

## Description

The VSM18N03 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

## General Features

### ● N-Channel

$$V_{DS} = 30V, I_D = 18A$$

$$R_{DS(ON)} < 41m\Omega @ V_{GS}=10V$$

$$R_{DS(ON)} < 54m\Omega @ V_{GS}=4.5V$$

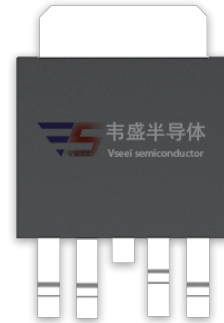
### ● P-Channel

$$V_{DS} = -30V, I_D = -12A$$

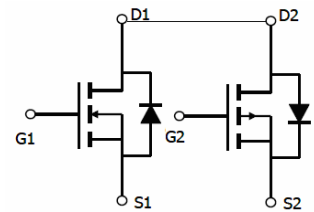
$$R_{DS(ON)} < 58m\Omega @ V_{GS}=-10V$$

$$R_{DS(ON)} < 85m\Omega @ V_{GS}=-4.5V$$

- High power and current handling capability
- Lead free product is acquired
- Surface mount package



TO-252-4L



Schematic Diagram

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM18N03-T2-4	VSM18N03	TO-252-4L	-	-	-

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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		$V_{DS}$	30	-30	V
Gate-Source Voltage		$V_{GS}$	$\pm 12$	$\pm 12$	V
Continuous Drain Current	$T_A=25^\circ\text{C}$	$I_D$	18	-12	A
	$T_A=70^\circ\text{C}$		14.4	-8.5	
Pulsed Drain Current <sup>(Note 1)</sup>		$I_{DM}$	72	-48	A
Maximum Power Dissipation	$T_A=25^\circ\text{C}$	$P_D$	25	25	W
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 To 150	-55 To 150	$^\circ\text{C}$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note2)</sup>	$R_{\theta JC}$	N-Ch	5	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case <sup>(Note2)</sup>	$R_{\theta JC}$	P-Ch	5	$^\circ\text{C/W}$

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	30	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.5	2.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =10A	-	36	41	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A	-	45	54	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =10A		10	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1.0MHz	-	519.9	-	PF
Output Capacitance	C <sub>oss</sub>		-	55.5	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	49.3	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =15V, R <sub>L</sub> =1.5Ω V <sub>GS</sub> =10V, R <sub>GEN</sub> =3Ω	-	5	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	3	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	15	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	3	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =10A, V <sub>GS</sub> =10V	-	14.7	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	2.5	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	3.0	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =10A	-	0.8	1.2	V

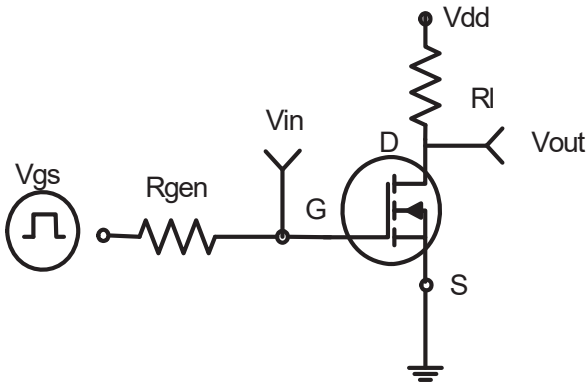
**P-CH Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =-250μA	-30	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V	-	-	-1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	-1.0	-1.5	-2.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-12A	-	50	58	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A	-	71	85	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V, I <sub>D</sub> =-12A	-	10	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, F=1.0MHz	-	464.7	-	PF
Output Capacitance	C <sub>OSS</sub>		-	70.4	-	PF
Reverse Transfer Capacitance	C <sub>rSS</sub>		-	53.8	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-15V, R <sub>L</sub> =1.25Ω V <sub>GS</sub> =-10V, R <sub>GEN</sub> =6Ω	-	5	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	3	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	15	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	4	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-15V, I <sub>D</sub> =-12A V <sub>GS</sub> =-10V	-	12.6	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	2.1	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	3.0	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-12A	-	-	-1.2	V

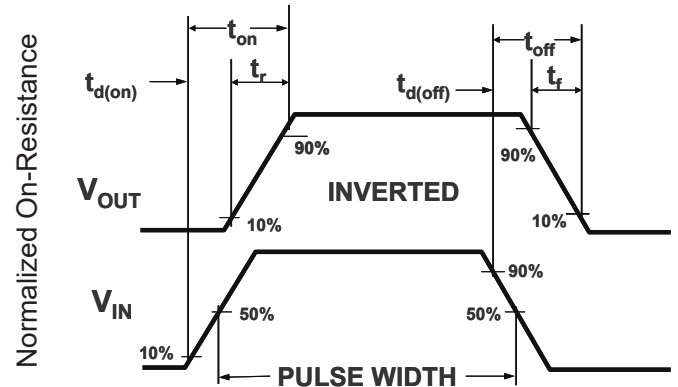
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

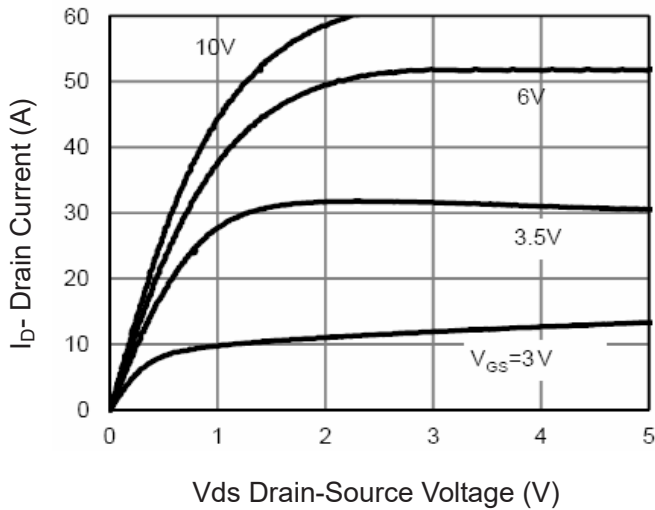
## N- Channel Typical Electrical and Thermal Characteristics (Curves)



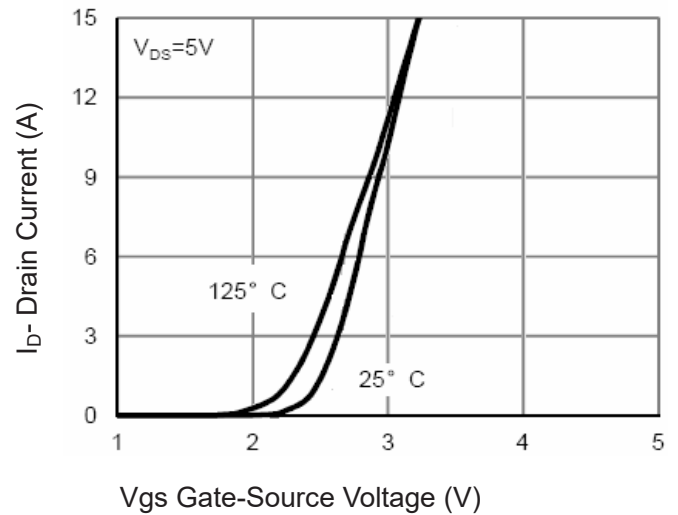
**Figure 1: Switching Test Circuit**



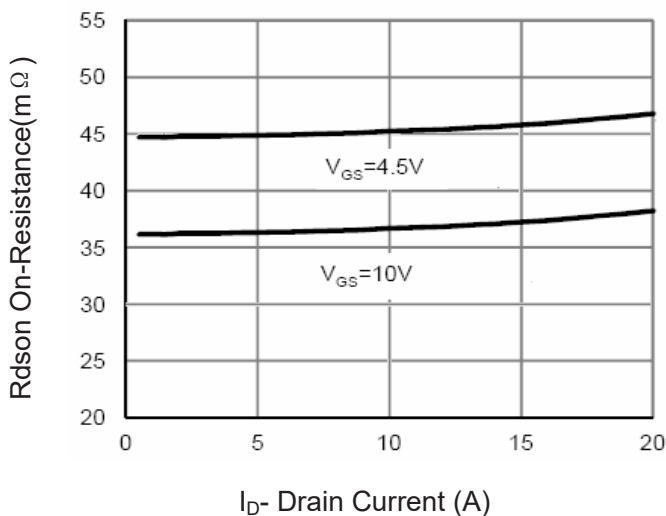
**Figure 2: Switching Waveforms**



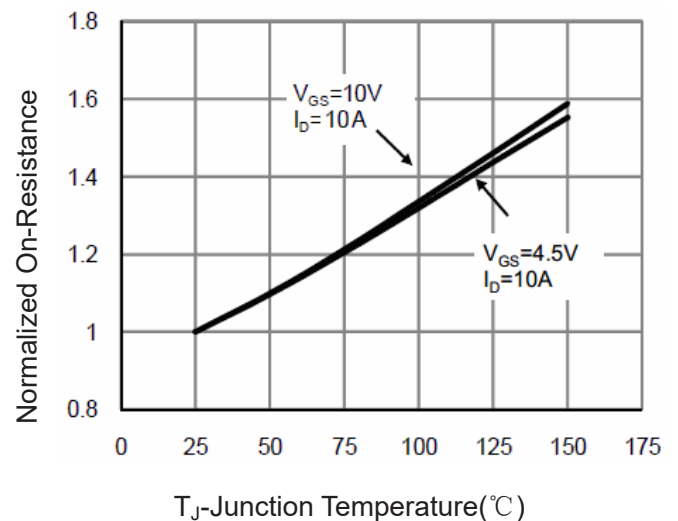
**Figure 3 Output Characteristics**



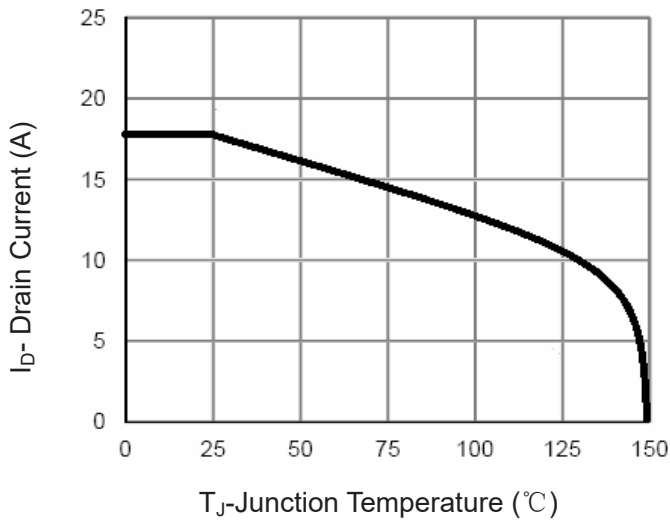
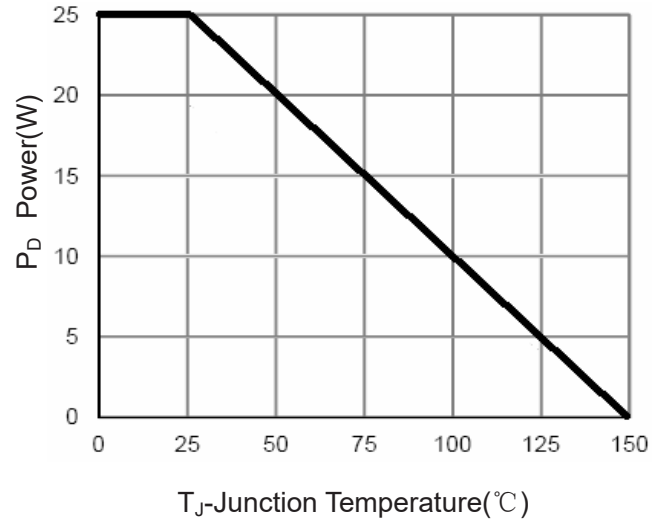
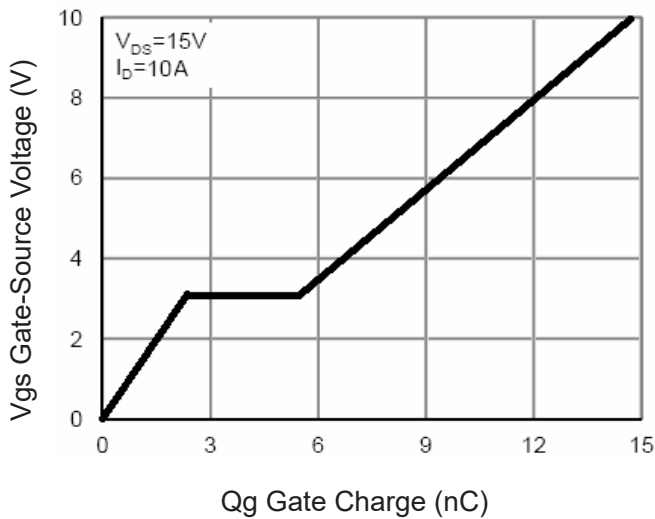
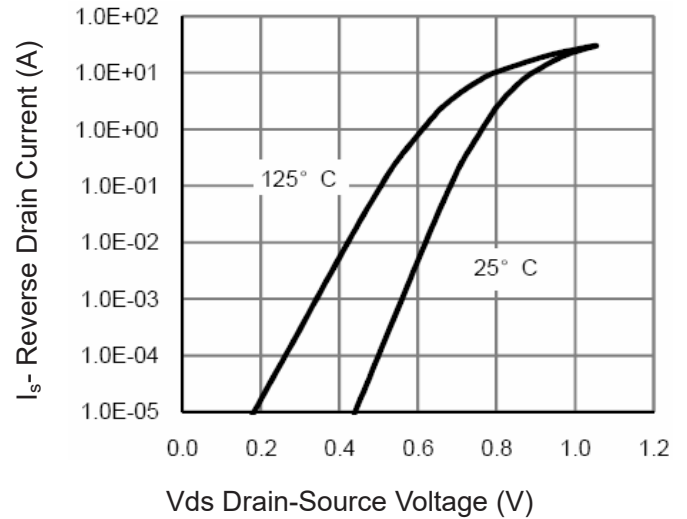
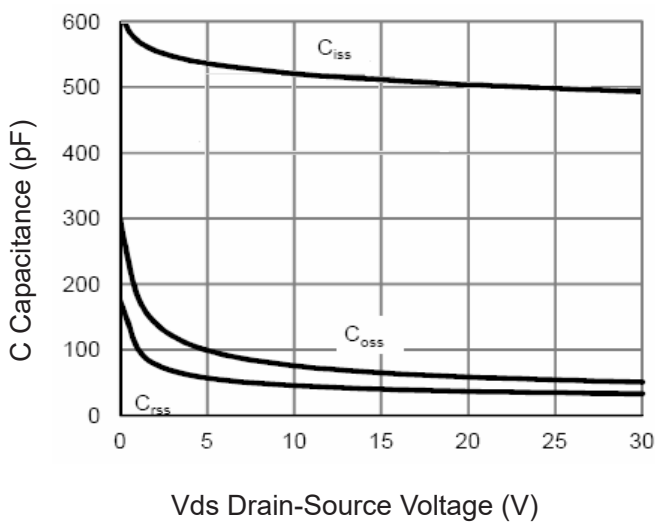
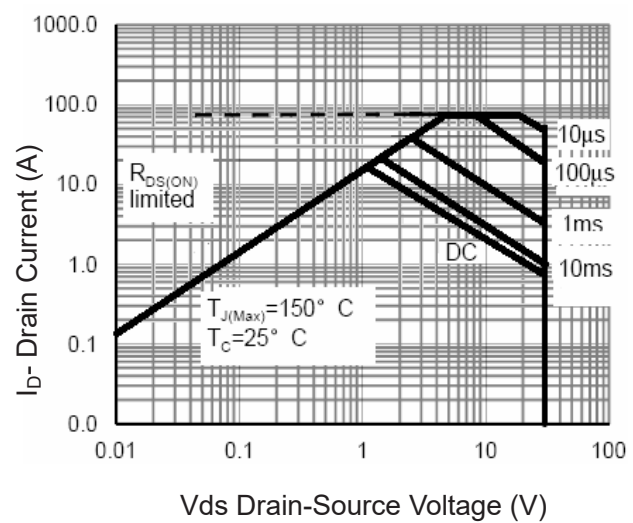
**Figure 4 Transfer Characteristics**

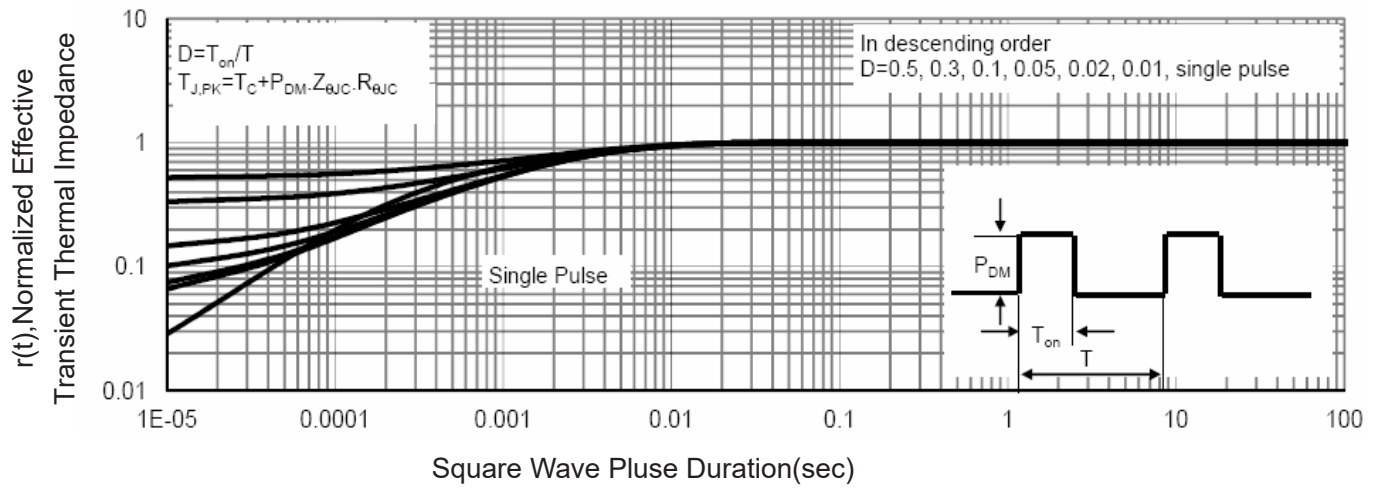


**Figure 5 Drain-Source On-Resistance**



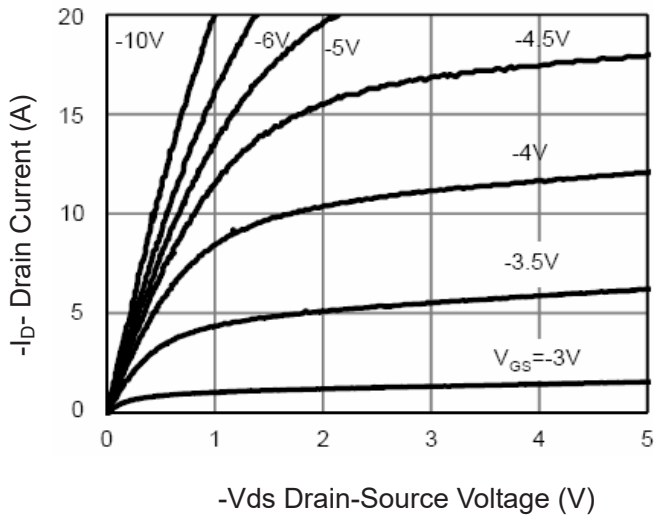
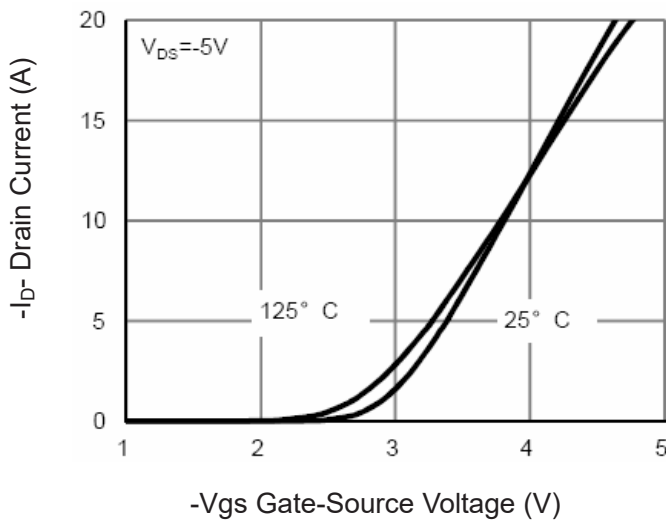
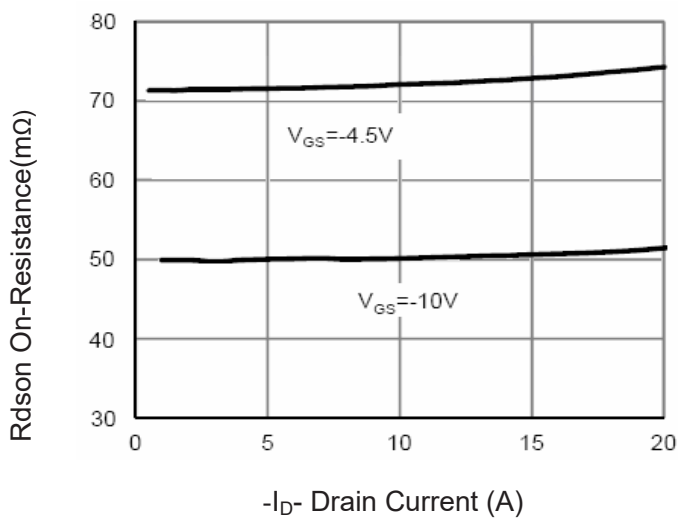
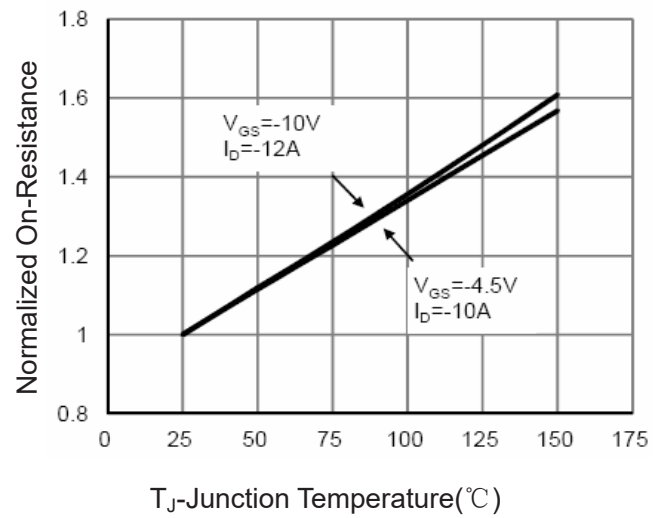
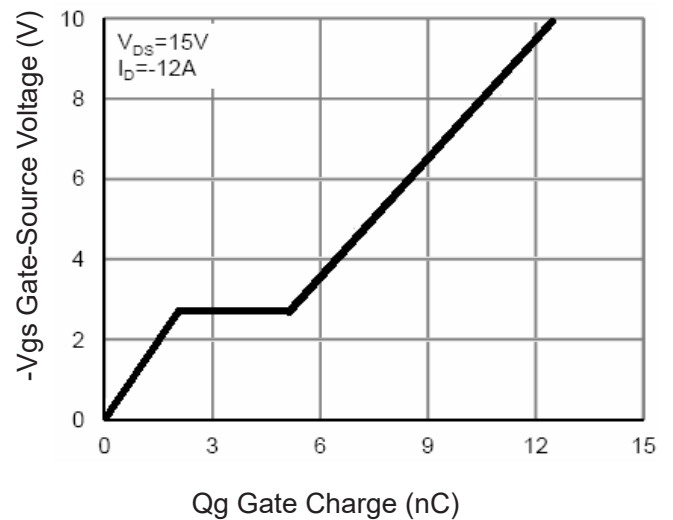
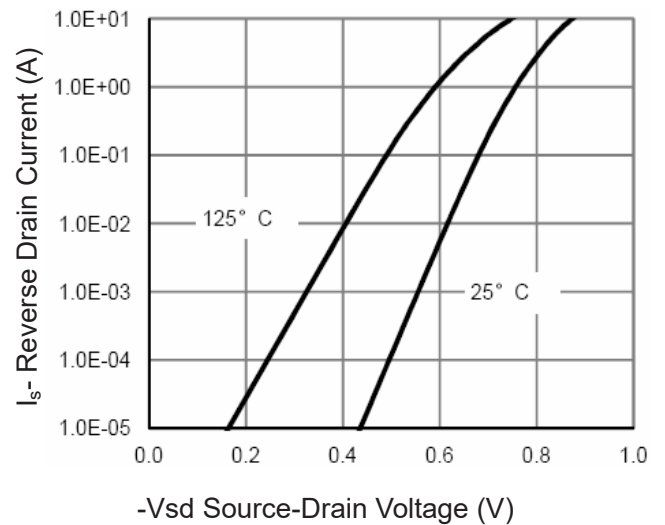
**Figure 6 Drain-Source On-Resistance**

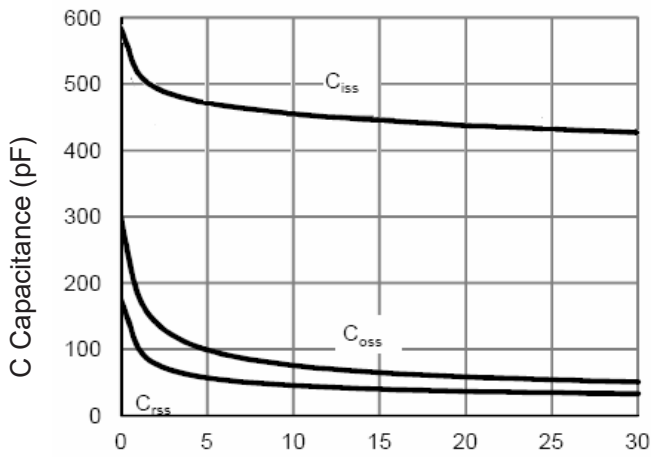

**Figure7 Current De-rating**

**Figure 8 Power Dissipation**

**Figure 9 Gate Charge**

**Figure 10 Source- Drain Diode Forward**

**Figure 11 Capacitance vs Vds**

**Figure 12 Safe Operation Area**



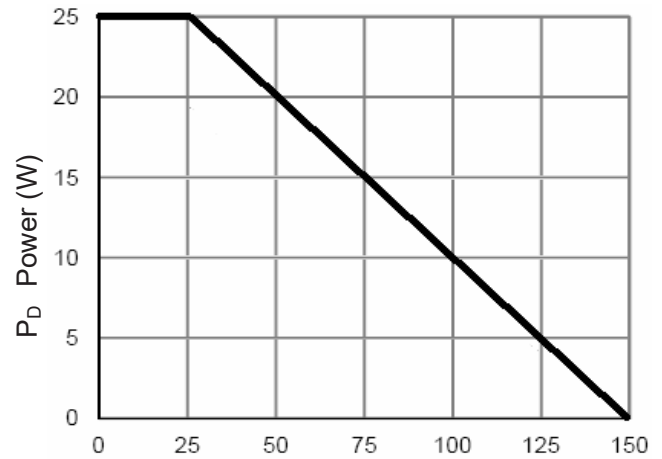
**Figure 13 Normalized Maximum Transient Thermal Impedance**

## P- Channel Typical Electrical and Thermal Characteristics (Curves)

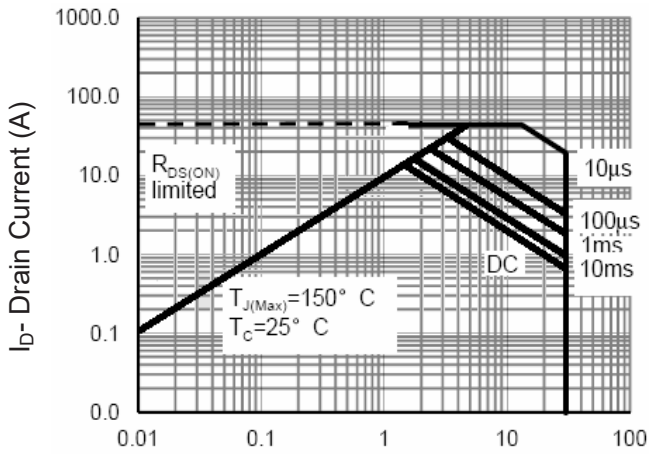

**Figure 1 Output Characteristics**

**Figure 2 Transfer Characteristics**

**Figure 3 Rdson- Drain Current**

**Figure 4 Rdson-Junction Temperature**

**Figure 5 Gate Charge**

**Figure 6 Source- Drain Diode Forward**



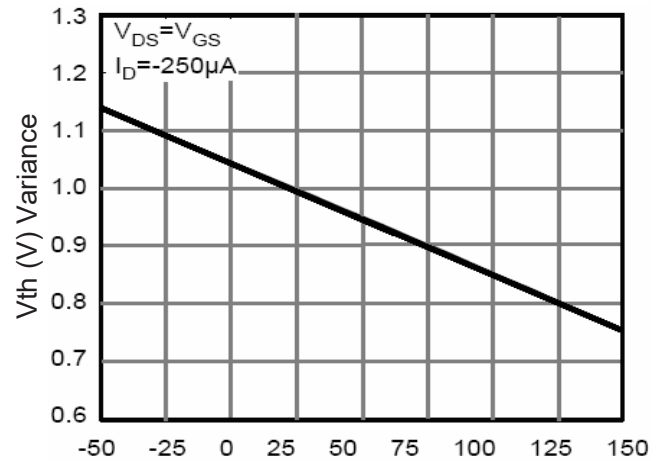
-Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



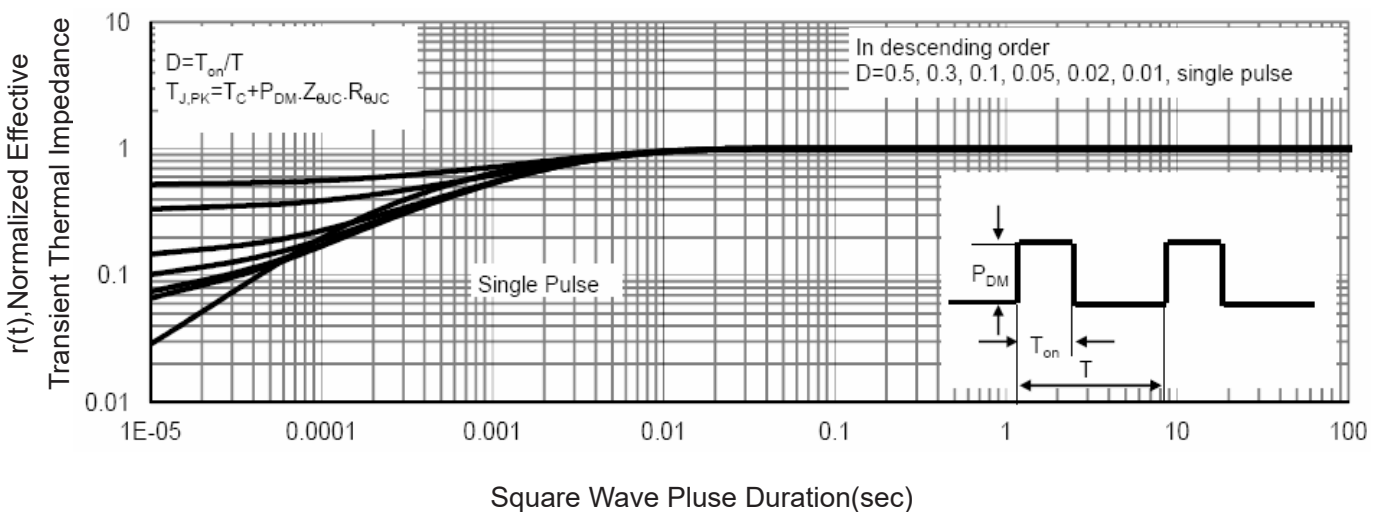
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 9 Power Dissipation**



-Vds Drain-Source Voltage (V)  
**Figure 8 Safe Operation Area**



T<sub>J</sub>-Junction Temperature(°C)  
**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**