

Description

The VSM18NP03 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use in inverter and other applications.

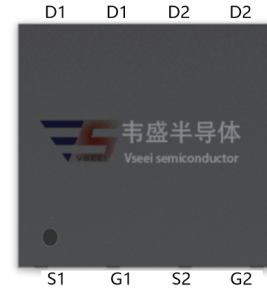
General Features

N-channel

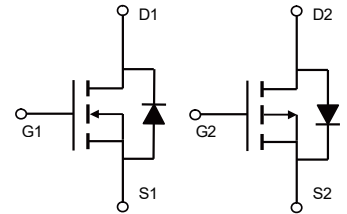
- $V_{DS} = 30V, I_D = 18A$
- $R_{DS(ON)} < 24m\Omega @ V_{GS}=10V$
- $R_{DS(ON)} < 37m\Omega @ V_{GS}=4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface mount package

P-channel

- $V_{DS} = -30V, I_D = -12A$
- $R_{DS(ON)} < 35m\Omega @ V_{GS}=-10V$
- $R_{DS(ON)} < 75m\Omega @ V_{GS}=-4.5V$



DFN3x3



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM18NP03	VSM18NP03-D33	DFN3x3	-	-	-

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

Parameter	Symbol	N-channel	P-channel	Unit
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Drain Current-Continuous (Note 2)	I_D	18	-12	A
		13.7	-9.4	A
Drain Current - Pulsed (Note 1)	I_{DM}	72	-48	A
Power Dissipation	P_D	17	15	W
		11.1	9.6	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 (Note 2) (N-channel)	$R_{\theta JC}$	7.4	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case (Note 2) (P-channel)	$R_{\theta JC}$	8.3	$^\circ\text{C/W}$

N-channel Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30	33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.6	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=9A$	-	19	24	mΩ
		$V_{GS}=4.5V, I_D=9A$	-	26	37	mΩ
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=9A$	15	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	547	-	PF
Output Capacitance	C_{oss}		-	65.6	-	PF
Reverse Transfer Capacitance	C_{rss}		-	58.8	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, I_D=9A$ $V_{GS}=10V, R_{GEN}=6\Omega$	-	4.5	-	nS
Turn-on Rise Time	t_r		-	2.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	14.5	-	nS
Turn-Off Fall Time	t_f		-	3.5	-	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=9A,$ $V_{GS}=10V$	-	15	-	nC
Gate-Source Charge	Q_{gs}		-	3.2	-	nC
Gate-Drain Charge	Q_{gd}		-	2.9	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=9A$	-	0.8	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	18	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ C$. The value in any given application depends on the user's specific board design. Surface Mounted on FR4 Board, $t \leq 10$ sec. The current rating is based on the $t \leq 10s$ thermal resistance rating.
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

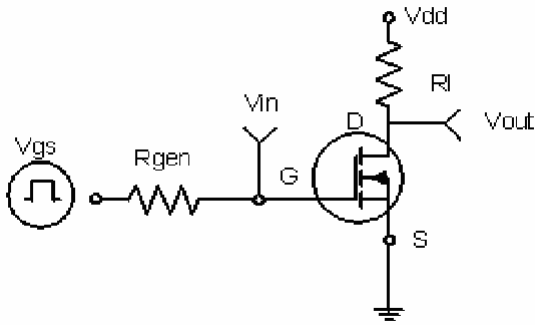


Figure 1: Switching Test Circuit

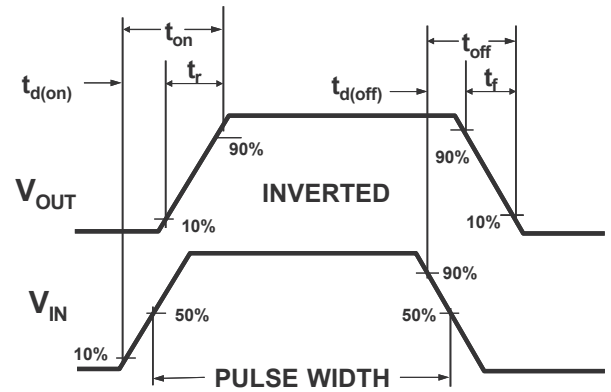


Figure 2: Switching Waveforms

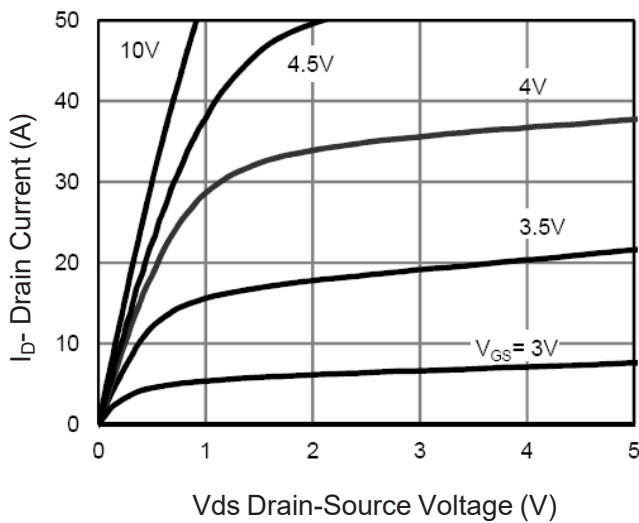


Figure 3 Output Characteristics

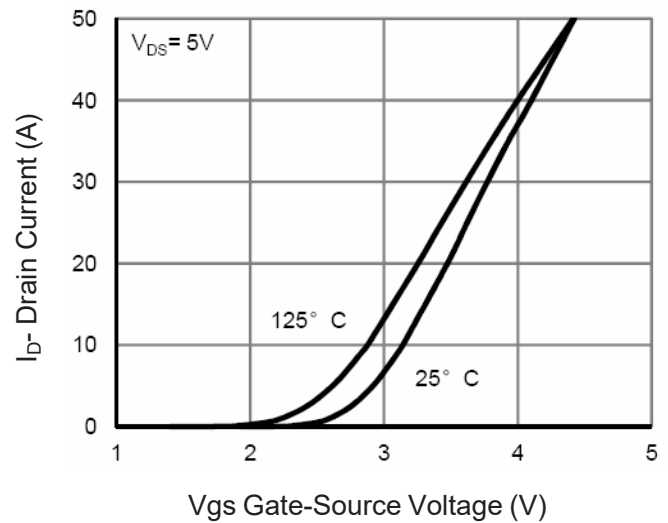


Figure 4 Transfer Characteristics

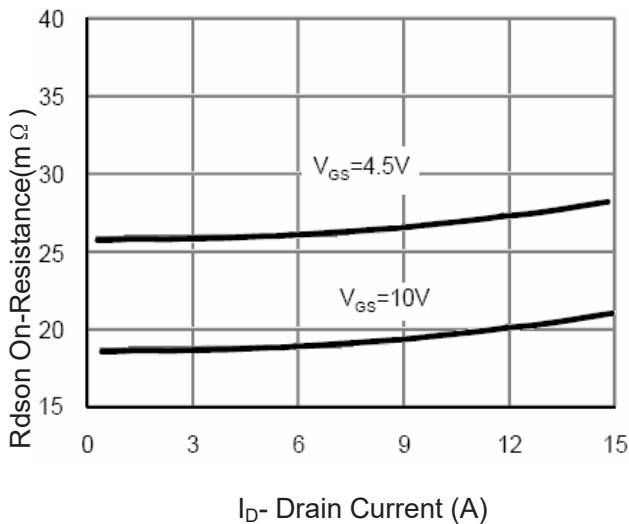


Figure 5 Drain-Source On-Resistance

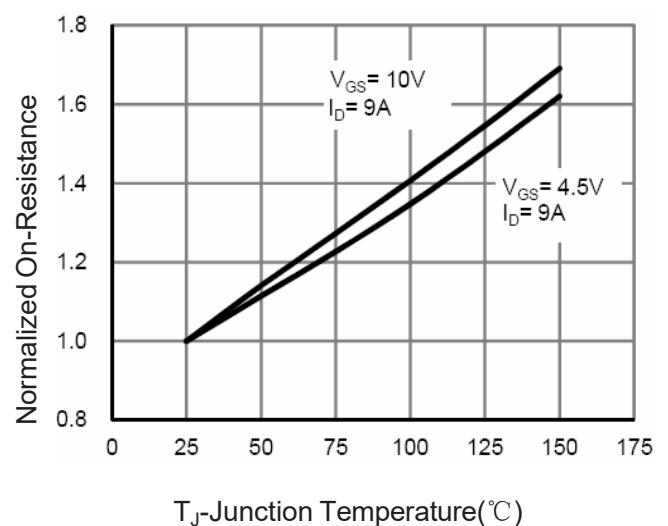
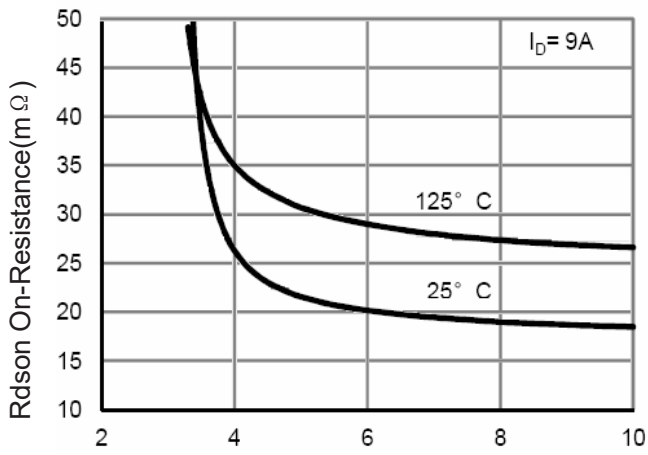
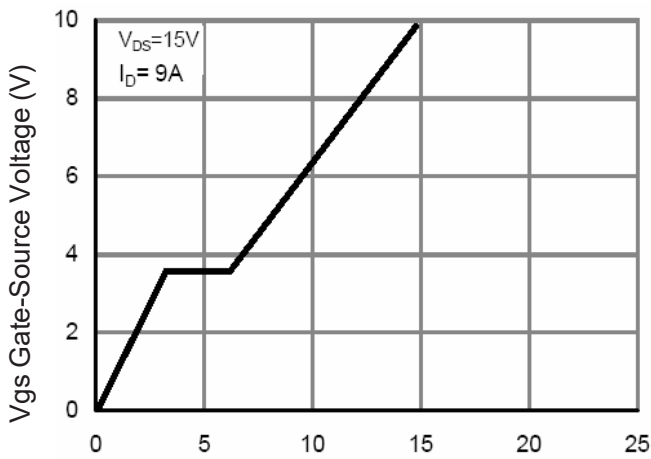


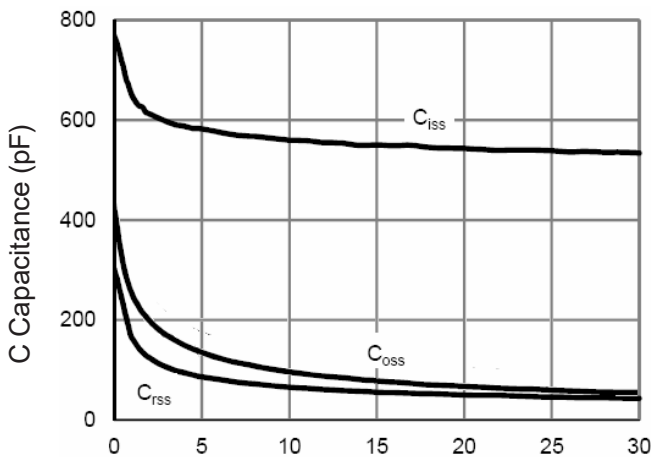
Figure 6 Drain-Source On-Resistance



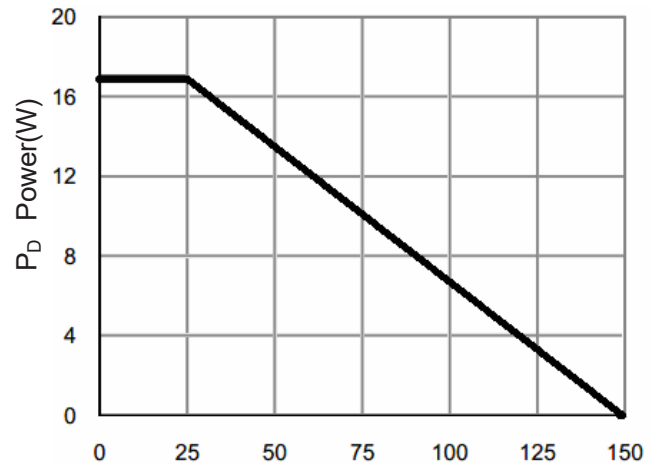
Vgs Gate-Source Voltage (V)
Figure 7 Rdson vs Vgs



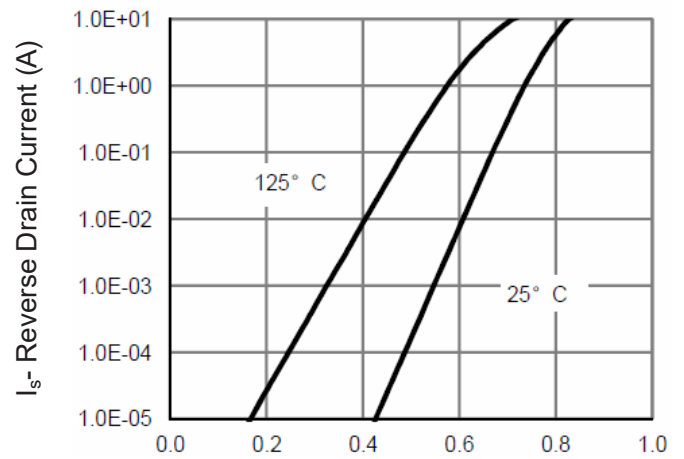
Qg Gate Charge (nC)
Figure 9 Gate Charge



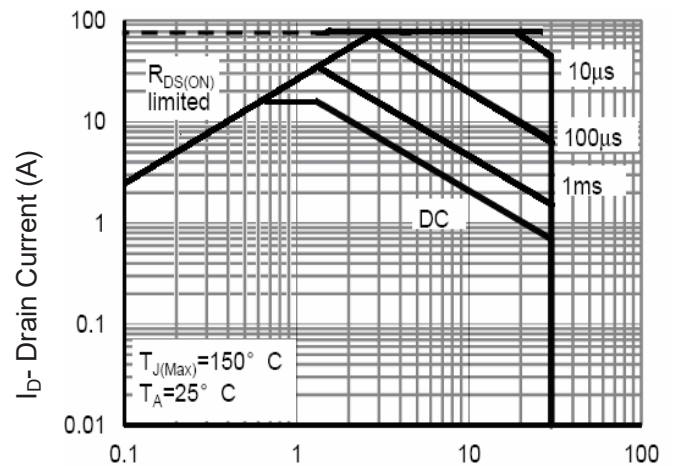
Vds Drain-Source Voltage (V)
Figure 11 Capacitance vs Vds



T_J -Junction Temperature (°C)
Figure 8 Power Dissipation



Vds Drain-Source Voltage (V)
Figure 10 Source-Drain Diode Forward



Vds Drain-Source Voltage (V)
Figure 12 Safe Operation Area

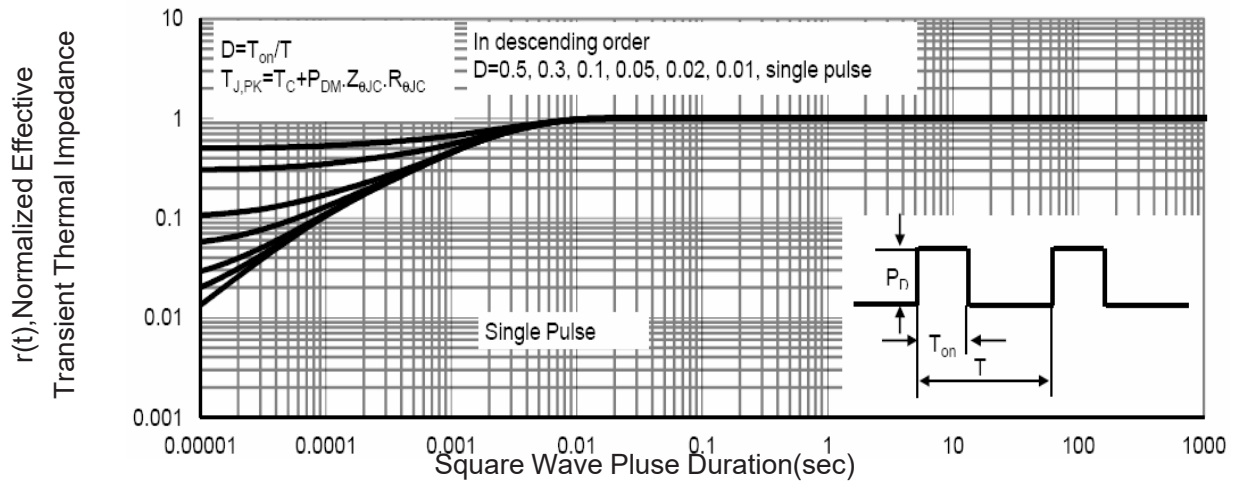


Figure 13 Normalized Maximum Transient Thermal Impedance

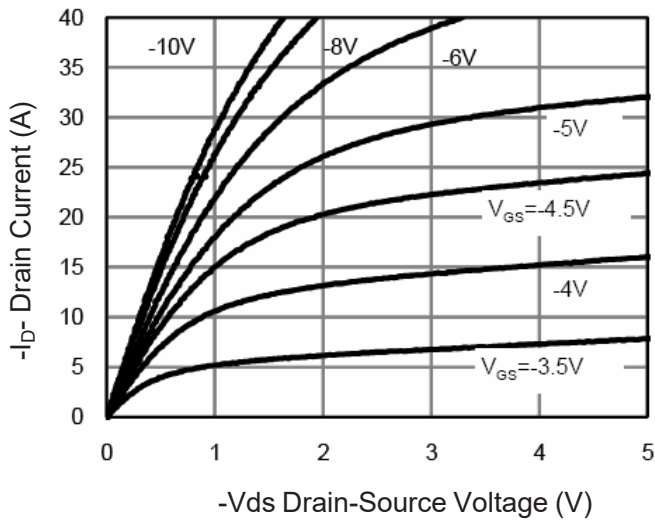
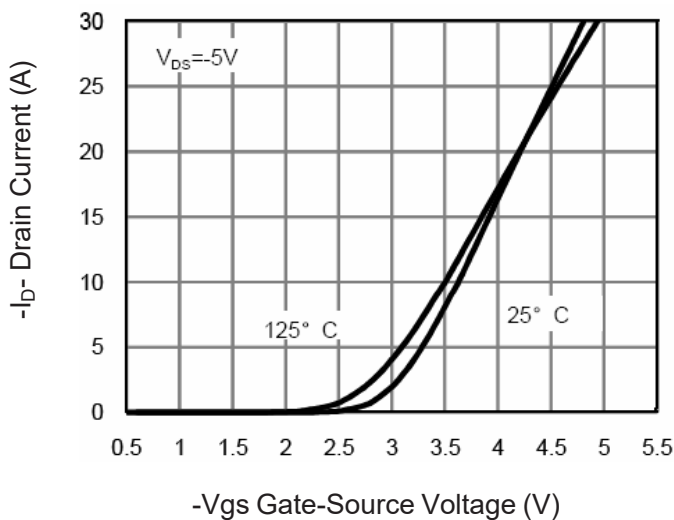
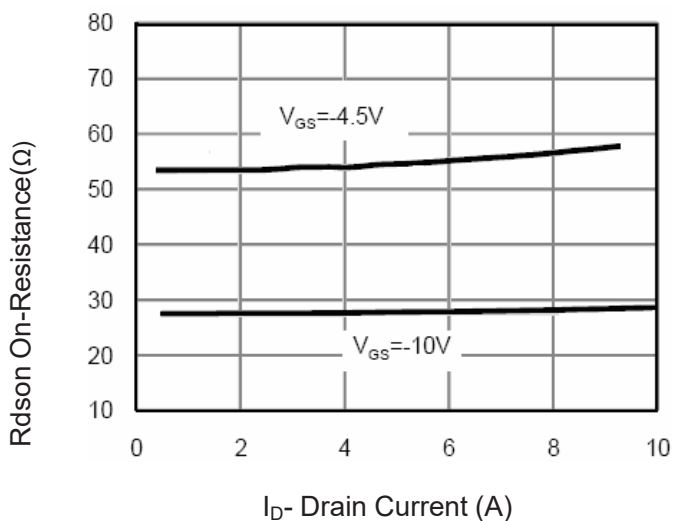
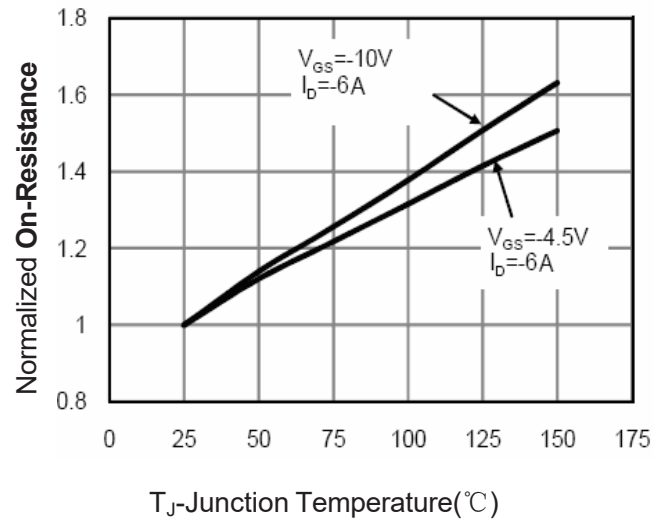
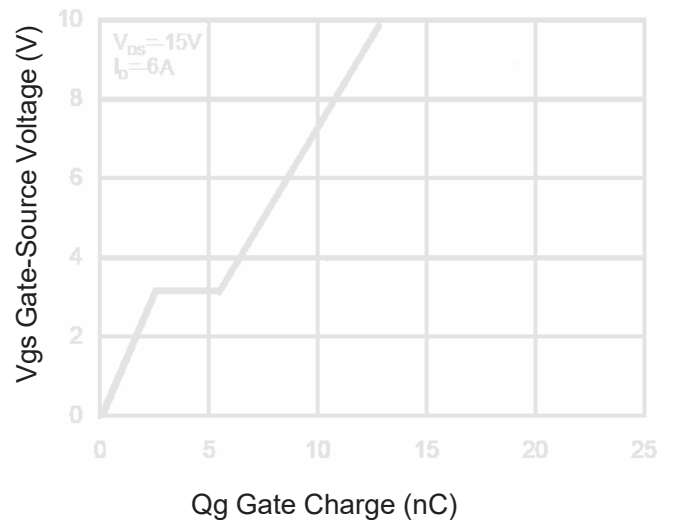
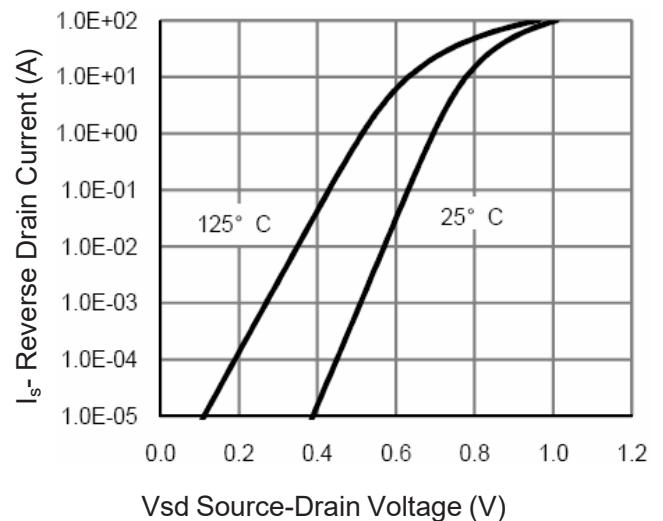
Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

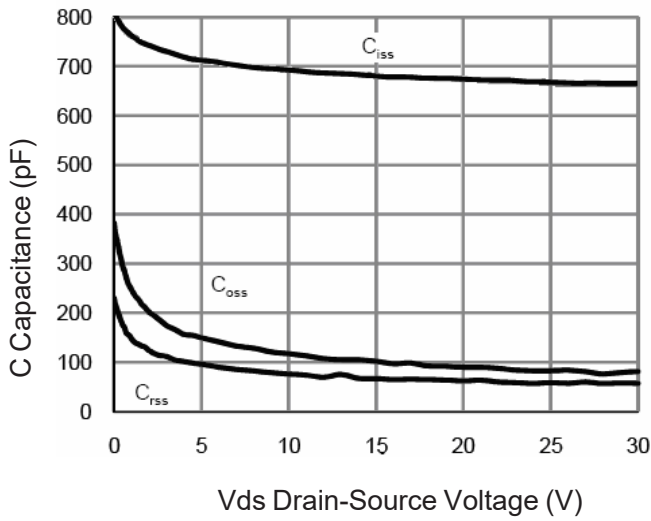
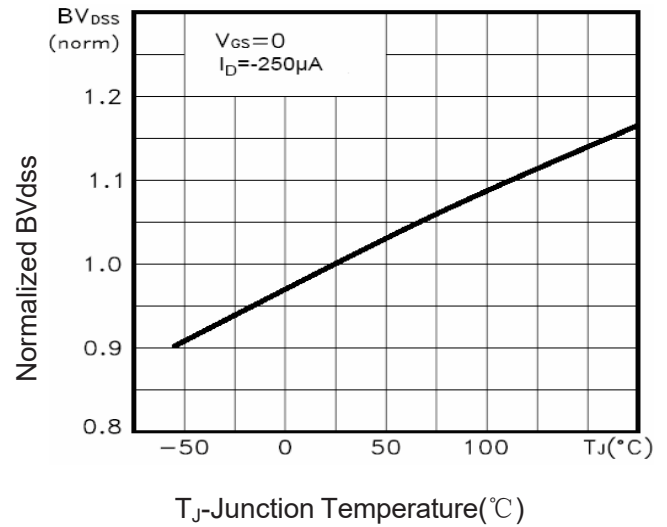
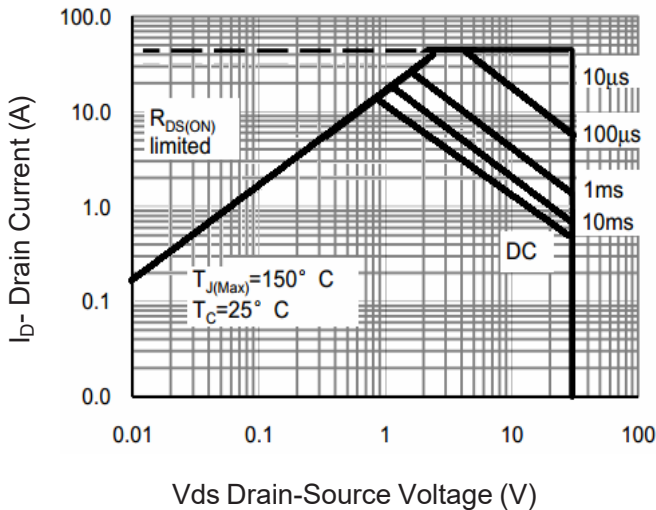
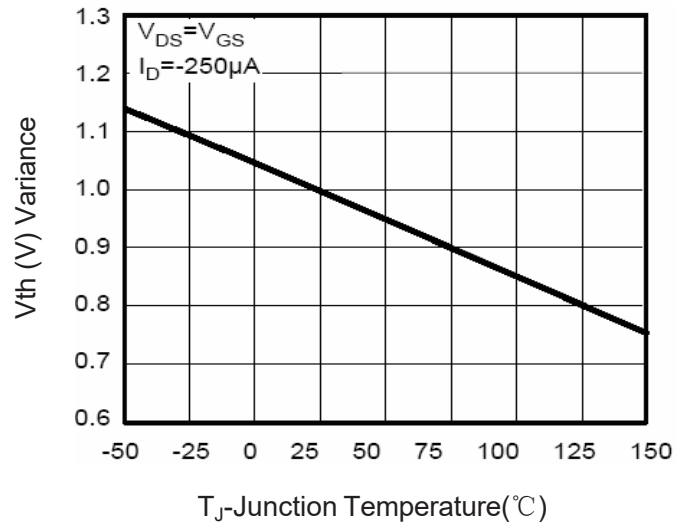
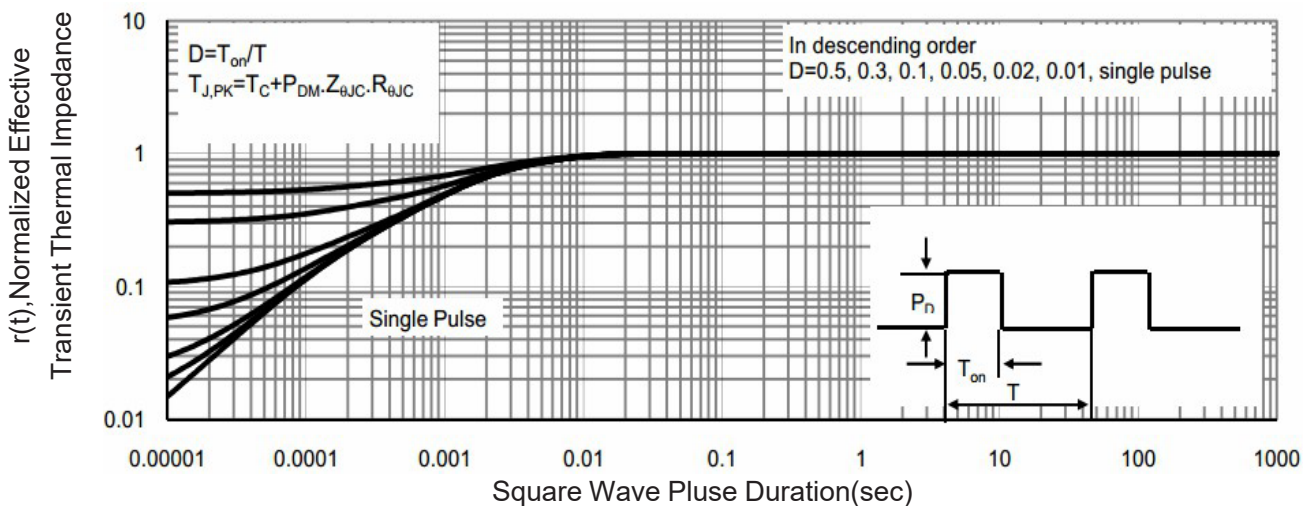
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	-1.7	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-6A$	-	29	35	m Ω
		$V_{GS}=-4.5V, I_D=-6A$	-	55	75	
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-6A$	-	13	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$	-	691.9	-	PF
Output Capacitance	C_{oss}		-	113.7	-	PF
Reverse Transfer Capacitance	C_{rss}		-	109.4	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, I_D=-6A$ $V_{GS}=-10V, R_{GEN}=3\Omega$	-	7.5	-	nS
Turn-on Rise Time	t_r		-	5.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	19	-	nS
Turn-Off Fall Time	t_f		-	7	-	nS
Total Gate Charge	Q_g	$V_{DS}=-15V, I_D=-6A,$ $V_{GS}=-10V$	-	12.9	-	nC
Gate-Source Charge	Q_{gs}		-	2.5	-	nC
Gate-Drain Charge	Q_{gd}		-	2.7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-6A$	-	-	-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-12	A

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

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


Figure 7 Capacitance vs Vds

Figure 9 BV_{DSS} vs Junction Temperature

Figure 8 Safe Operation Area

Figure 10 V_{GS(th)} vs Junction Temperature

Figure 11 Normalized Maximum Transient Thermal Impedance