



### Description

The NVTF5C680NL 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

$V_{DS} = 60V$   $I_D = 20A$

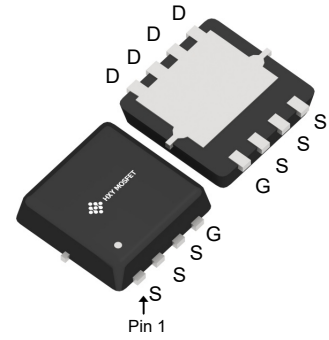
$R_{DS(ON)} < 30m\Omega$  @  $V_{GS}=10V$

### Application

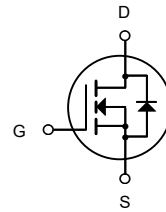
Battery protection

Load switch

Uninterruptible power supply



DFN3X3-8L



N-Channel MOSFET

### Ordering Information

Product ID	Pack	Brand	Qty(PCS)
NVTF5C680NL	DFN3X3-8L	HXY MOSFET	5000

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

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	20	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	14	A
IDM	Pulsed Drain Current <sup>2</sup>	90	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	42	mJ
$P_D@T_C=25^\circ C$	Total Power Dissipation <sup>4</sup>	33	W
TSTG	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C
R <sub>θJA</sub>	Thermal Resistance Junction-ambient <sup>1</sup>	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	3.79	°C/W



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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{GS}=0V, V_{DS}=60V$	---	---	1	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0A$	---	---	$\pm 100$	nA
$V_{GS(th)}$	GATE-Source Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.8	2.5	V
$R_{DS(ON)}$	Drain-Source On Resistance <sup>3</sup>	$V_{GS}=10V, I_D=20A$	---	24	30	m $\Omega$
		$V_{GS}=4.5V, I_D=20A$	---	31	40	
$C_{ISS}$	Input Capacitance	$V_{DS}=30V, V_{GS}=0V,$ $f=1MHz$	---	1060	---	pF
$C_{OSS}$	Output Capacitance		---	64	---	
$C_{RSS}$	Reverse Transfer Capacitance		---	54	---	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=30V,$ $V_{GS}=10V,$ $I_D=20A, R_G=3\Omega$	---	8.4	---	ns
$t_r$	Rise Time		---	8.5	---	ns
$t_{d(off)}$	Turn-Off Delay Time		---	36	---	ns
$t_f$	Fall Time		---	5	---	ns
$Q_g$	Total Gate Charge	$V_{DS}=30V, V_{GS}=10V,$ $I_D=20A$	---	26	---	nC
$Q_{gs}$	Gate-Source Charge		---	5.7	---	nC
$Q_{gd}$	Gate-Drain "Miller" Charge		---	5.2	---	nC
$I_S$	Continuous Source Current	$V_G=V_D=0V$	---	---	20	A
$I_{SM}$	Pulsed Source Current	$V_G=V_D=0V$	---	---	90	A
$V_{SD}$	Forward on voltage	$I_S=20A, V_{GS}=0V$	---	---	1.2	V
$T_{rr}$	Body Diode Reverse Recovery Time	$I_F=20A, di/dt=100A/\mu s$	---	18	---	nS
$Q_{rr}$	Body Diode Reverse Recovery Charge		---	13	---	nC

**Notes:**

- 1)  $L=0.5mH, V_{DD}=30V, \text{Start } T_J=25^\circ\text{C}$ .
- 2) Limited by maximum junction temperature.
- 3) Repetitive Rating: Pulse width limited by maximum junction temperature



### Typical Characteristics

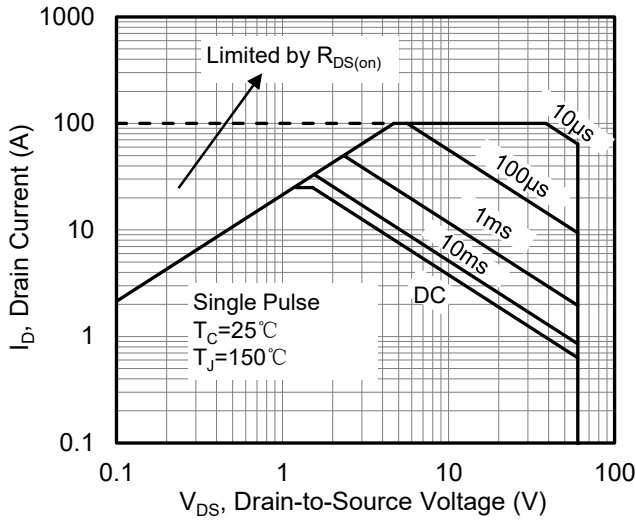


Figure 1. Maximum Safe Operating Area

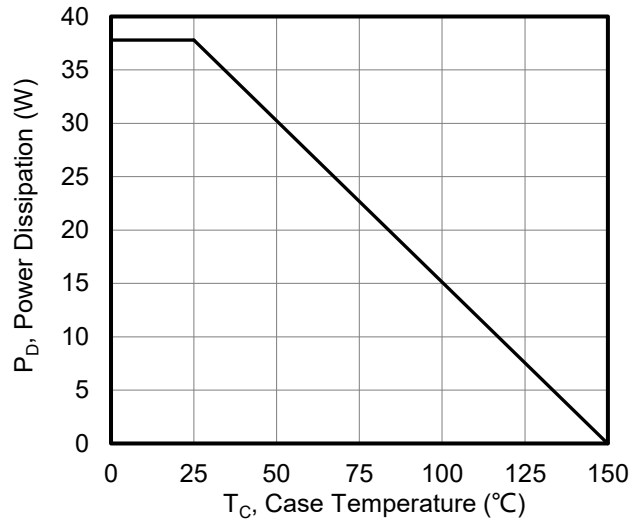


Figure 2. Maximum Power Dissipation vs Case Temperature

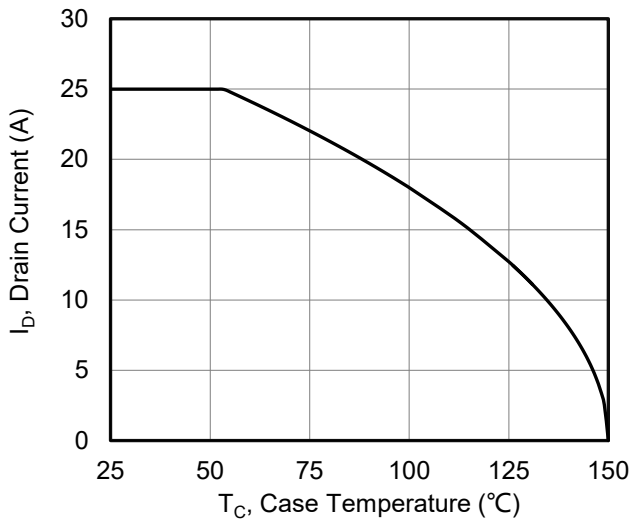


Figure 3. Maximum Continuous Drain Current vs Case Temperature

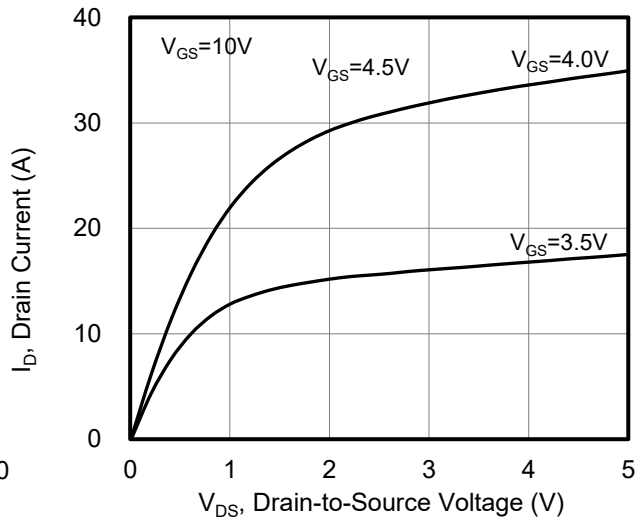


Figure 4. Typical output Characteristics

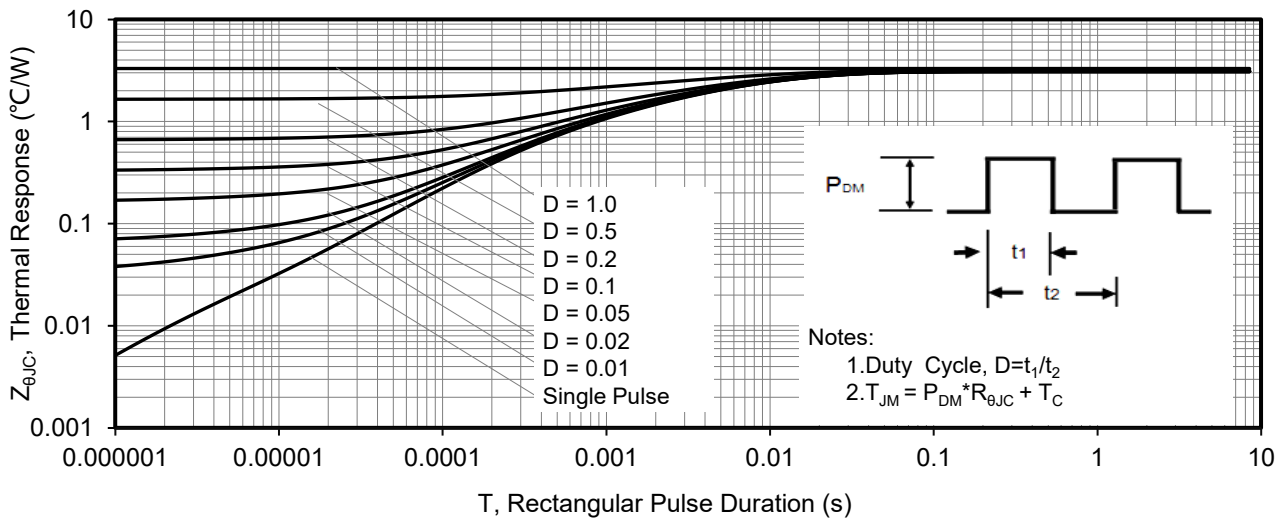


Figure 5. Maximum Effective Thermal Impedance, Junction to Case

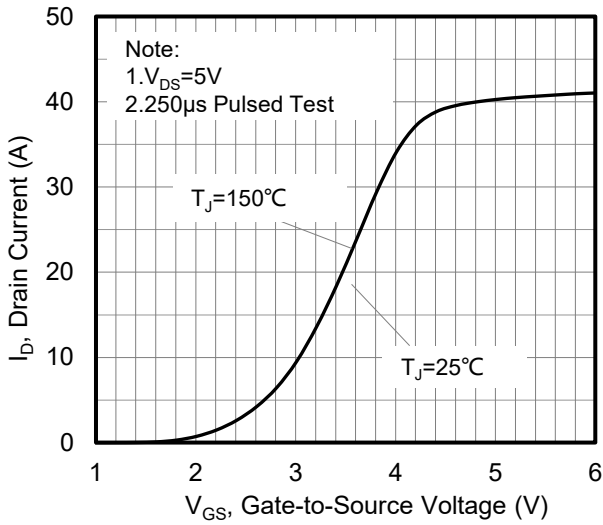


Figure 6. Typical Transfer Characteristics

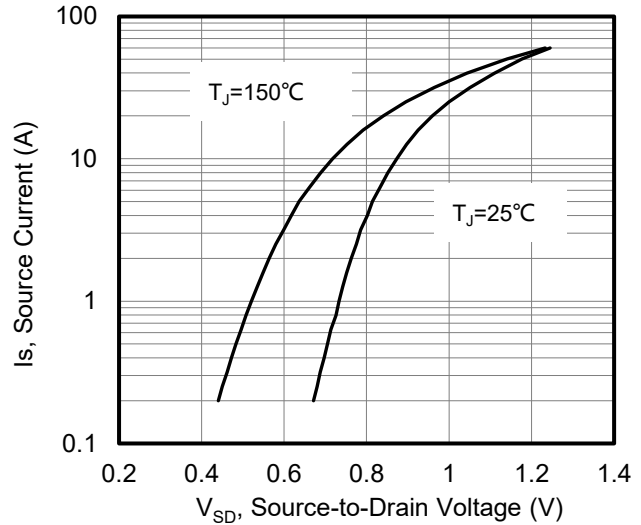


Figure 7. Typical Body Diode Transfer Characteristics

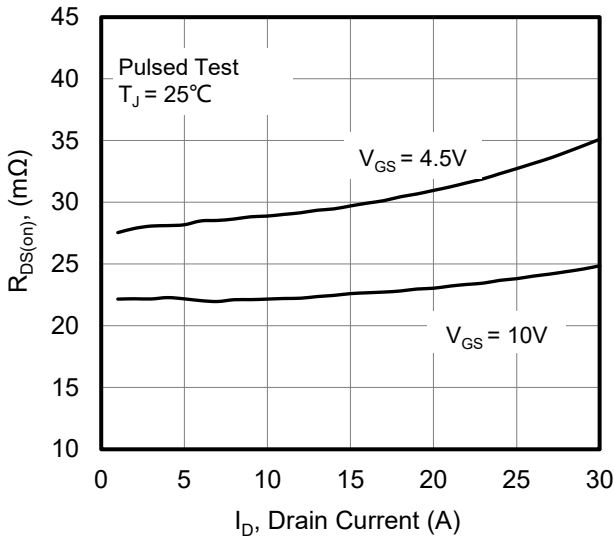


Figure 8. Drain-to-Source On Resistance vs Drain Current

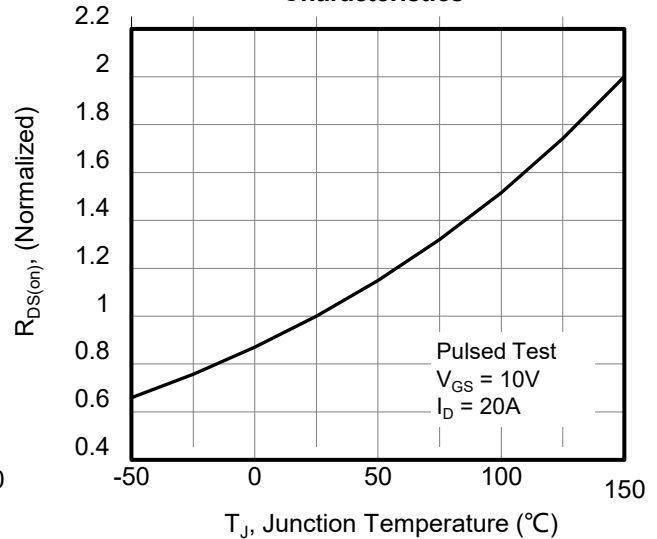


Figure 9. Normalized On Resistance vs Junction Temperature

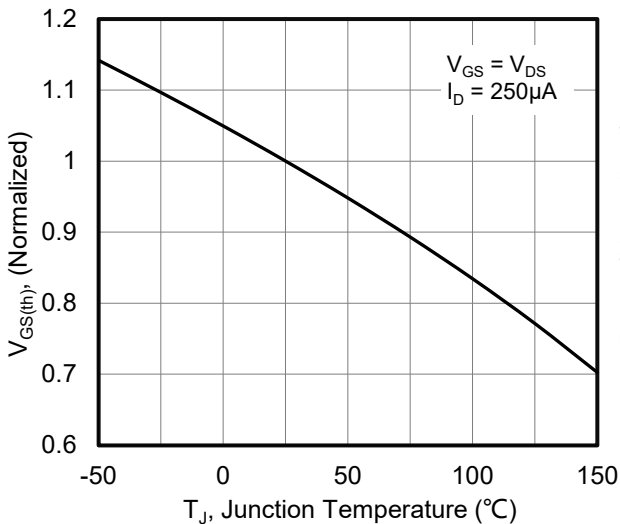


Figure 10. Normalized Threshold Voltage vs Junction Temperature

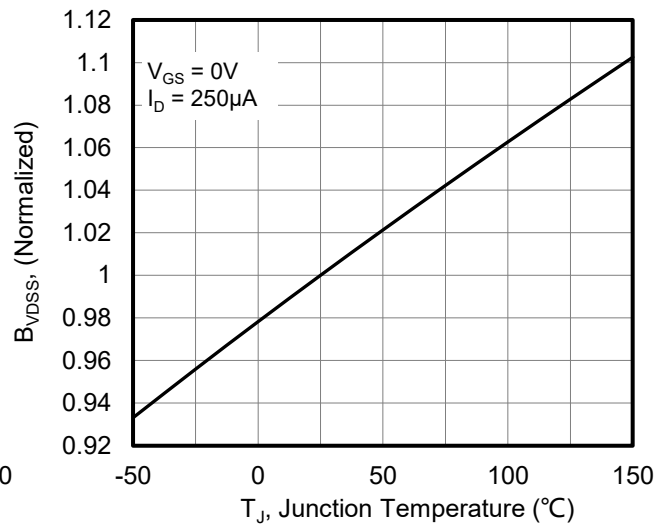


Figure 11. Normalized Breakdown Voltage vs Junction Temperature

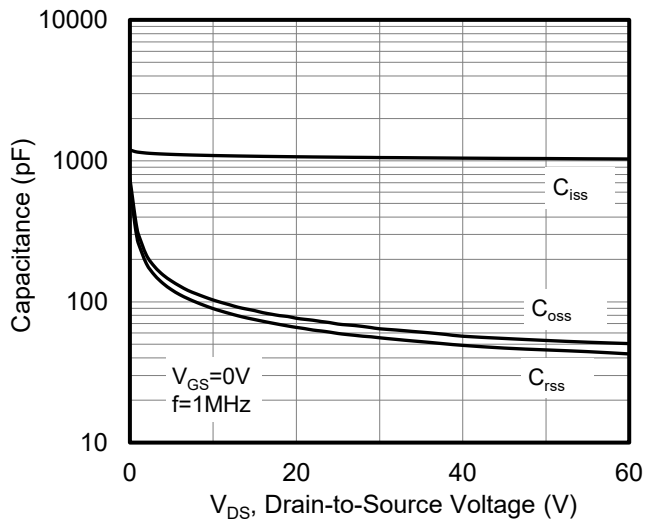


Figure 12. Capacitance Characteristics

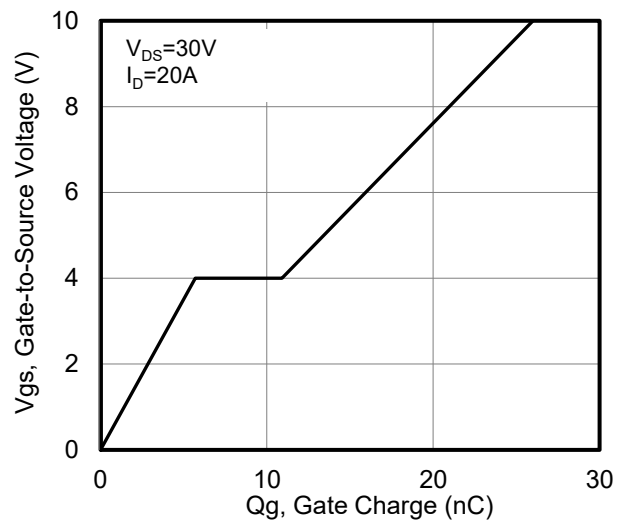
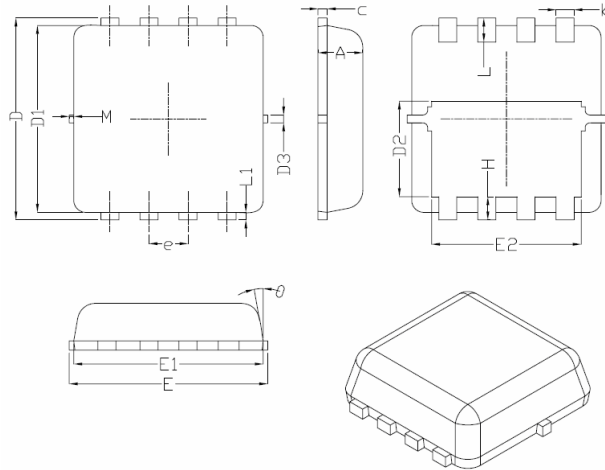


Figure 13. Typical Gate Charge vs. Gate to Source Voltage



### DFN3X3-8L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.48	1.58	1.68
D3	-	0.13	-
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
M	*	*	0.15
$\theta$		10°	12°



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