

# GSMDC2116M

## 20V N+P Dual Channel MOSFETs

### Product Description

These N+P dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are well suited for high efficiency fast switching applications.

### Features

- N-Channel  
20V, 5A,  $R_{DS(ON)}=40m\Omega@V_{GS}=4.5V$
- P-Channel  
-20V, -4.7A,  $R_{DS(ON)}=100m\Omega@V_{GS}=-4.5V$
- Fast switching
- Suit for -1.8V/1.8V Gate Drive Applications
- Green Device Available
- DFN2X3-8L package design

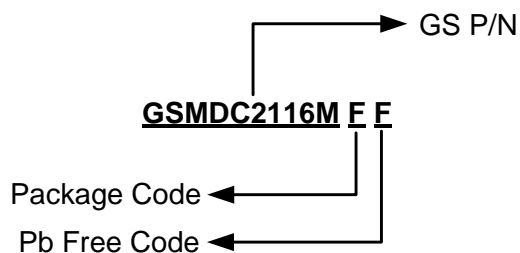
### Applications

- Notebook
- Load Switch
- Networking
- Hand-Held Instruments

### Packages & Pin Assignments

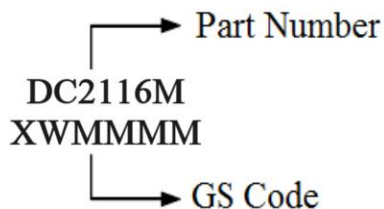
GSMDC2116MFF (DFN2X3-8L)	
Bottom Views	
Pin	Description
1	Source 1
2	Gate 1
3	Source 2
4	Gate 2
5	Drain 2
6	Drain 2
7	Drain 1
8	Drain 1

## Ordering Information



Part Number	Package	Quantity
GSMDC2116MFF	DFN2X3-8L	3000pcs

## Marking Information



## Absolute Maximum Ratings

$T_C=25^{\circ}\text{C}$  Unless otherwise noted

Symbol	Parameter	Typical		Unit	
		N-Channel	P-Channel		
$V_{DS}$	Drain-Source Voltage	20	-20	V	
$V_{GS}$	Gate –Source Voltage	$\pm 10$	$\pm 10$	V	
$I_D$	Continuous Drain Current ( $T_J=150^{\circ}\text{C}$ )	$T_C=25^{\circ}\text{C}$	5	-4.7	A
		$T_C=100^{\circ}\text{C}$	4.1	-3.9	
$I_{DM}$	Pulsed Drain Current	15.2	-10	A	
$P_D$	Power Dissipation	$T_C=25^{\circ}\text{C}$	1.56	W	
		Derate above $25^{\circ}\text{C}$	0.0125	W/ $^{\circ}\text{C}$	
$T_J$	Operating Junction Temperature Range	-55 to +150		$^{\circ}\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to +150		$^{\circ}\text{C}$	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	80		$^{\circ}\text{C}/\text{W}$	

## Electrical Characteristics (N-Channel)

T<sub>J</sub>=25°C Unless otherwise noted

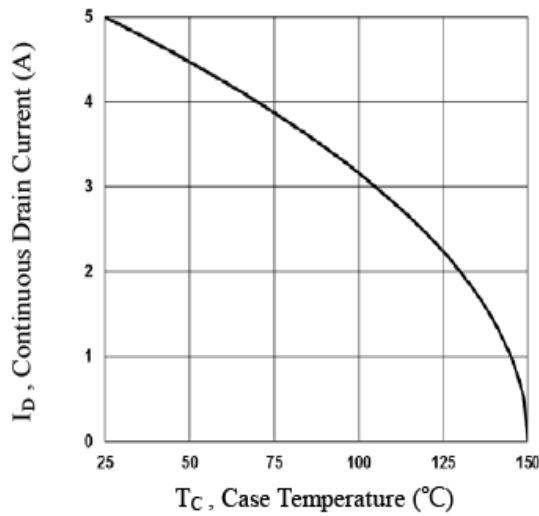
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	20			V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA		0.02		V/°C
V <sub>GS(th)</sub>	Gate Threshold Voltage		0.3	0.6	1.0	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA		-2		mV/°C
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V			±100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V			1	uA
		V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C			10	
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current			5	A
I <sub>SM</sub>	Pulsed Source Current				10	
R <sub>DS(on)</sub>	Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A		30	40	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =2A		42	55	
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =1.5A		55	70	
g <sub>Fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =2A		4.4		S
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =1A			1	V
<b>Dynamic</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A		5.8	10	nC
Q <sub>gs</sub>	Gate-Source Charge			0.6	1.5	
Q <sub>gd</sub>	Gate-Drain Charge			1.5	3	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz		315	600	pF
C <sub>oss</sub>	Output Capacitance			50	80	
C <sub>rss</sub>	Reverse Transfer Capacitance			40	60	
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =10V, I <sub>D</sub> =1A, V <sub>GS</sub> =4.5V, R <sub>G</sub> =25Ω		2.9	6	ns
t <sub>r</sub>				8.4	16	
t <sub>d(off)</sub>	Turn-Off Time			19.2	38	
t <sub>f</sub>				5.6	12	

## Electrical Characteristics (P-Channel)

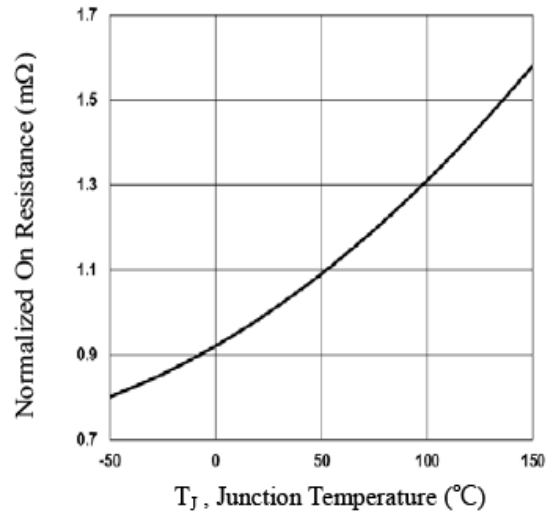
T<sub>J</sub>=25°C Unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-20			V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA		-0.01		V/°C
V <sub>GS(th)</sub>	Gate Threshold Voltage		-0.3	-0.6	-1.0	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA		3		mV/°C
I <sub>GSS</sub>	Gate Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V			±100	nA
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V			-1	uA
		V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C			-10	
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current			-4.7	A
I <sub>SM</sub>	Pulsed Source Current				-9.4	
R <sub>DS(on)</sub>	Drain-Source On-Resistance	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A		82	100	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2A		125	140	
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1A		197	230	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-1A		2.2		S
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A			-1	V
<b>Dynamic</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A		4.8	10	nC
Q <sub>gs</sub>	Gate-Source Charge			0.5	1	
Q <sub>gd</sub>	Gate-Drain Charge			1.9	4	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz		350	510	pF
C <sub>oss</sub>	Output Capacitance			65	95	
C <sub>rss</sub>	Reverse Transfer Capacitance			50	75	
t <sub>d(on)</sub>	Turn-On Time	V <sub>DD</sub> =-10V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =25Ω		3.5	7	ns
t <sub>r</sub>				12.6	24	
t <sub>d(off)</sub>	Turn-Off Time			32.6	62	
t <sub>f</sub>				8.4	16	

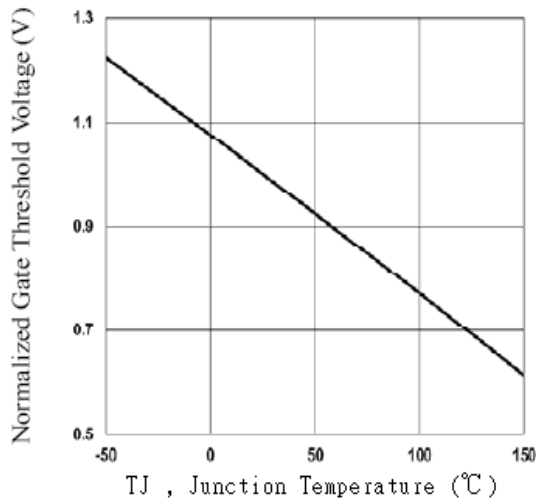
## Typical Performance Characteristics (N-Channel)



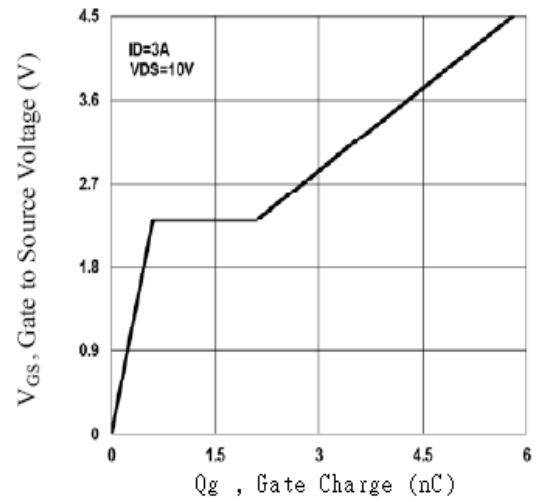
**Fig.1 Continuous Drain Current vs.  $T_C$**



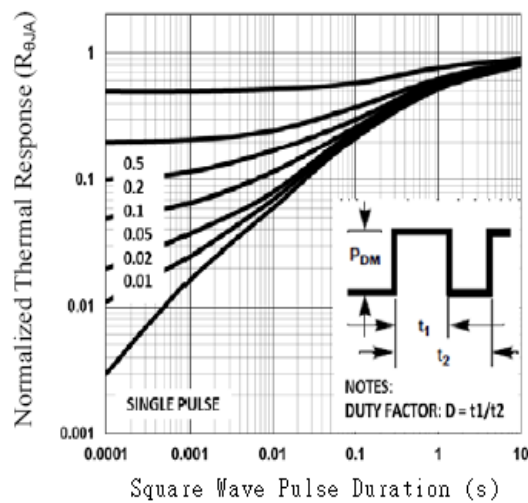
**Fig.2 Normalized RDSON vs.  $T_J$**



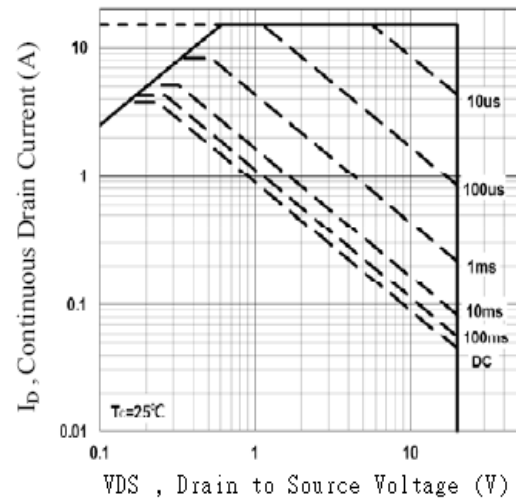
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



**Fig.4 Gate Charge Waveform**



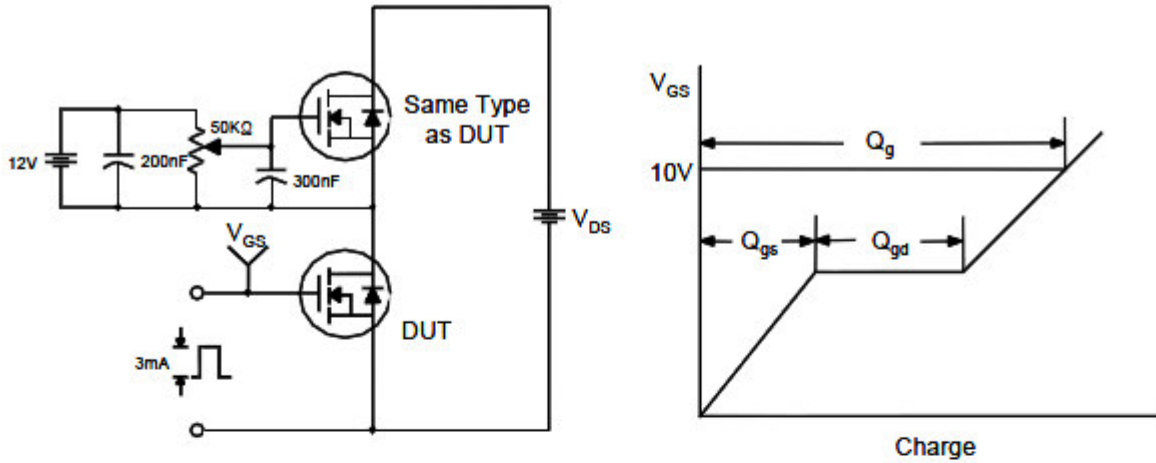
**Fig.5 Normalized Transient Impedance**



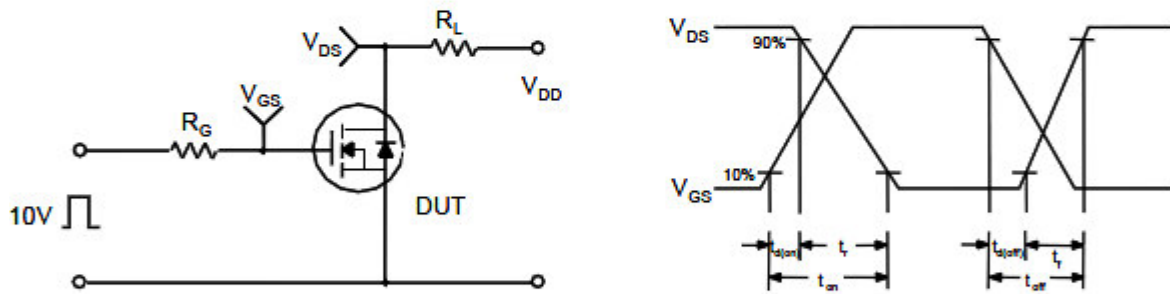
**Fig.6 Maximum Safe Operation Area**

## Typical Performance Characteristics (N-Channel)

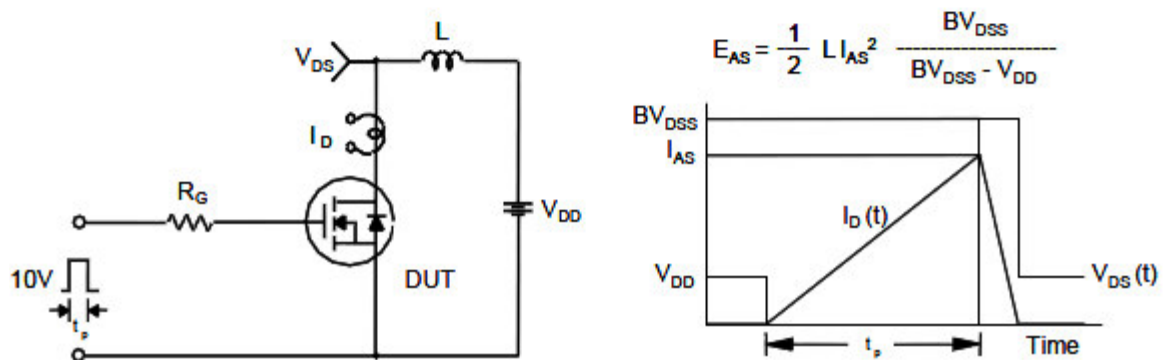
Gate Charge Test Circuit & Waveform



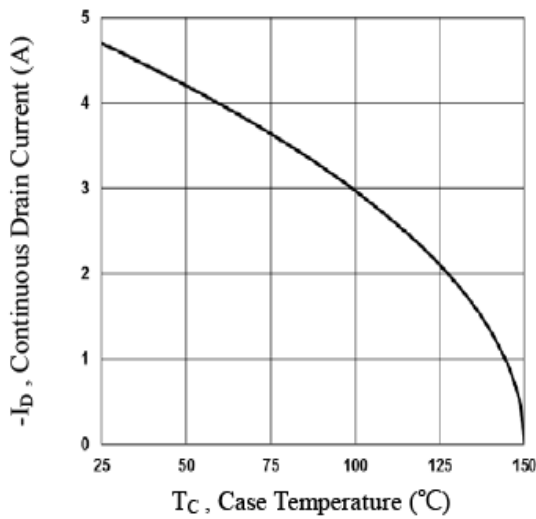
Resistive Switching Test Circuit & Waveforms



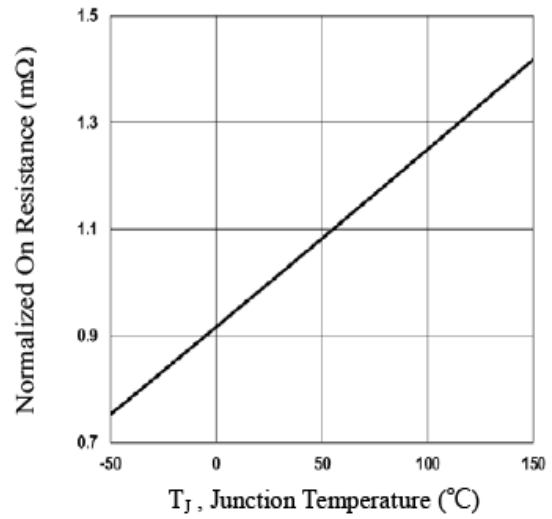
Unclamped Inductive Switching Test Circuit & Waveforms



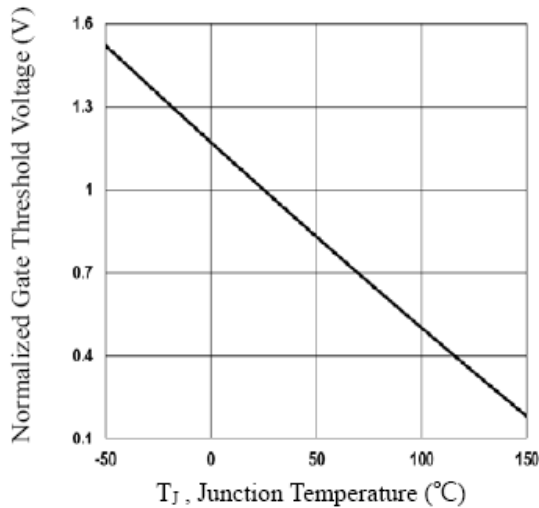
## Typical Performance Characteristics (P-Channel)



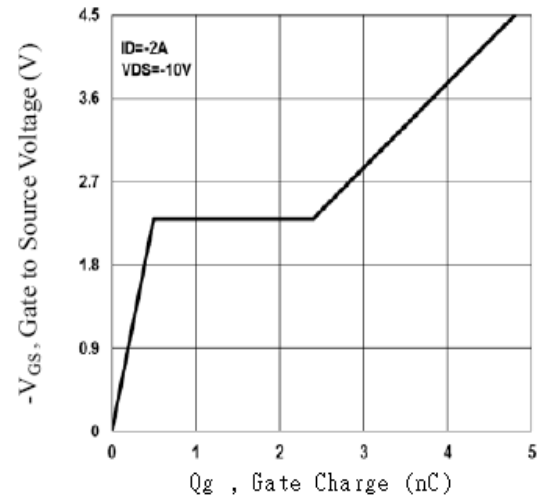
**Fig.1 Continuous Drain Current vs.  $T_c$**



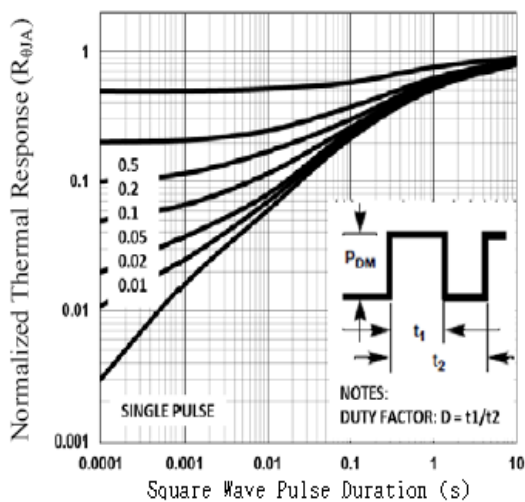
**Fig.2 Normalized RDSON vs.  $T_j$**



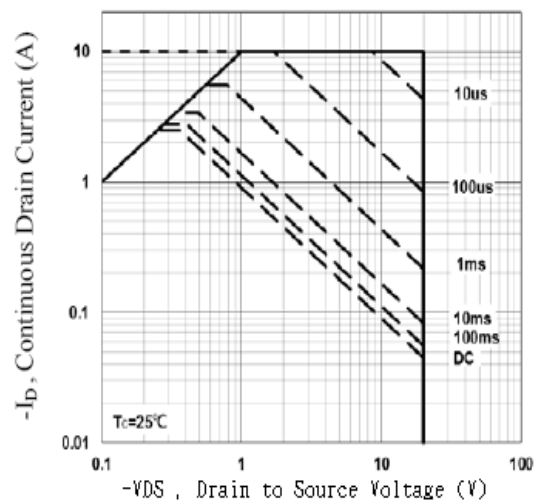
**Fig.9 Normalized  $V_{th}$  vs.  $T_j$**



**Fig.10 Gate Charge Waveform**



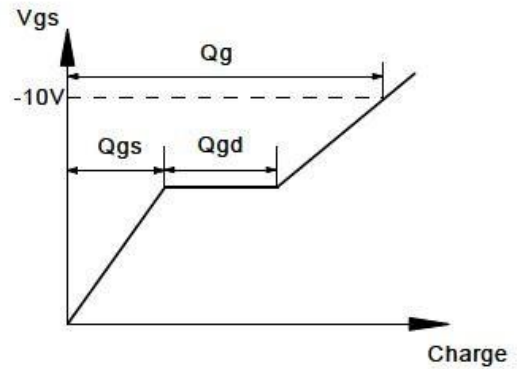
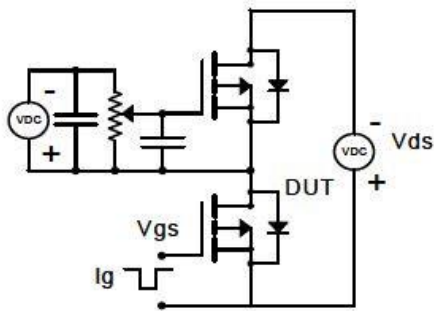
**Fig.11 Normalized Transient Impedance**



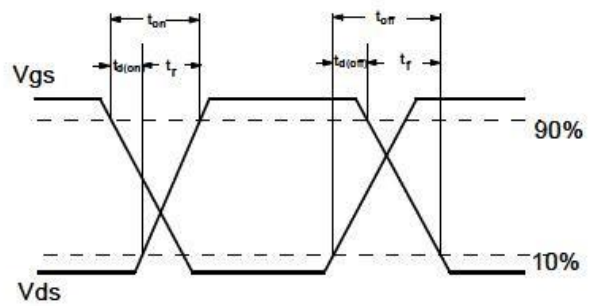
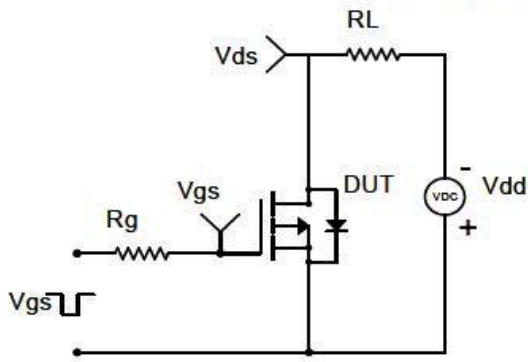
**Fig.12 Maximum Safe Operation Area**

## Typical Performance Characteristics (P-Channel)

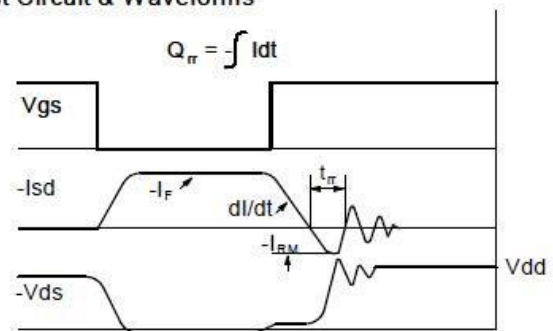
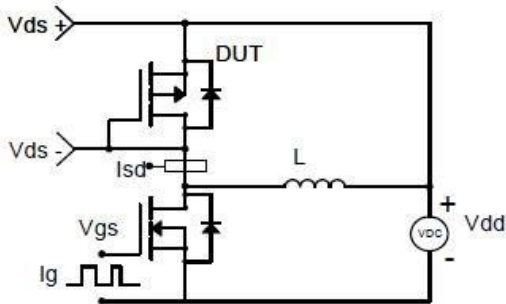
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



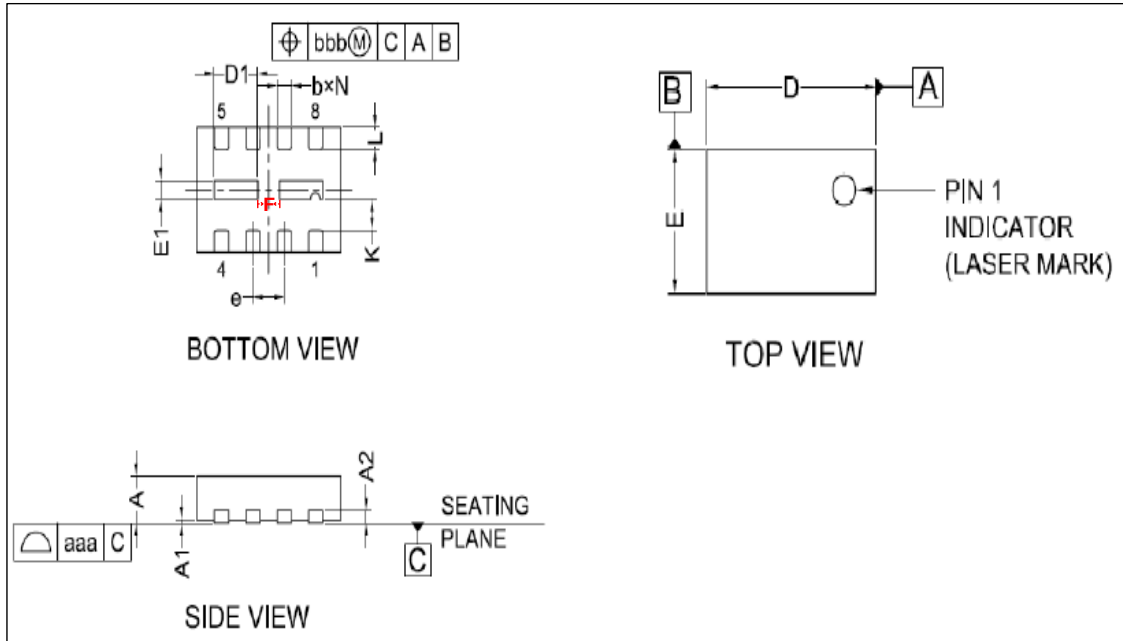
### Diode Recovery Test Circuit & Waveforms





## Package Dimension

### DFN2X3-8L







### Dimensions



Symbol	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.70	0.75	0.80	0.027	0.029	0.032
A1	0.00	0.02	0.05	0.000	0.001	0.002
A2	0.203			0.008		
b	0.25	0.30	0.35	0.009	0.012	0.014
D	2.95	3.00	3.05	0.116	0.118	0.120
D1	0.80	0.90	1.00	0.031	0.035	0.039
E	1.95	2.00	2.05	0.076	0.078	0.081
E1	0.20	0.30	0.40	0.007	0.012	0.016
F	0.25	0.45	0.65	0.009	0.017	0.026
e	0.65 (BSC)			0.026 (BSC)		
L	0.30	0.35	0.40	0.012	0.014	0.016
K	0.20 (MIN)			0.007 (MIN)		
N	8			8		
aaa	0.08			0.003		
bbb	0.10			0.004		

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