$ , $I_D=-250\mu A$	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^{\circ}\text{C}$ , $I_D=-1\text{mA}$	---	-0.021	---	$\text{V}/^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-10V$ , $I_D=-8A$	---	25	30	$\text{m}\Omega$
		$V_{GS}=-4.5V$ , $I_D=-6A$	---	30	35	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$ , $I_D=-250\mu A$	-1.0	---	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.2	---	$\text{mV}/^{\circ}\text{C}$
$I_{DSS}$	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
$g_{fs}$	Forward Transconductance	$V_{DS}=-5V$ , $I_D=-8A$	---	12.6	---	S
$R_g$	Gate Resistance	$V_{DS}=0V$ , $V_{GS}=0V$ , $f=1\text{MHz}$		15	---	$\Omega$
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS}=-20V$ , $V_{GS}=-4.5V$ , $I_D=-6A$	---	9.8	---	nC
$Q_{gs}$	Gate-Source Charge		---	2.2	---	
$Q_{gd}$	Gate-Drain Charge		---	3.4	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-24V$ , $V_{GS}=-10V$ , $R_G=3.3\Omega$ , $I_D=-1A$	---	16.4	---	ns
$T_r$	Rise Time		---	20.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	55	---	
$T_f$	Fall Time		---	10	---	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	930	---	pF
$C_{oss}$	Output Capacitance		---	148	---	
$C_{rss}$	Reverse Transfer Capacitance		---	115	---	
$I_S$	Continuous Source Current <sup>1,5</sup>	$V_G=V_D=0V$ , Force Current	---	---	-14	A
$I_{SM}$	Pulsed Source Current <sup>2,5</sup>		---	---	-24	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^{\circ}\text{C}$	---	---	-1.2	V

Note :

1. The data tested by surface mounted on a 1 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  $V_{DD}=-25V$ ,  $V_{GS}=-10V$ ,  $L=0.1\text{mH}$ ,  $I_{AS}=-30A$
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.



## N-Channel Typical Characteristics

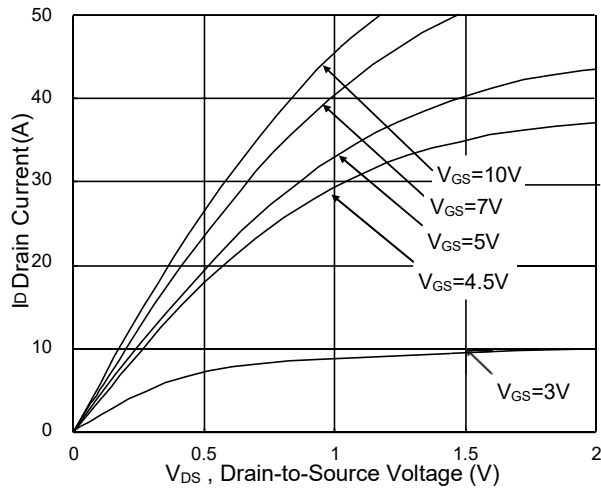


Fig.1 Typical Output Characteristics

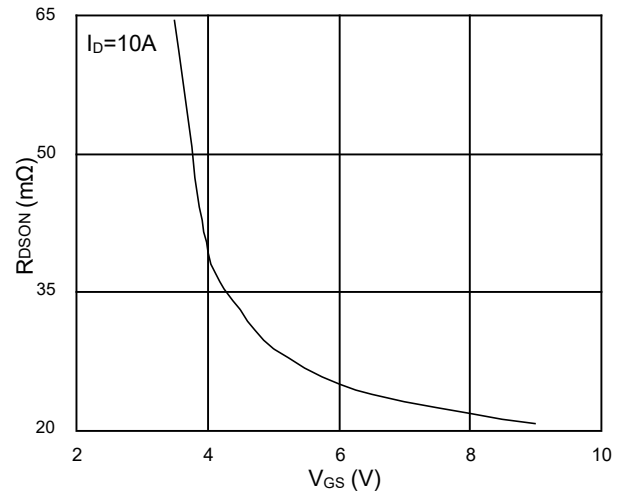


Fig.2 On-Resistance vs. Gate-Source

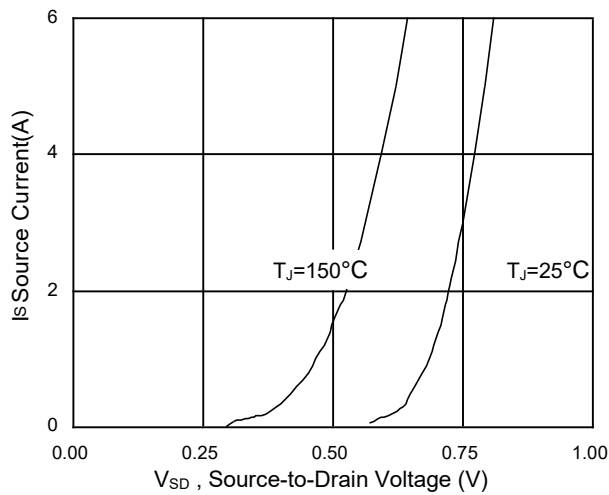


Fig.3 Forward Characteristics Of Reverse

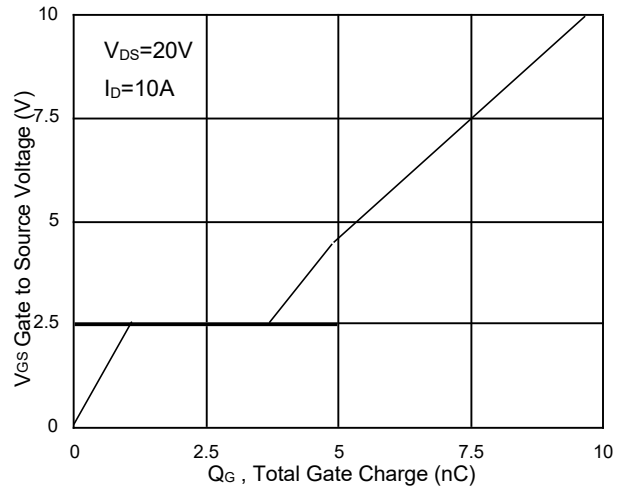


Fig.4 Gate-Charge Characteristics

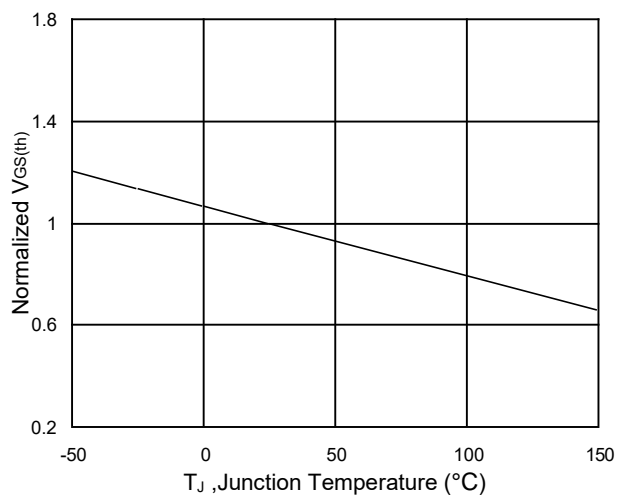


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

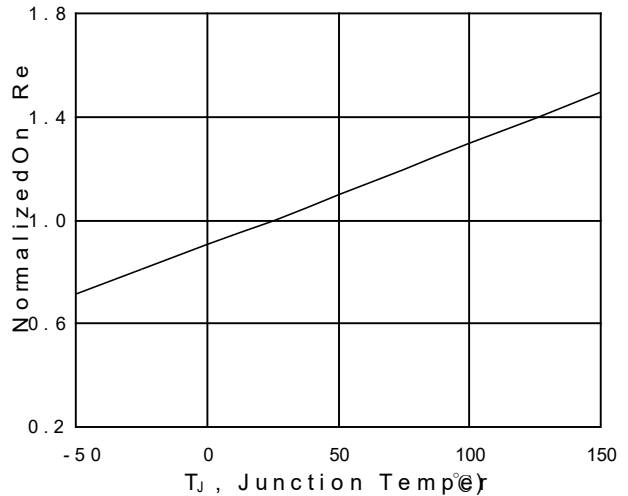


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

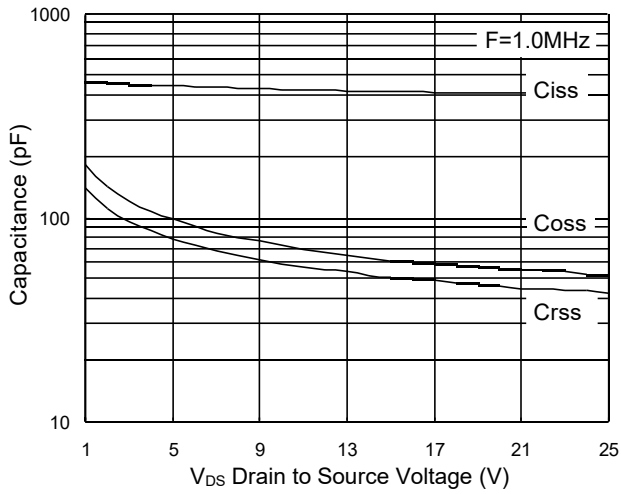


Fig.7 Capacitance

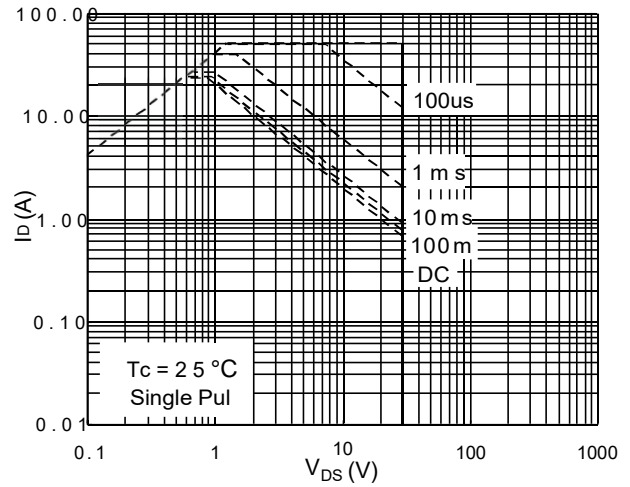


Fig.8 Safe Operating Area

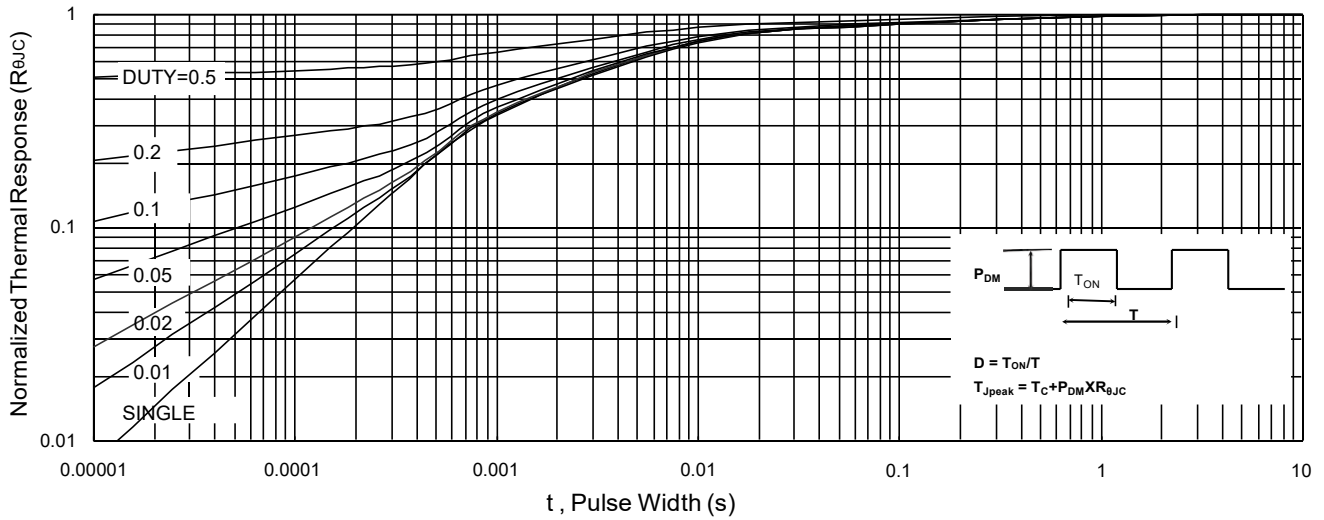
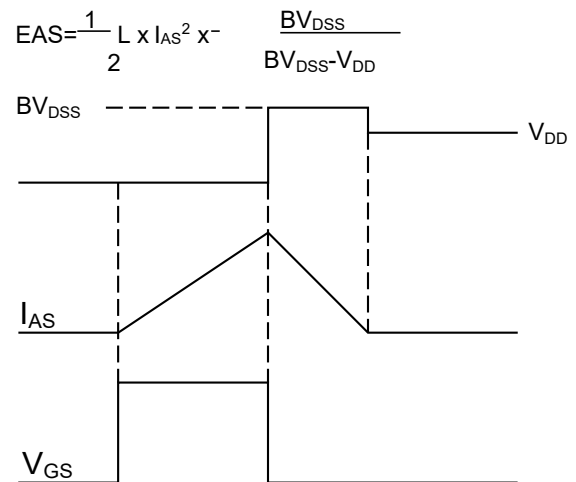
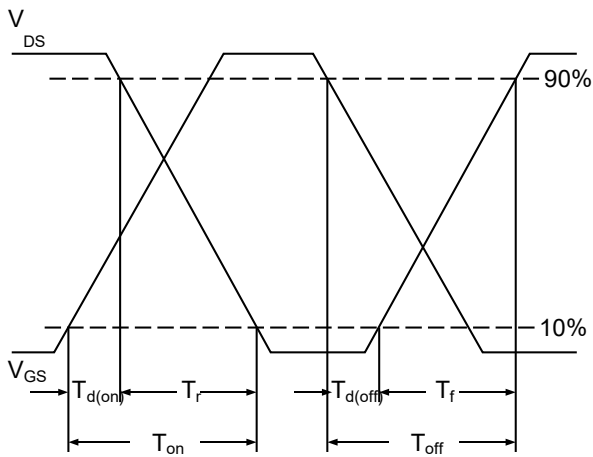


Fig.9 Normalized Maximum Transient Thermal Impedance





## P-Channel Typical Characteristics

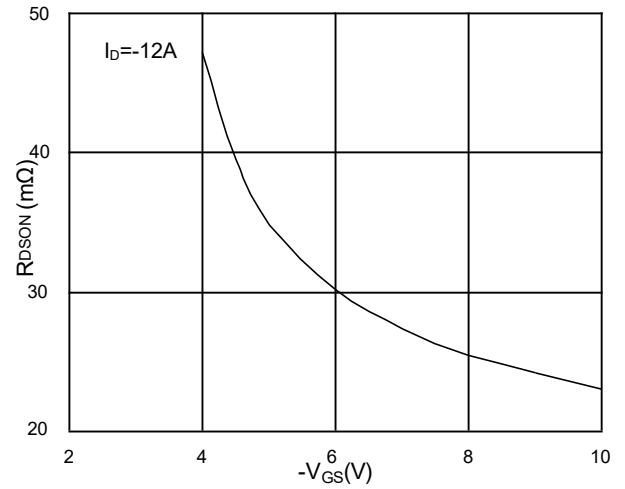
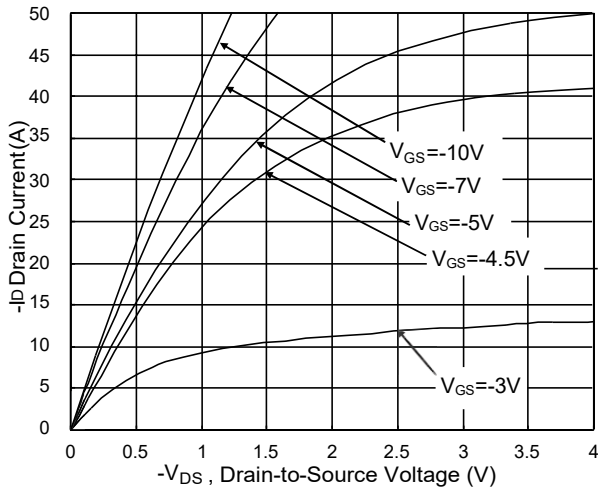


Fig.1 Typical Output Characteristics

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

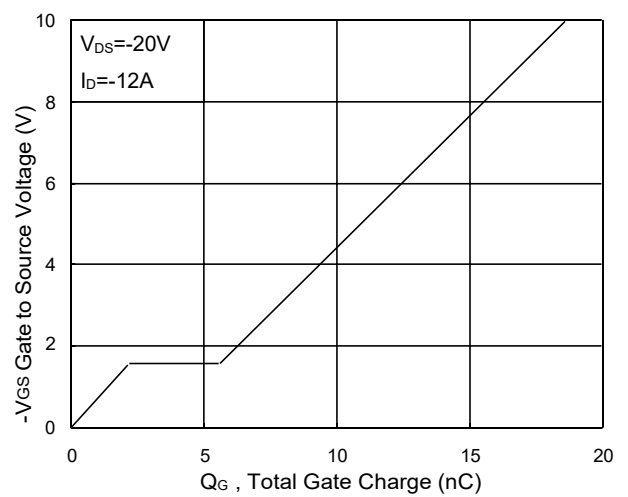
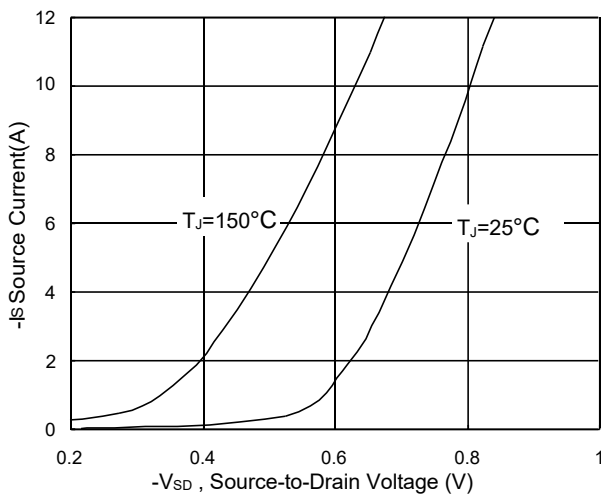


Fig.3 Forward Characteristics Of Reverse

Fig.4 Gate-Charge Characteristics

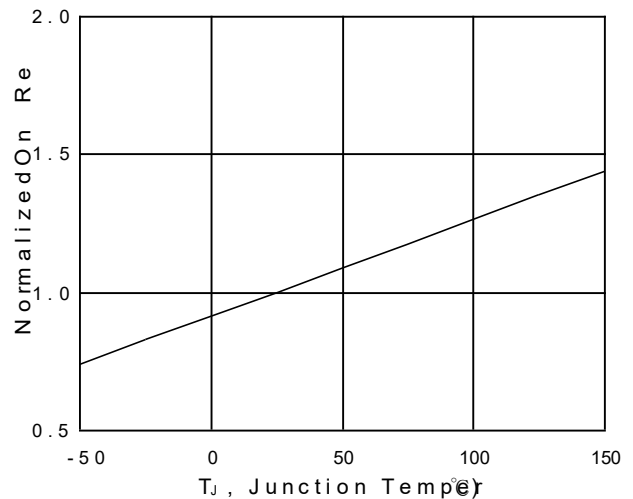
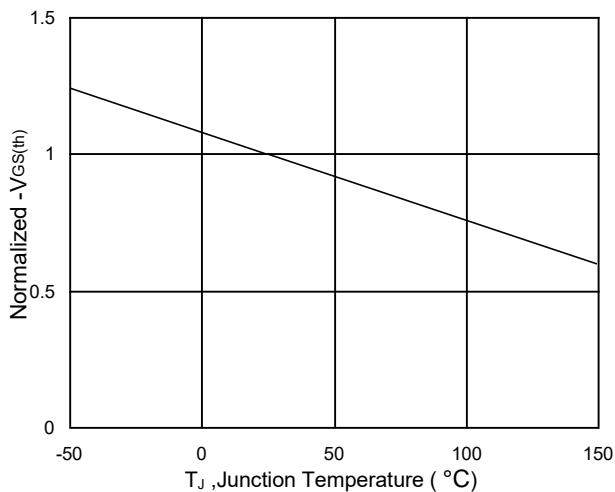


Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$

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

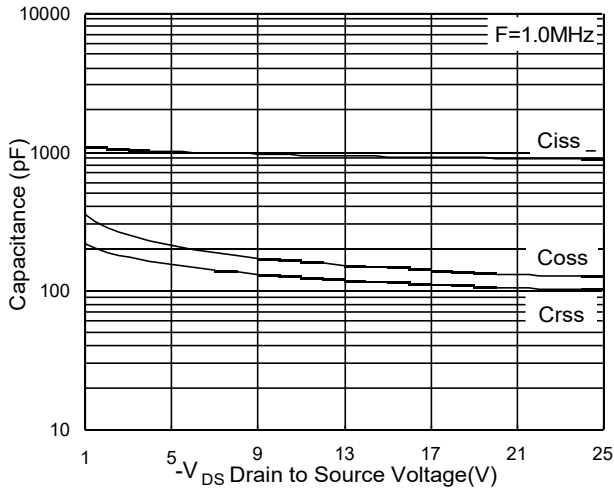


Fig.7 Capacitance

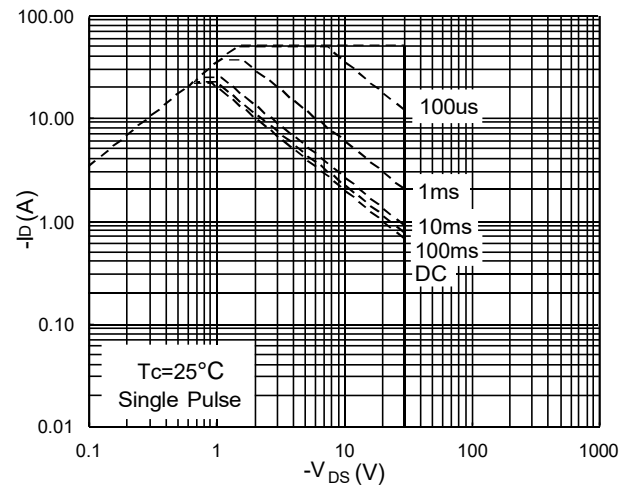


Fig.8 Safe Operating Area

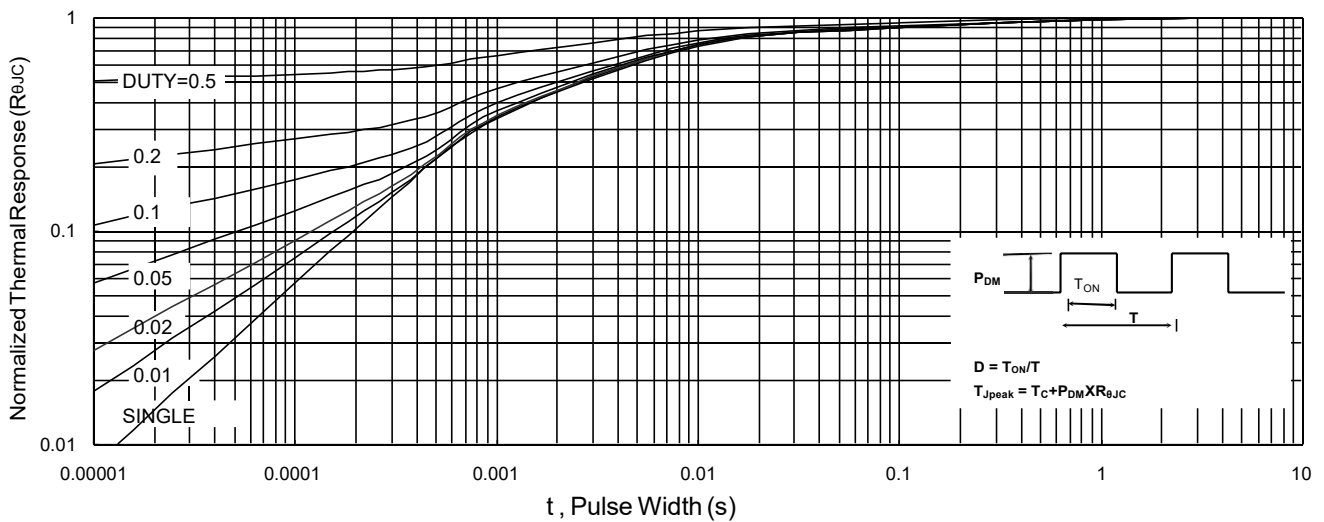


Fig.9 Normalized Maximum Transient Thermal Impedance

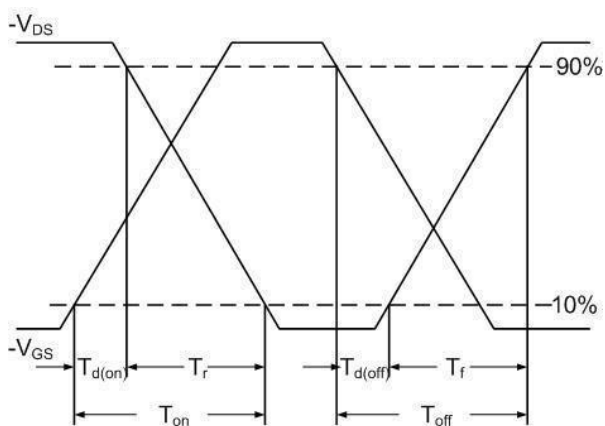


Fig.10 Switching Time Waveform

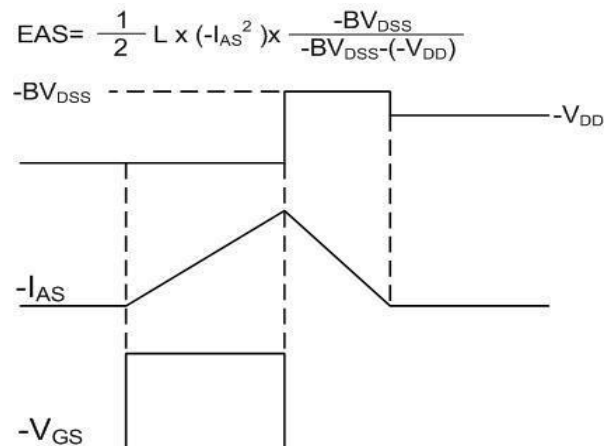
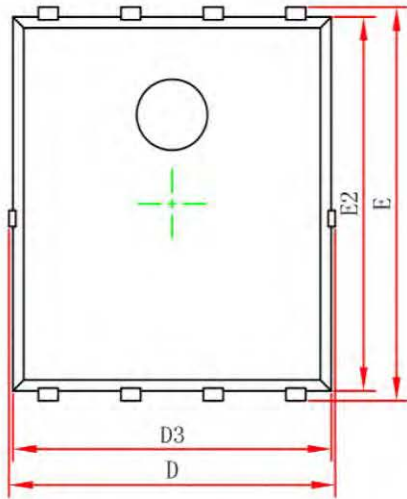


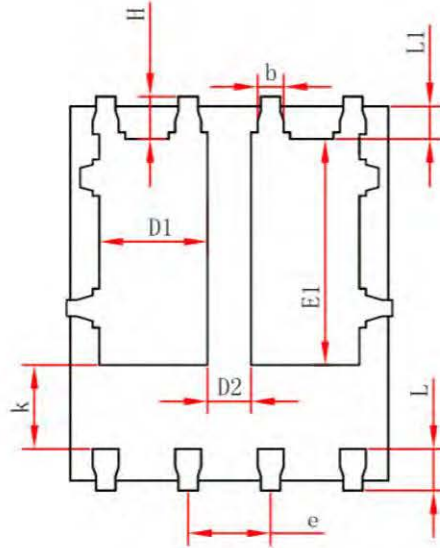
Fig.11 Unclamped Inductive Switching Waveform



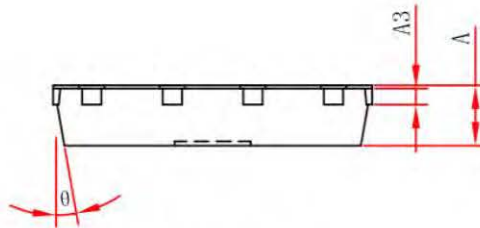
### DFN5X6B-8L Package Information



**Top View**



**Bottom View**



**Side View**

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.154REF.		0.006REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°





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