Description

The VSM6N03 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 =6.5A

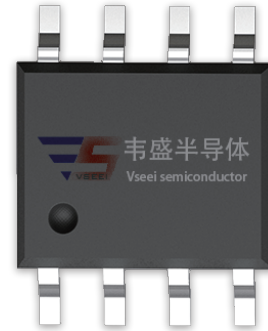 $R_{DS(ON)}$ < 24mΩ @ V_{GS}=10V

  $R_{DS(ON)}$ < 37mΩ @ V_{GS}=4.5V
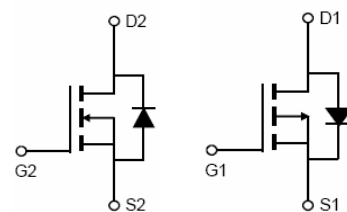
- ● **P-Channel**

  V_{DS} = -30V,I_D = -7A

  $R_{DS(ON)}$ < 32mΩ @ V_{GS}=-10V

  $R_{DS(ON)}$ < 70mΩ @ V_{GS}=-4.5V

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

SOP-8

N-channel   **P-channel**

Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM6N03-S8	VSM6N03	SOP-8	Ø330mm	12mm	4000 units

Absolute Maximum Ratings (T_A=25℃ 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
Continuous Drain Current	T_A=25℃	I_D	6.5	-7	A
	T_A=70℃		5.4	-5.8	
Pulsed Drain Current [Note 1]		I_{DM}	30	-30	A
Maximum Power Dissipation	T_A=25℃	P_D	2.0	2.0	W
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-55 To 150	-55 To 150	℃

Thermal Characteristic

	Symbol			Unit
Thermal Resistance,Junction-to-Ambient [Note2]	$R_{θJA}$	N-Ch	62.5	℃/W
Thermal Resistance,Junction-to-Ambient [Note2]	$R_{θJA}$	P-Ch	62.5	℃/W

N-CH Electrical Characteristics (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250µA	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}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics [Note 3]						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250µA	1	1.6	3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=6A	-	19	24	mΩ
		V_{GS}=4.5V, I_D=6A	-	26	37	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=6A	15	-	-	S
Dynamic Characteristics [Note4]						
Input Capacitance	C_{Iss}	V_{DS}=15V,V_{GS}=0V, F=1.0MHz	-	485.8	-	PF
Output Capacitance	C_{oss}		-	65.2		PF
Reverse Transfer Capacitance	C_{rss}		-	54	-	PF
Switching Characteristics [Note 4]						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=15V, R_L=2.5Ω V_{GS}=10V,R_{GEN}=3Ω	-	4.0	-	nS
Turn-on Rise Time	t_r		-	2.0	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	14.0	-	nS
Turn-Off Fall Time	t_f		-	3.0	-	nS
Total Gate Charge	Q_g	V_{DS}=15V,I_D=6A, V_{GS}=10V	-	12.6	-	nC
Gate-Source Charge	Q_{gs}		-	1.9	-	nC
Gate-Drain Charge	Q_{gd}		-	2.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage [Note 3]	V_{SD}	V_{GS}=0V,I_S=6A	-	0.8	1.2	V

P-CH Electrical Characteristics (T_A=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=-250μA	-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}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics [(Note 3)]						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1.3	-1.65	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-6.5A	-	28	32	mΩ
		V_{GS}=-4.5V, I_D=-6.5A	-	49	70	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-6.5A	10	-	-	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, R_L=2.3Ω V_{GS}=-10V,R_{GEN}=6Ω	-	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=-6.5A V_{GS}=-10V	-	16.3	-	nC
Gate-Source Charge	Q_{gs}		-	2.2	-	nC
Gate-Drain Charge	Q_{gd}		-	4.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage [(Note 3)]	V_{SD}	V_{GS}=0V,I_S=-6.5A	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. Surface Mounted on FR4 Board, t ≤ 10 sec.

3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
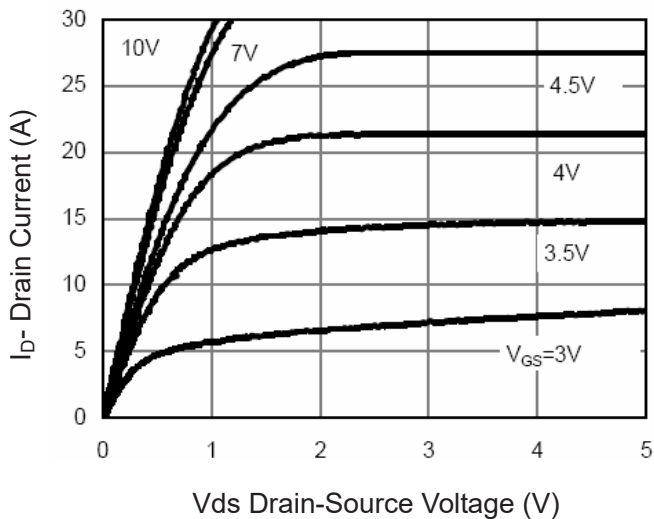
4. Guaranteed by design, not subject to production

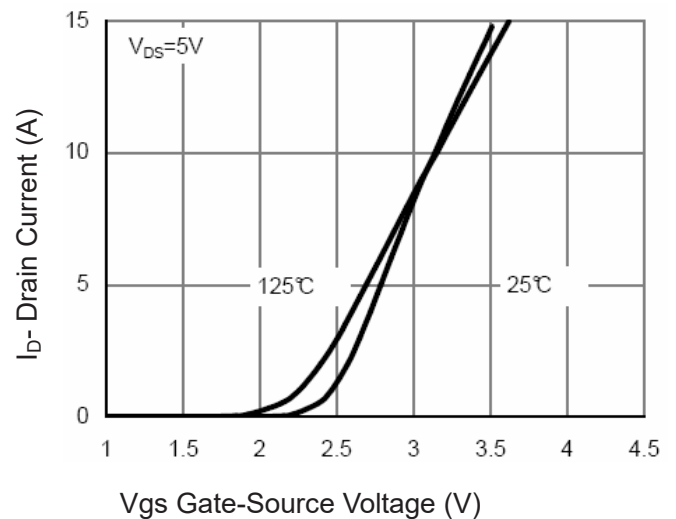## N- Channel Typical Electrical and Thermal Characteristics (Curves)
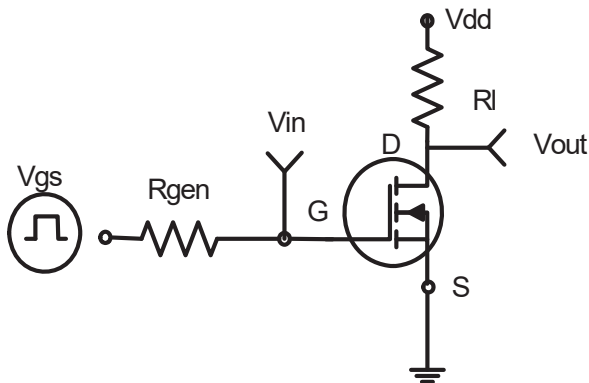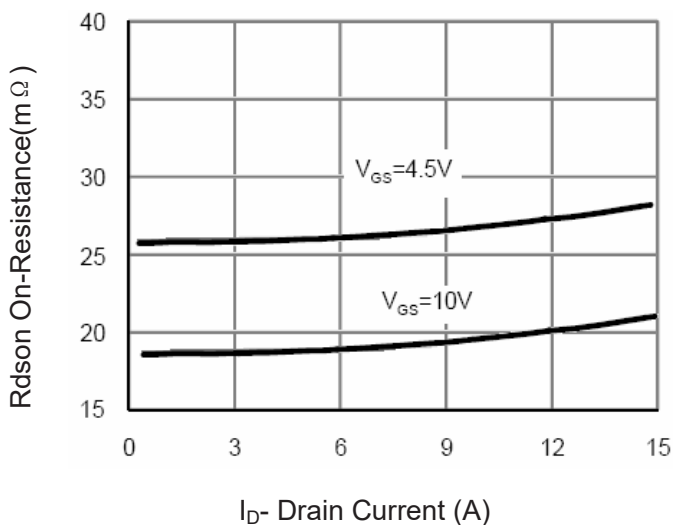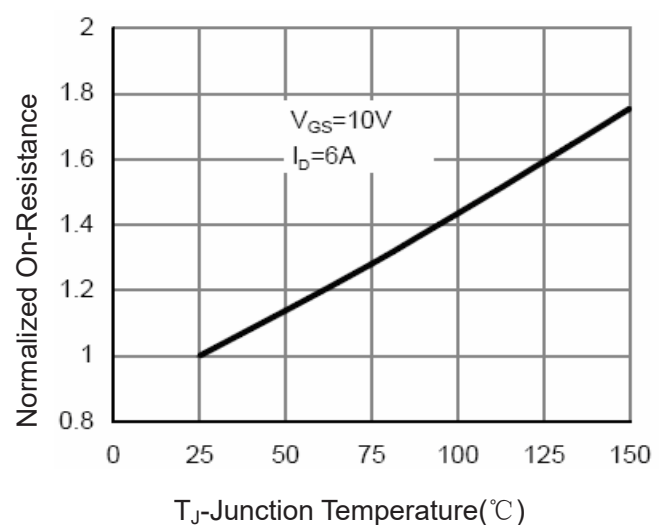
Figure 1:Switching Test Circuit
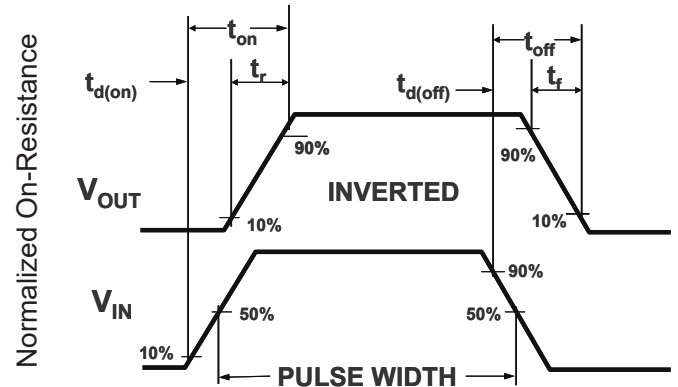
Figure 2:Switching Waveforms

Figure 3 Output Characteristics

Figure 4 Transfer Characteristics
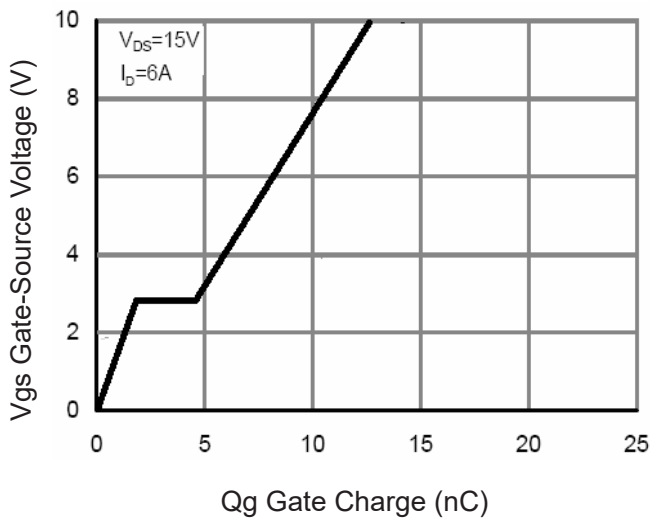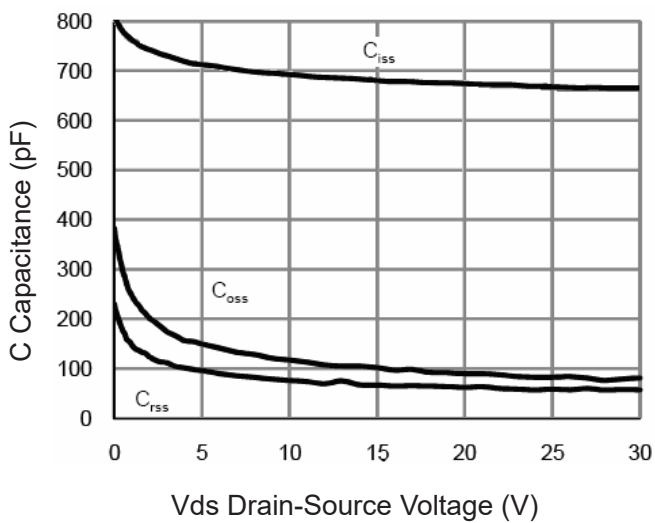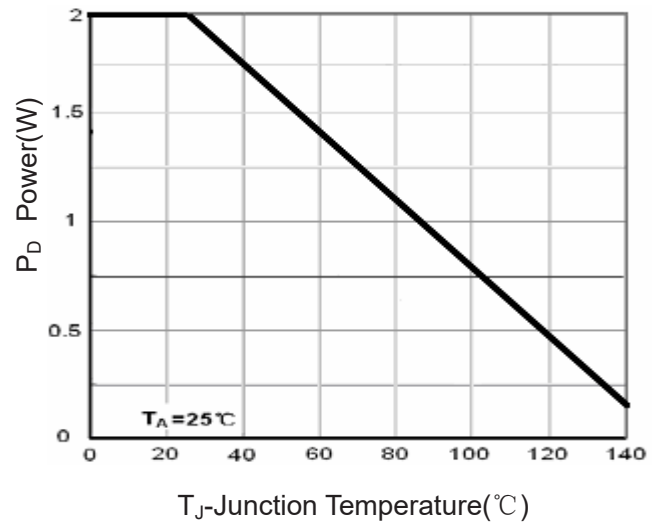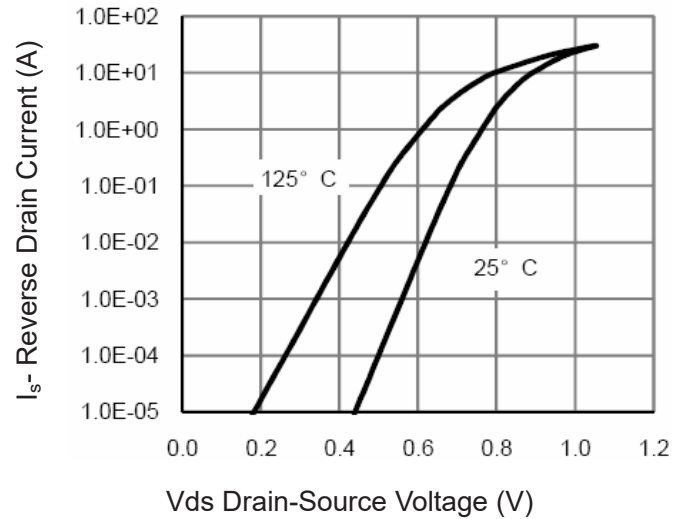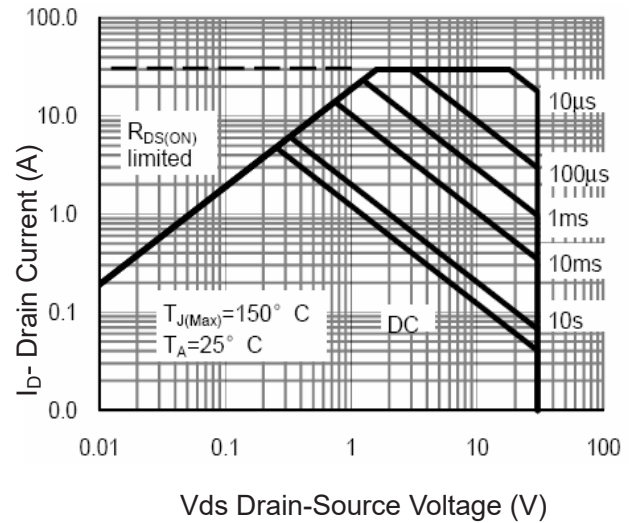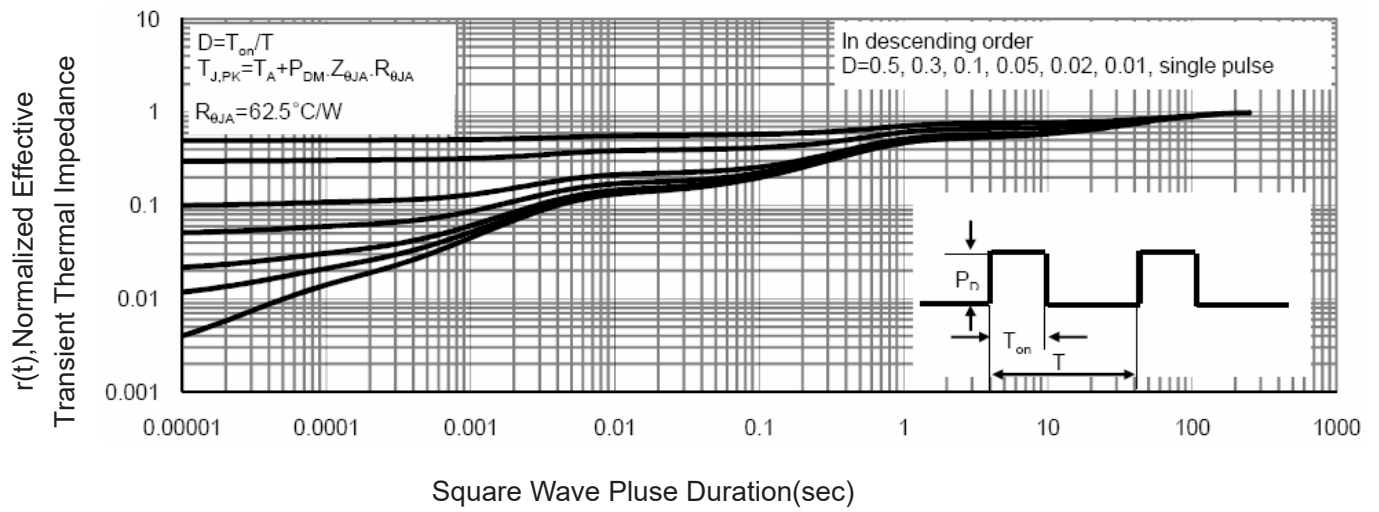
Figure 5 Drain-Source On-Resistance

Figure 6 Drain-Source On-Resistance
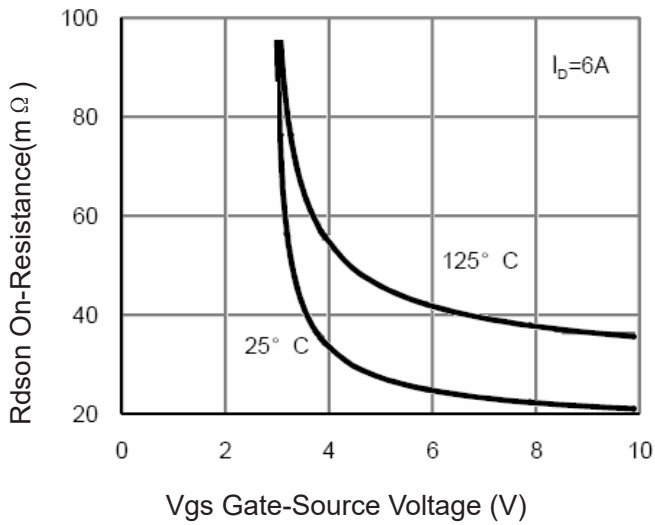
Figure7 Rdson vs Vgs

Figure 8 Power Dissipation

Figure 9 Gate Charge

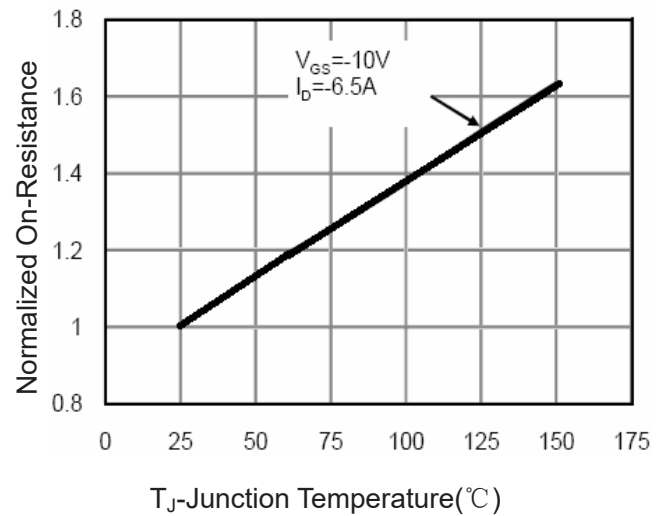**Figure 10 Source- Drain Diode Forward**

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)
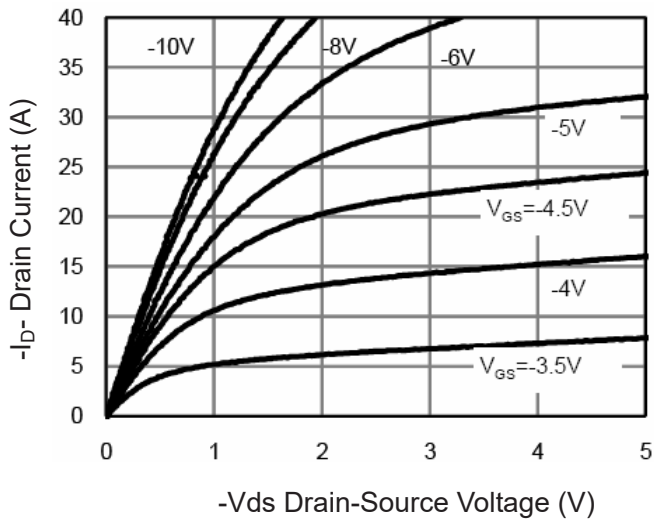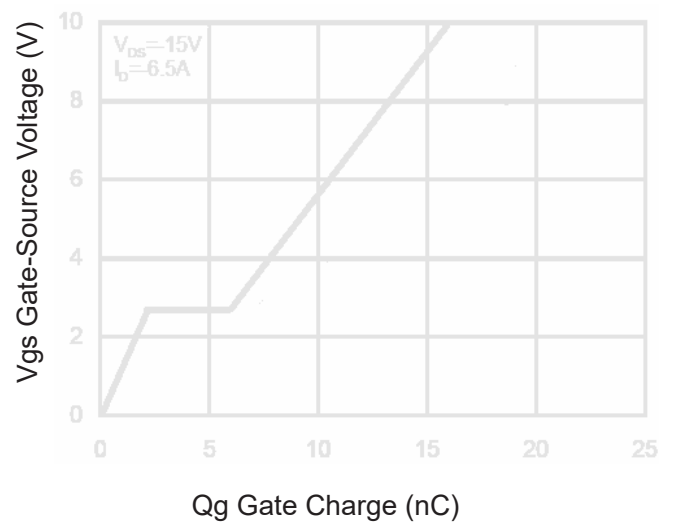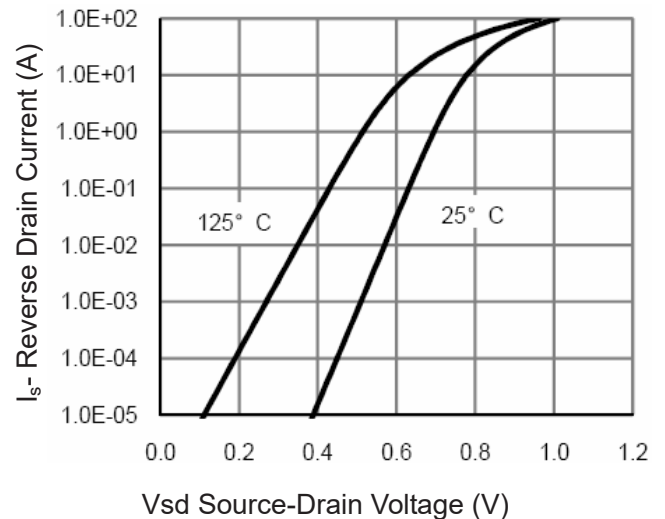

Figure 1 Output Characteristics

Figure 4 Rdson-Junction Temperature

Figure 2 Transfer Characteristics

Figure 5 Gate Charge

Figure 3 Rdson- Drain Current

Figure 6 Source- Drain Diode Forward
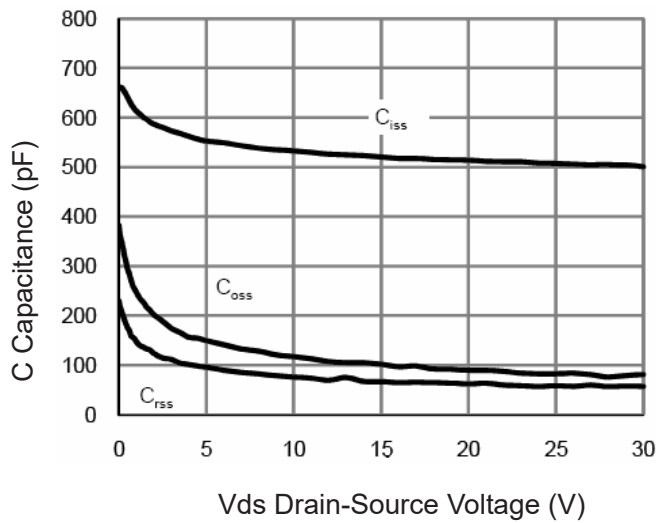
Figure 7 Capacitance vs Vds
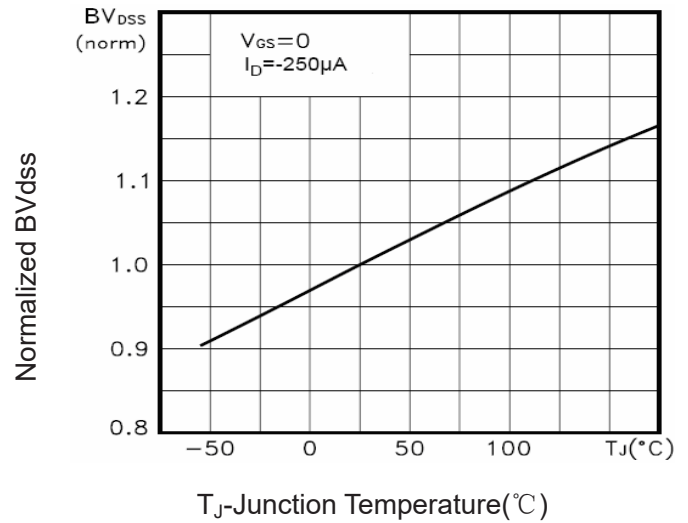
Figure 9 BV$_{DSS}$ vs Junction Temperature
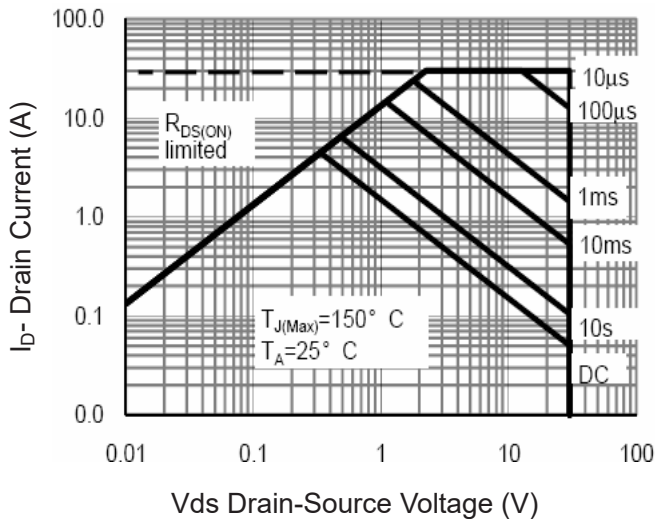
Figure 8 Safe Operation Area
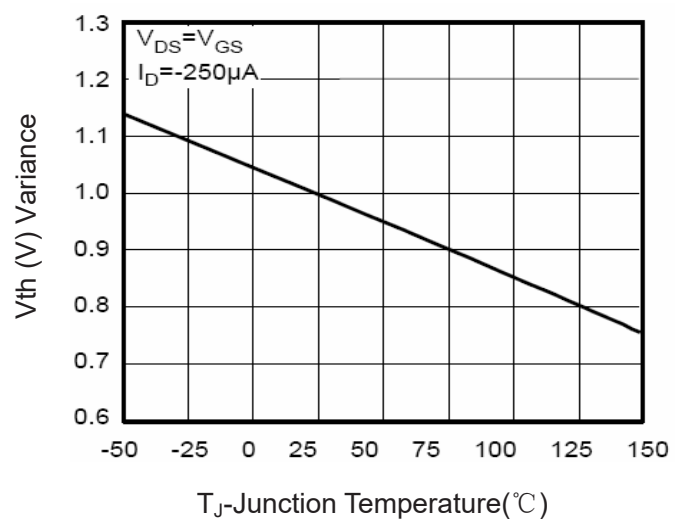
Figure 10 V$_{GS(th)}$ vs Junction Temperature

Square Wave Pluse Duration(sec)
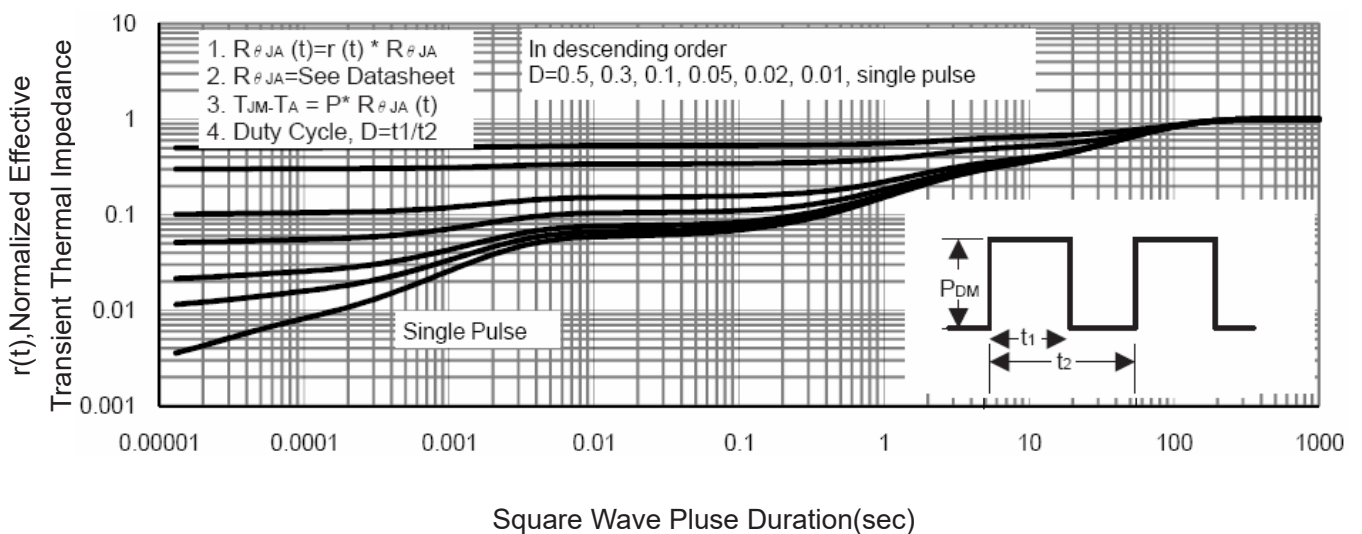
Figure 11 Normalized Maximum Transient Thermal Impedance