

## Dual N-Channel Fast Switching MOSFET

### General Description

The QM3816N6 is the highest performance trench Dual N-channel MOSFET with extreme high cell density, which provide excellent RDS(on) and gate charge for most of the synchronous buck converter applications.

The QM3816N6 meet the RoHS and Green Product requirement with full function reliability approved.

### Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Green Device Available

### Product Summary

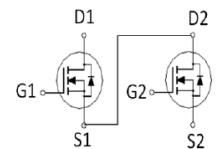
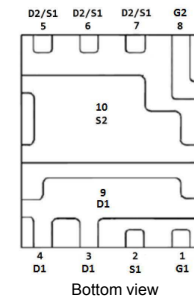


	BVDSS	RDS(on) (VGS=10V)	ID (Tc=25°C)
Die1	30V	7.3mΩ	51A
Die2	30V	1.9mΩ	117A

### Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- CCFL Back-light Inverter

### DFN 5X6 Pin Configuration



### Absolute Maximum Ratings(T<sub>J</sub>=25 °C, unless otherwise noted)

Symbol	Parameter	Rating		Units
		Die1	Die2	
V <sub>DS</sub>	Drain-Source Voltage	30	30	V
V <sub>GS</sub>	Gate-Source Voltage	±20	±20	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	51	117	A
I <sub>D</sub> @T <sub>C</sub> =100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	32	74	A
I <sub>D</sub> @T <sub>A</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	13	28	A
I <sub>D</sub> @T <sub>A</sub> =70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	10	22	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	102	234	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	59.5	519.2	mJ
I <sub>AS</sub>	Avalanche Current	34.5	101.9	A
P <sub>D</sub> @T <sub>C</sub> =25°C	Total Power Dissipation <sup>4</sup>	31	40	W
P <sub>D</sub> @T <sub>A</sub> =25°C	Total Power Dissipation <sup>4</sup>	2	2	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	-55 to 150	°C

### Thermal Data

Symbol	Parameter	Die 1	Die 2	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sup>1</sup>	62	56	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	4	3.1	°C/W

**Die1 N-Channel Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	30	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BVDSS Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.03	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	---	5.8	7.3	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	---	9.0	11.7	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	1.2	---	2.5	V
ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-5.5	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V	---	---	1	μA
		V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =30A	---	31	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	1.2	---	Ω
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	18.3	---	nC
Q <sub>g</sub>	Total Gate Charge (4.5V)	V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	---	9.1	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	3.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	3.6	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω I <sub>D</sub> =15A	---	7.7	---	ns
T <sub>r</sub>	Rise Time		---	37.7	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	22.4	---	
T <sub>f</sub>	Fall Time		---	9.8	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	---	1022	---	pF
C <sub>oss</sub>	Output Capacitance		---	160	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	106	---	

**Guaranteed Avalanche Characteristics(T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy <sup>5</sup>	V <sub>DD</sub> =25V, L=0.1mH, I <sub>AS</sub> =24A	28.8	---	---	mJ

**Diode Characteristics(T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	51	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	---	102	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A	---	---	1.2	V

Note :

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH.
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

**Die2 N-Channel Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	30	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BVDSS Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.03	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	---	1.5	1.9	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	---	2.2	2.9	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.2	---	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	6.0	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V	---	---	1	uA
		V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =30A	---	115	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	0.7	---	Ω
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	80.7	---	nC
Q <sub>g</sub>	Total Gate Charge (4.5V)	V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	---	40.7	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	14.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	16.2	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω I <sub>D</sub> =15A	---	19.1	---	ns
T <sub>r</sub>	Rise Time		---	51.6	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	68.6	---	
T <sub>f</sub>	Fall Time		---	22.5	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	---	4982	---	pF
C <sub>oss</sub>	Output Capacitance		---	763	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	468	---	

**Guaranteed Avalanche Characteristics(T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy <sup>5</sup>	V <sub>DD</sub> =25V, L=0.1mH, I <sub>AS</sub> =72A	259.2	---	---	mJ

**Diode Characteristics(T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	117	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	---	234	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A	---	---	1.2	V

Note :

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=50V, V<sub>GS</sub>=10V, L=0.1mH.
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

### Die 1 Typical Characteristics

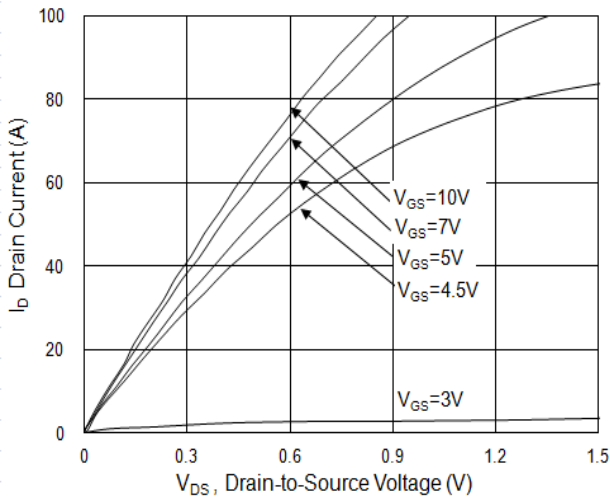


Fig.1 Typical Output Characteristics

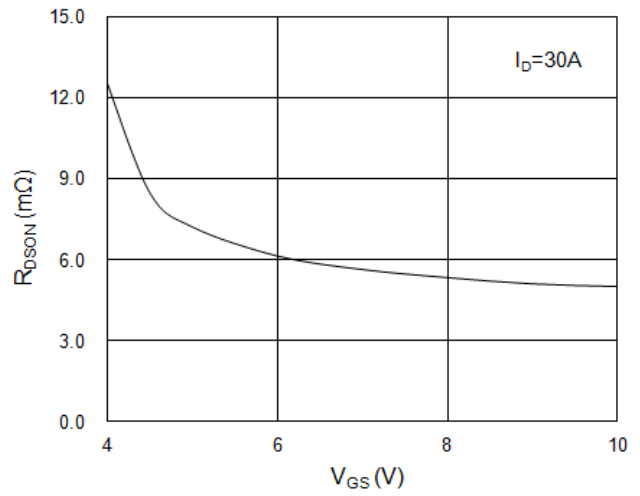


Fig.2 On-Resistance vs. Gate-Source

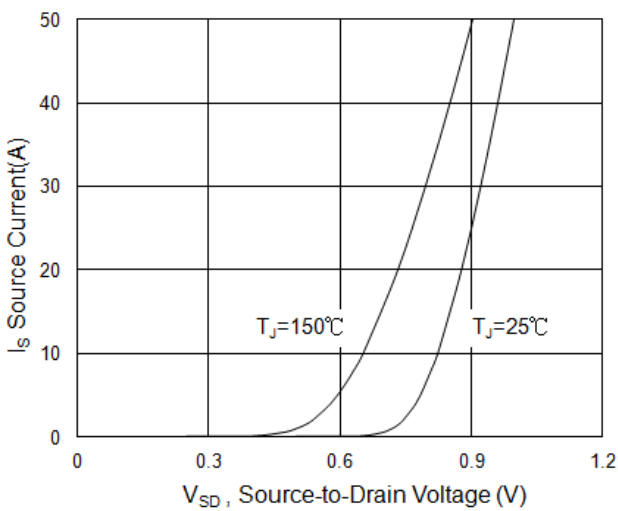


Fig.3 Forward Characteristics of Reverse

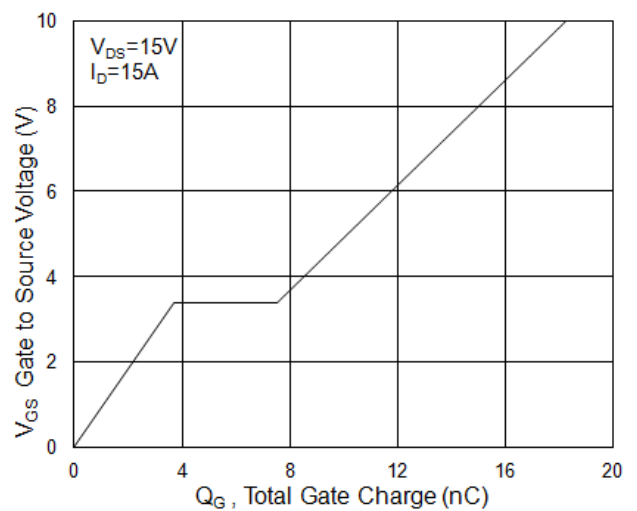


Fig.4 Gate-Charge Characteristics

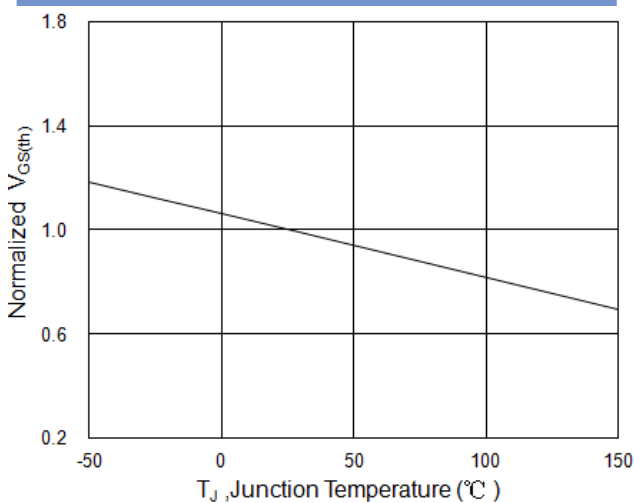


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

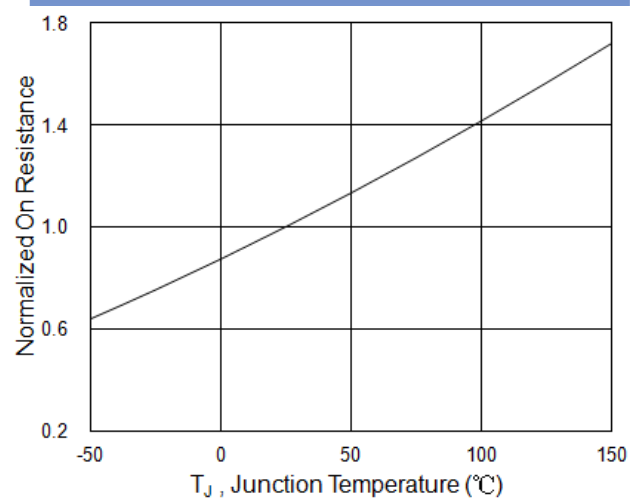


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

## Dual N-Channel Fast Switching MOSFET

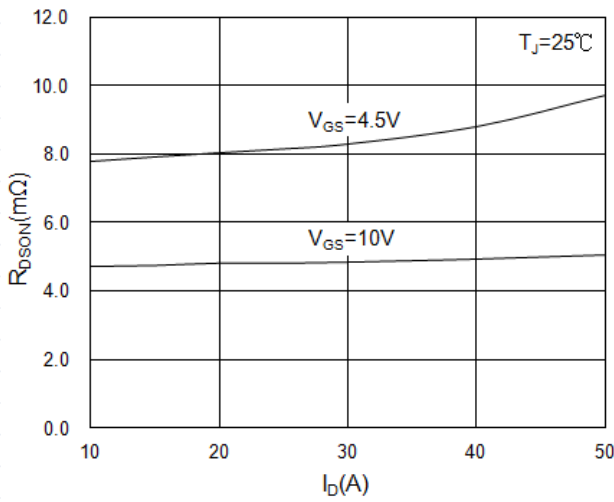


Fig.7 Drain-Source On-State Resistance

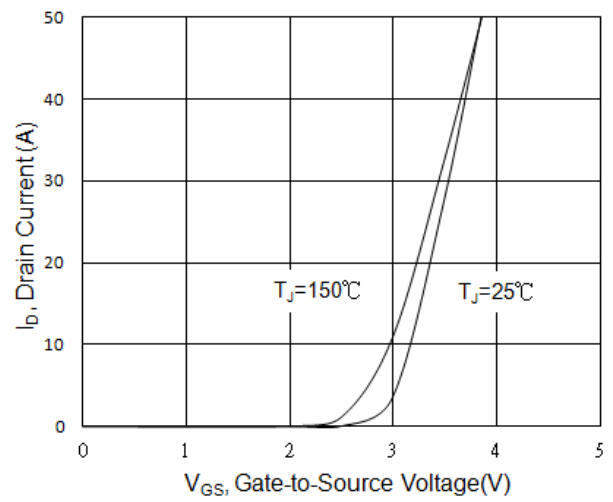


Fig.8 Transfer Characteristics

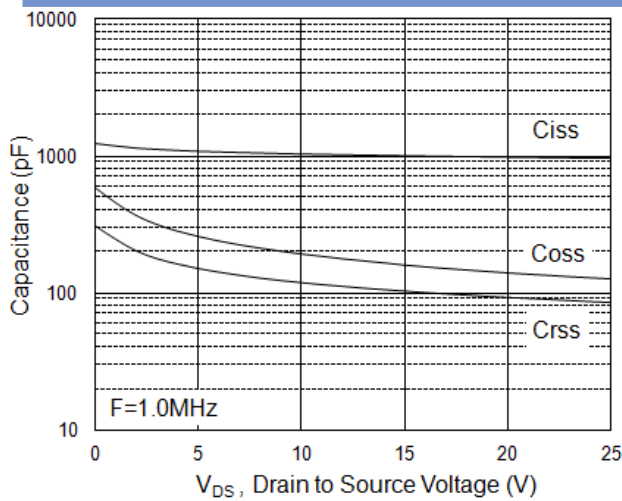


Fig.9 Capacitance

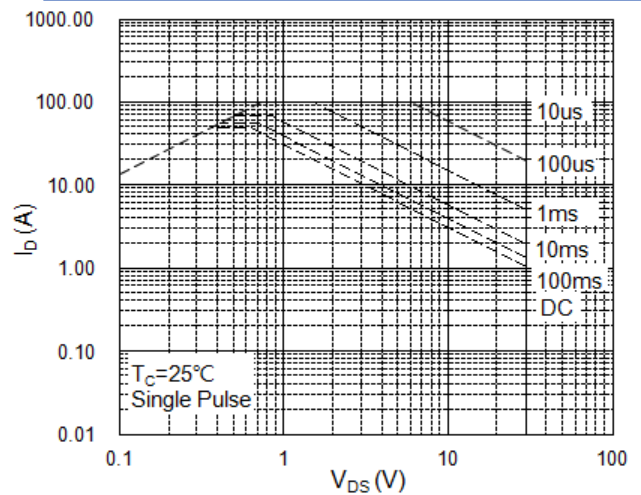


Fig.10 Safe Operating Area

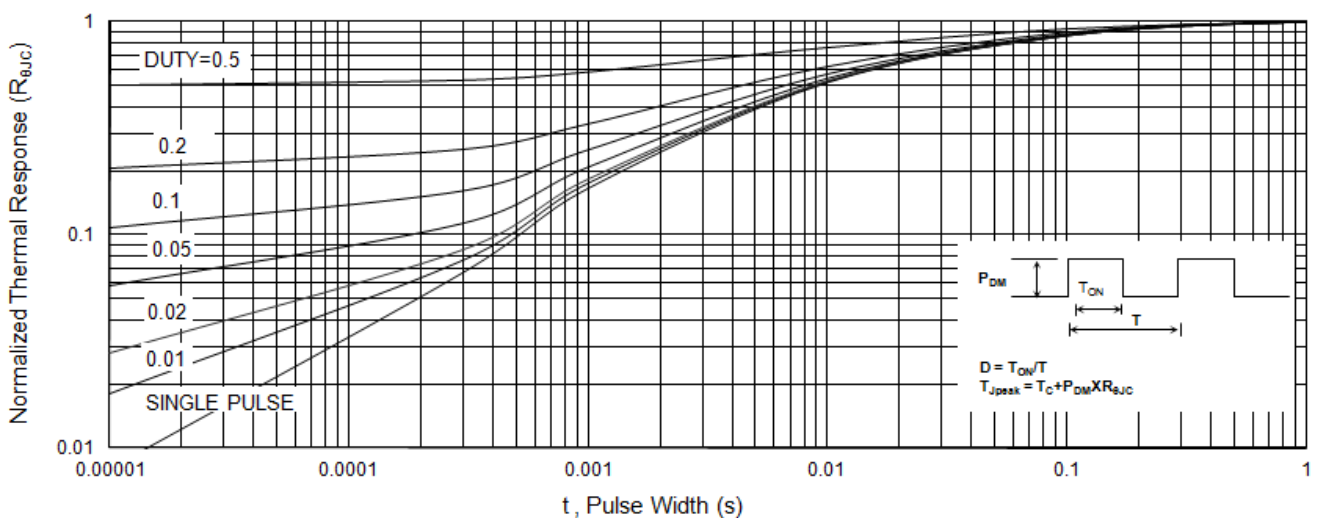


Fig.11 Normalized Maximum Transient Thermal Impedance

### Die 2 Typical Characteristics

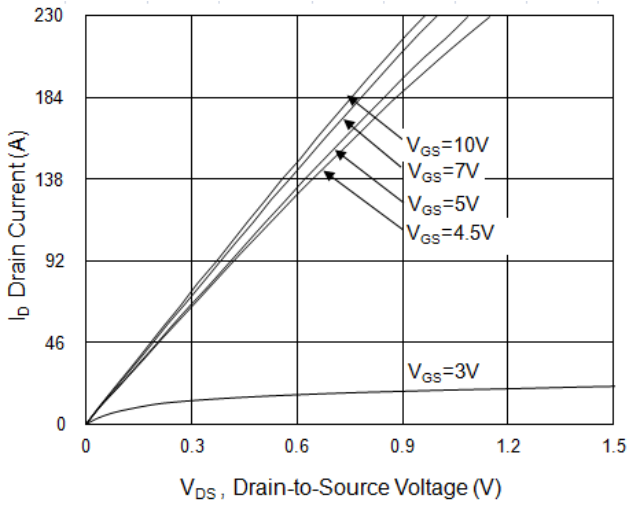


Fig.1 Typical Output Characteristics

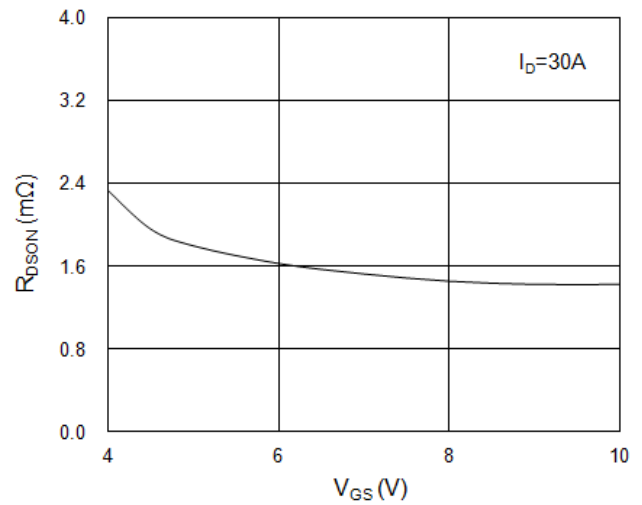


Fig.2 On-Resistance vs. Gate-Source

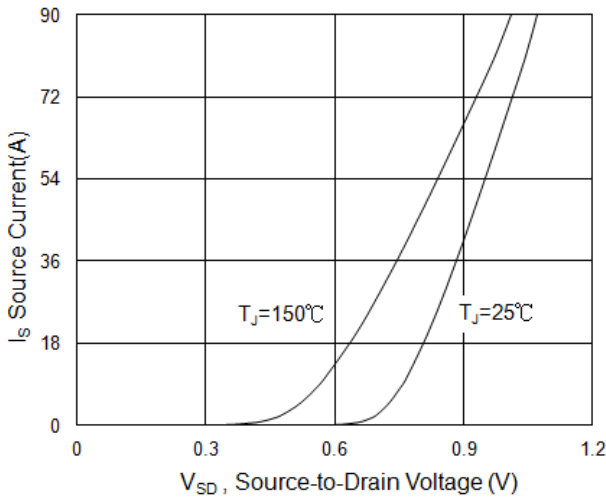


Fig.3 Forward Characteristics of Reverse

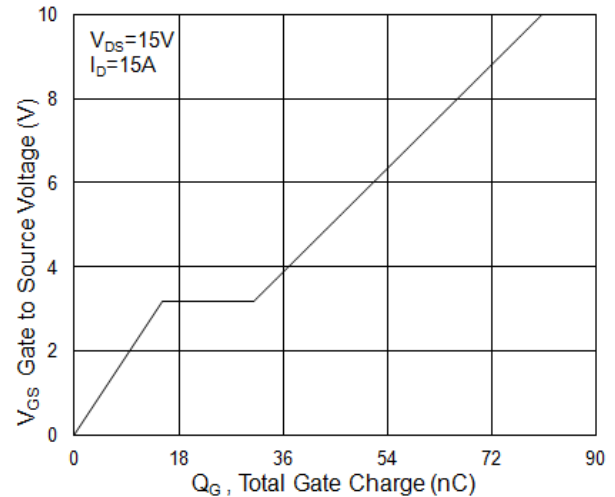


Fig.4 Gate-Charge Characteristics

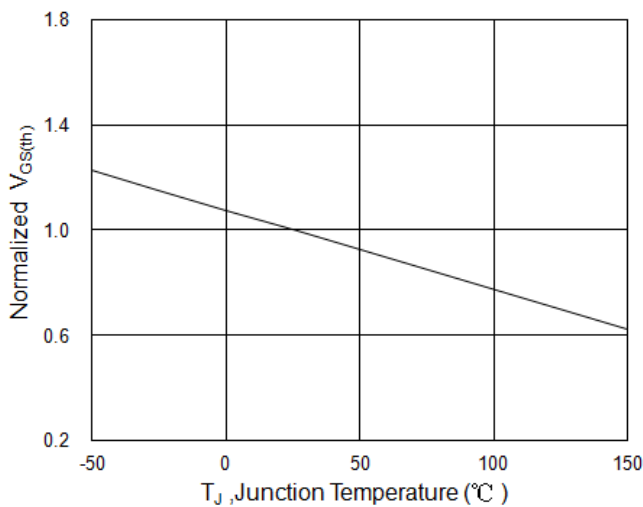


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

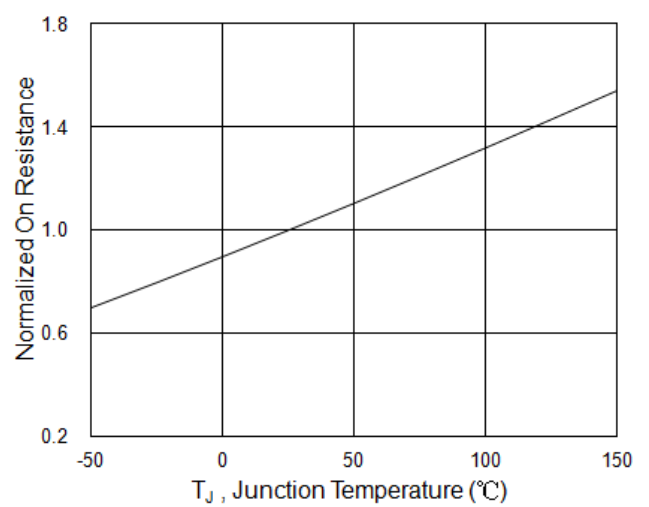


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

## Dual N-Channel Fast Switching MOSFET

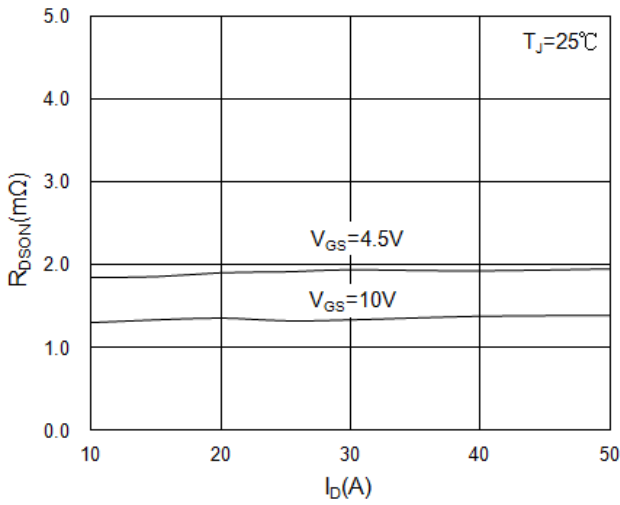


Fig.7 Drain-Source On-State Resistance

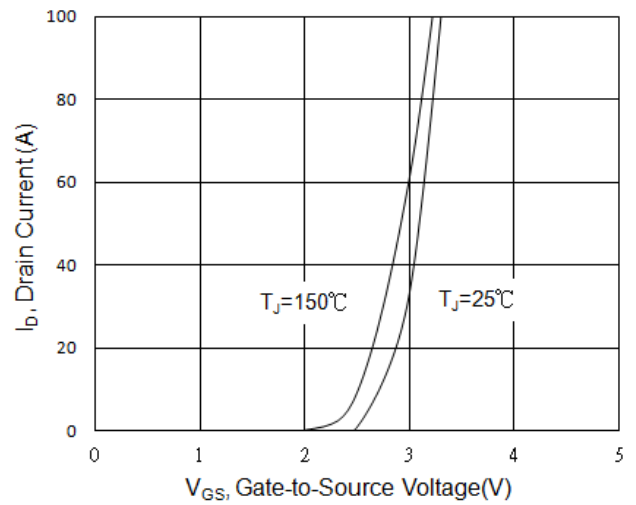


Fig.8 Transfer Characteristics

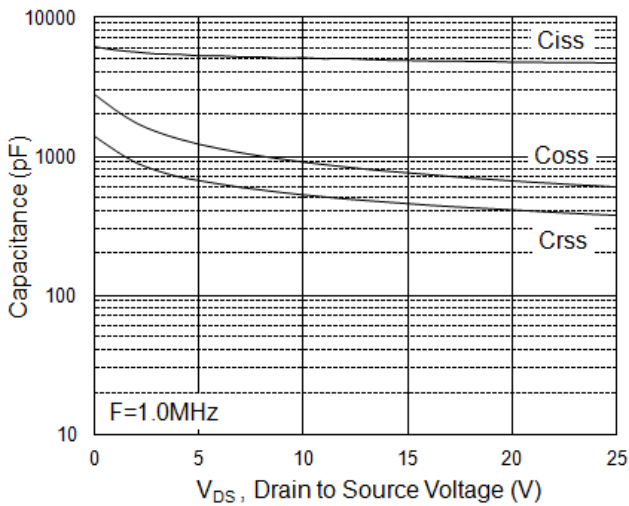


Fig.9 Capacitance

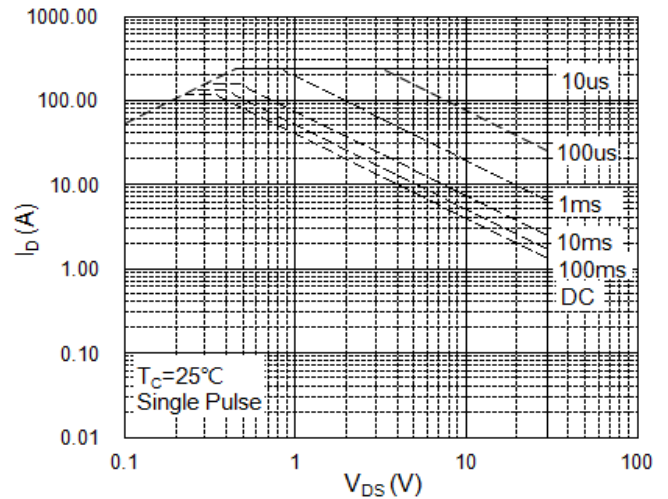


Fig.10 Safe Operating Area

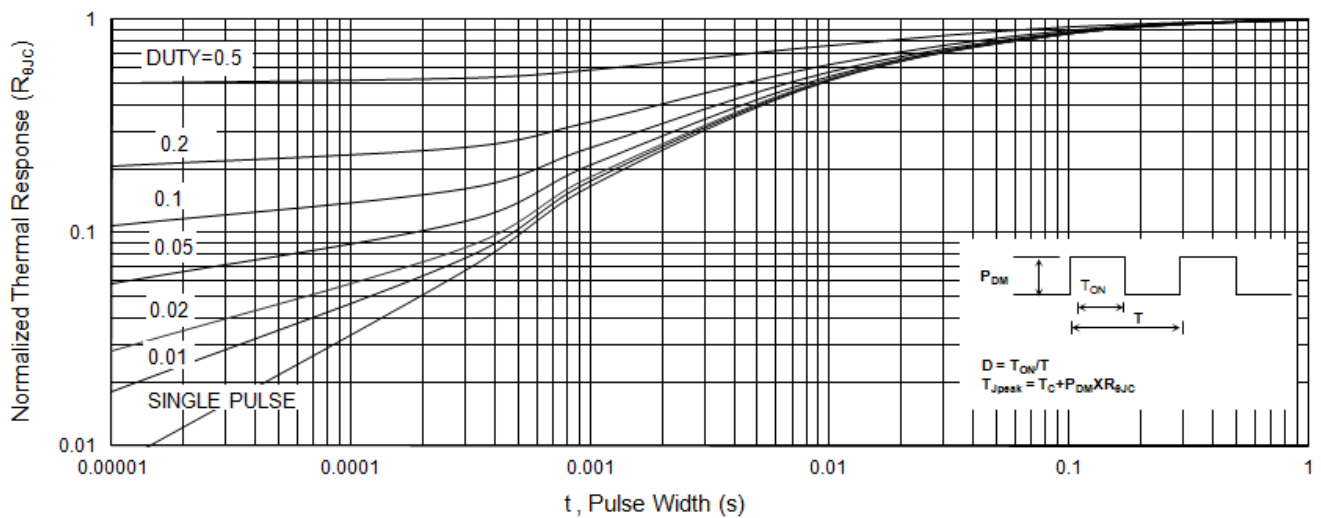
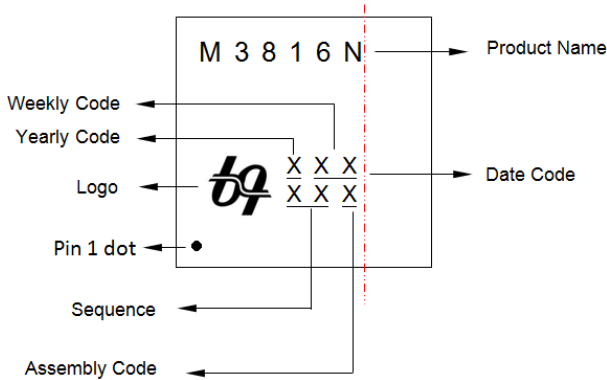
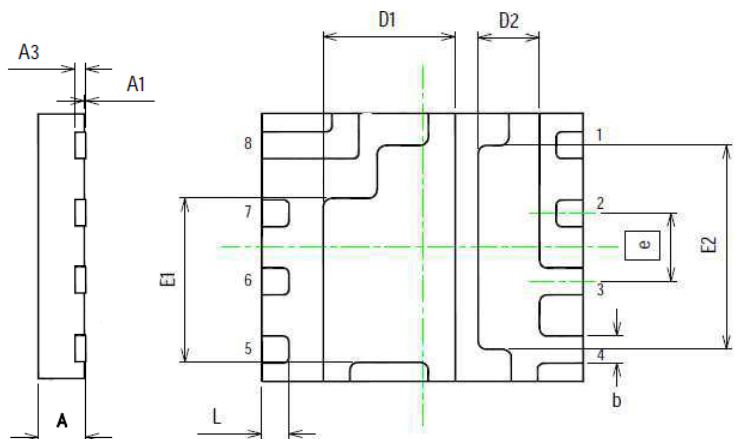
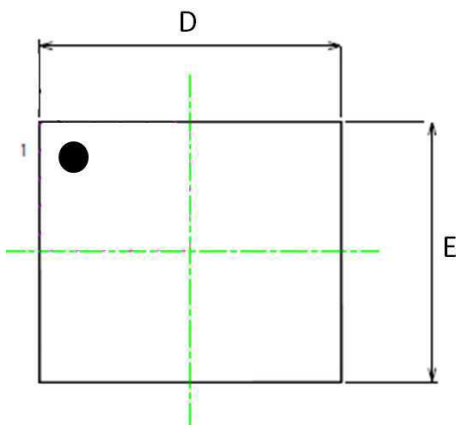


Fig.11 Normalized Maximum Transient Thermal Impedance

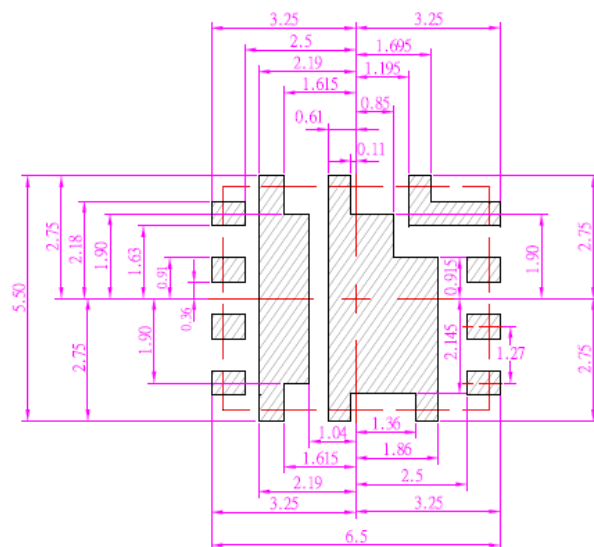
### Top Marking



### DFN 5X6 Package Outline Drawing



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0.00	0.02	0.05
A3	--	0.203	--
b	0.40	0.50	0.60
D	--	6.00	--
E	--	5.00	--
e	--	1.27	--
D1	2.37	2.47	2.57
E1	2.96	3.06	3.16
D2	1.05	1.15	1.25
E2	3.70	3.80	3.90
L	0.40	0.50	0.60



LAND PATTERN RECOMMENDATION (Unit :mm)

Note:  
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.