



YEA SHIN TECHNOLOGY CO., LTD

YS2116MCE

N+P-Channel Enhancement MOSFET



N-ch: VDS= 20V, ID= 3.8A / P-ch: VDS= -20V, ID= -2.5A

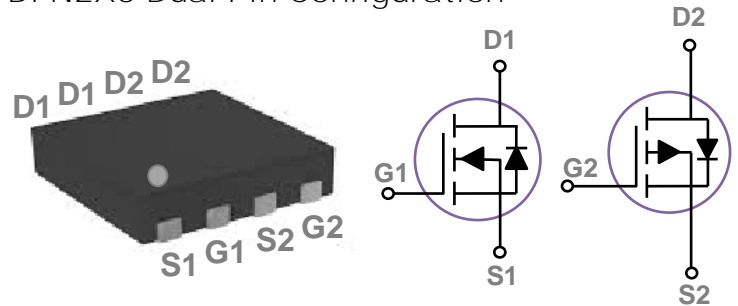
Features

- Fast switching
- Green Device Available
- Suit for 1.8V Gate Drive Applications

Applications

- Notebook
- Load Switch
- Networking
- Hand-held Instruments

DFN2X3 Dual Pin Configuration



Absolute Maximum Rating $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rating		Units
V _{DS}	Drain-Source Voltage	20	-20	V
V _{GS}	Gate-Source Voltage	±10	±10	V
I _D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	3.8	-2.5	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	2.3	-1.5	A
I _{DM}	Drain Current – Pulsed ¹	15.2	-10	A
P _D	Power Dissipation ($T_c=25^\circ\text{C}$)	1.25	1.25	W
	Power Dissipation – Derate above 25°C	0.01	0.01	W/°C
T _{STG}	Storage Temperature Range	-55 to 150	-55 to 150	°C
T _J	Operating Junction Temperature Range	-55 to 150	-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction to ambient	---	100	°C/W

DEVICE CHARACTERISTICS

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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to $25\text{ }^\circ\text{C}$, $I_D=1mA$	---	0.02	---	$V/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=20V, V_{GS}=0V, T_J=25\text{ }^\circ\text{C}$	---	---	1	μA
		$V_{DS}=16V, V_{GS}=0V, T_J=125\text{ }^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 10V, V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-source On-Resistance	$V_{GS}=4.5V, I_D=3A$	---	30	40	$m\Omega$
		$V_{GS}=2.5V, I_D=2A$	---	42	55	$m\Omega$
		$V_{GS}=1.8V, I_D=1.5A$	---	55	70	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	0.3	0.6	1	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-2	---	$mV/^\circ\text{C}$
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=2A$	---	4.4	---	S

Dynamic and Switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=10V, V_{GS}=4.5V, I_D=3A$	---	5.8	10	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	0.6	1.5	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	1.5	3	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=10V, V_{GS}=4.5V, R_G=25\Omega, I_D=1A$	---	2.9	6	ns
T_r	Rise Time ^{2,3}		---	8.4	16	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	19.2	38	
T_f	Fall Time ^{2,3}		---	5.6	12	
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1MHz$	---	315	600	pF
C_{oss}	Output Capacitance		---	50	80	
C_{rss}	Reverse Transfer Capacitance		---	40	60	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	3.8	A
I_{SM}	Pulsed Source Current		---	---	7.6	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25\text{ }^\circ\text{C}$	---	---	1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
3. Essentially independent of operating temperature.

DEVICE CHARACTERISTICS

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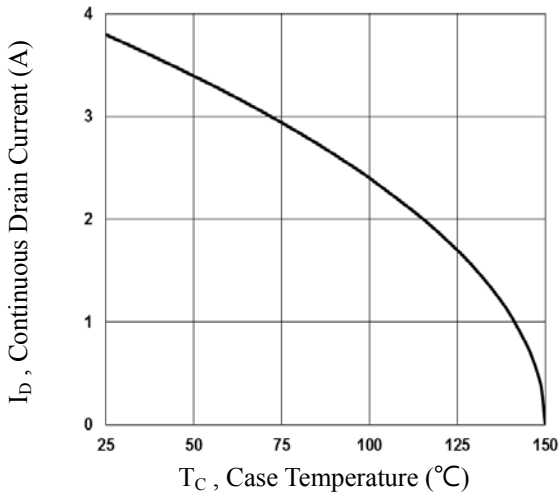


Fig.1 Continuous Drain Current vs. T_C

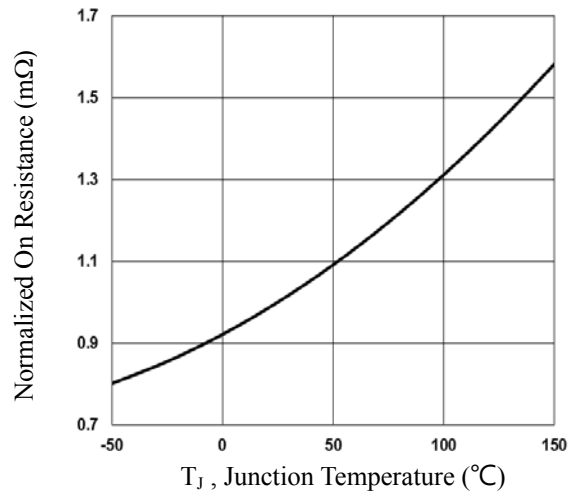


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

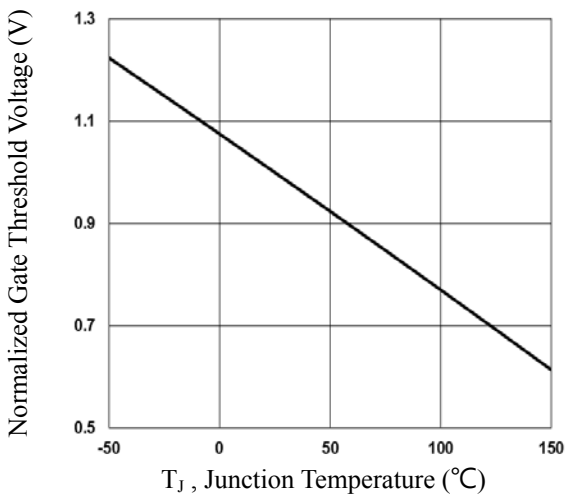


Fig.3 Normalized V_{th} vs. T_J

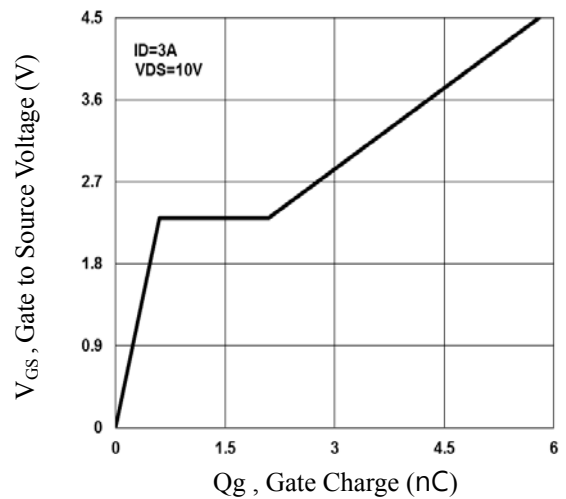


Fig.4 Gate Charge Waveform

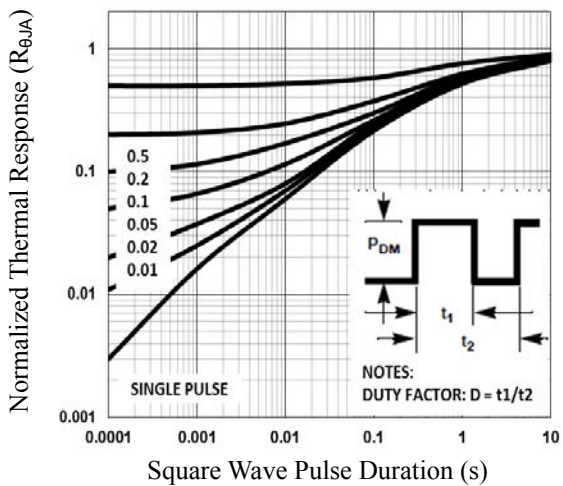


Fig.5 Normalized Transient Impedance

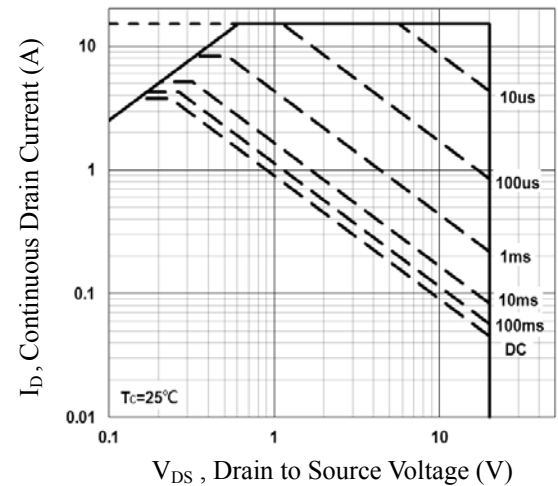


Fig.6 Maximum Safe Operation Area

DEVICE CHARACTERISTICS

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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.01	---	$V/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-20V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-16V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	-10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 10V, V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-source On-Resistance	$V_{GS}=-4.5V, I_D=-3A$	---	65	90	$m\Omega$
		$V_{GS}=-2.5V, I_D=-2A$	---	85	130	$m\Omega$
		$V_{GS}=-1.8V, I_D=-1A$	---	120	180	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-0.3	-0.6	-1	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3	---	$mV/^\circ\text{C}$
g_{fs}	Forward Transconductance	$V_{DS}=-10V, I_S=-1A$	---	2.2	---	S

Dynamic and Switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=-10V, V_{GS}=-4.5V, I_D=-2A$	---	4.8	10	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	0.5	1	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	1.9	4	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=-10V, V_{GS}=-4.5V, R_G=25\Omega, I_D=-1A$	---	3.5	7	ns
T_r	Rise Time ^{2,3}		---	12.6	24	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	32.6	62	
T_f	Fall Time ^{2,3}		---	8.4	16	
C_{iss}	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	---	350	510	pF
C_{oss}	Output Capacitance		---	65	95	
C_{rss}	Reverse Transfer Capacitance		---	50	75	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	-2.5	A
I_{SM}	Pulsed Source Current		---	---	-5	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
3. Essentially independent of operating temperature.

DEVICE CHARACTERISTICS

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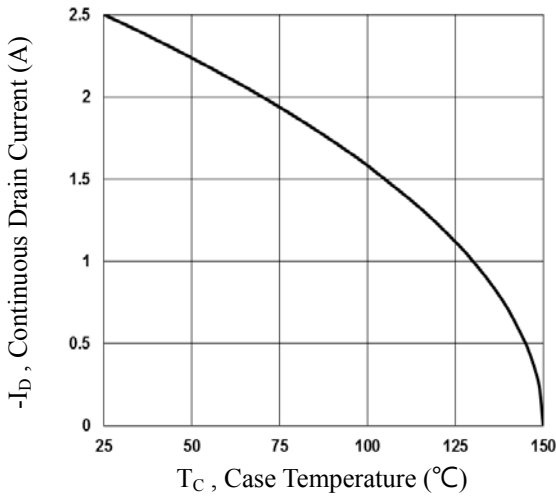


Fig.7 Continuous Drain Current vs. T_c

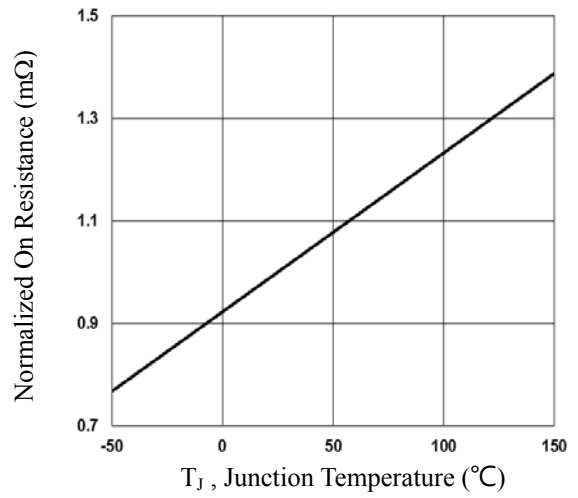


Fig.8 Normalized $R_{DS(on)}$ vs. T_j

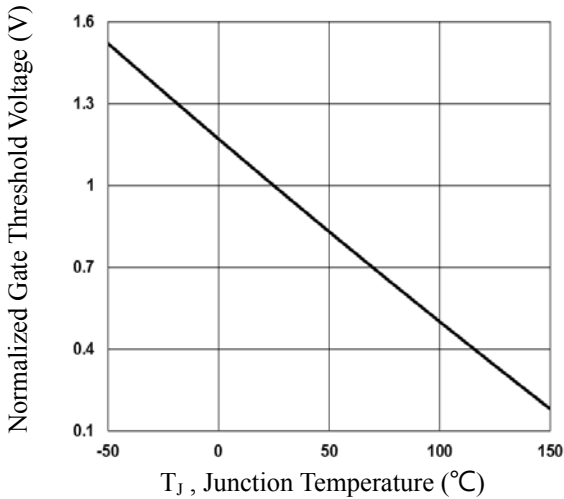


Fig.9 Normalized V_{th} vs. T_j

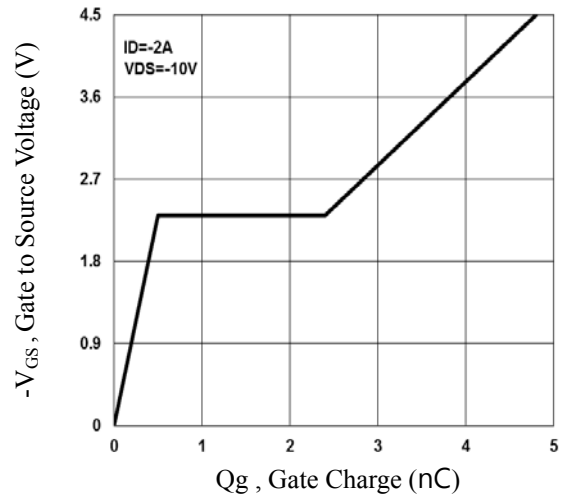


Fig.10 Gate Charge Waveform

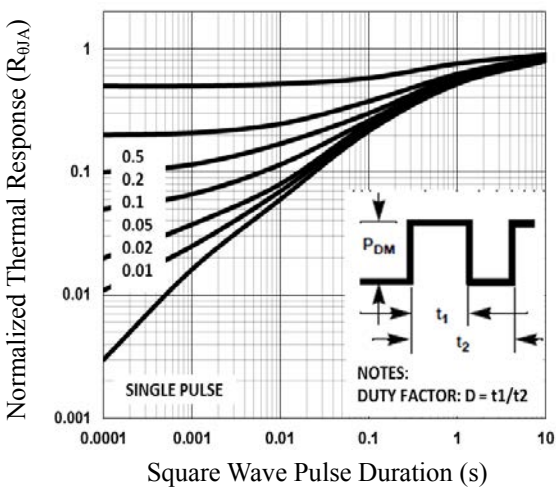


Fig.11 Normalized Transient Impedance

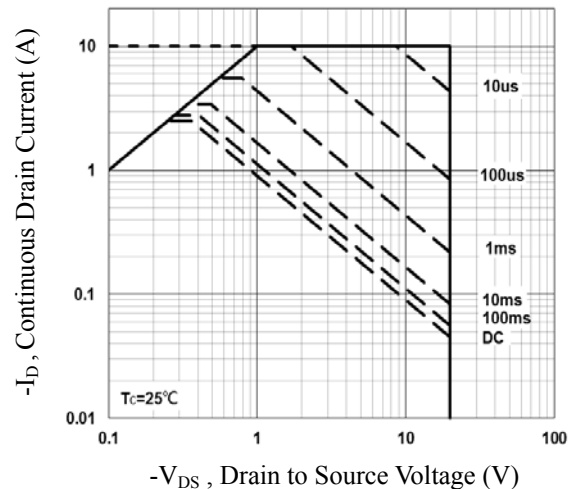
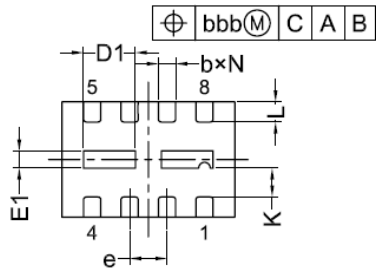


Fig.12 Maximum Safe Operation Area

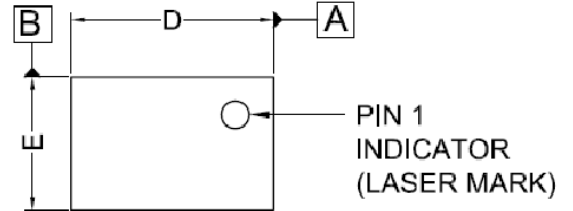
PACKAGE OUTLINE & DIMENSIONS

YS2116MCE

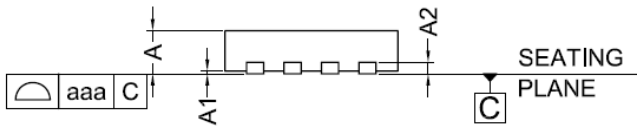
DFN2X3 Dual PACKAGE INFORMATION



BOTTOM VIEW



TOP VIEW



SIDE VIEW

SYMBOL	MIN	TYP	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.203		
b	0.25	0.30	0.35
D	2.95	3.00	3.05
D1	0.80	0.90	1.00
E	195	2.00	2.05
E1	0.20	0.30	0.40
e	0.65BSC		
L	0.30	0.35	0.40
K	0.20MIN		
N	8		
aaa	0.08		
bbb	0.10		