

Description

The VSM10NP03 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The SOP-8 package is universally preferred for all commercial industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

General Features

● N-Channel

$$V_{DS} = 30V, I_D = 10A$$

$$R_{DS(ON)} < 20m\Omega @ V_{GS}=4.5V$$

$$R_{DS(ON)} < 13.5m\Omega @ V_{GS}=10V$$

● P-Channel

$$V_{DS} = -30V, I_D = -9.1A$$

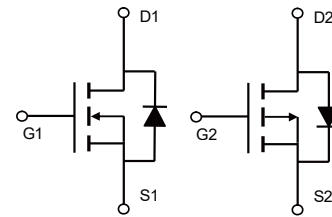
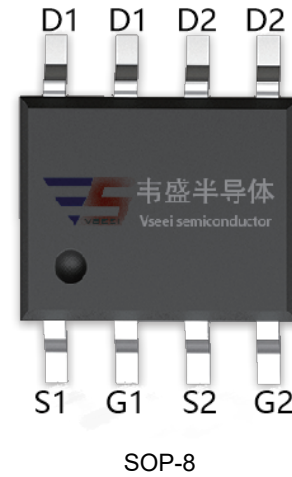
$$R_{DS(ON)} < 35m\Omega @ V_{GS}=-4.5V$$

$$R_{DS(ON)} < 20m\Omega @ V_{GS}=-10V$$

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

Application

- Battery protection
- Load switch
- Power management



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM10NP03	VSM10NP03-S8	SOP-8	Ø330mm	12mm	2500 units

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}	± 20	± 20	V
Continuous Drain Current	$T_A=25^\circ\text{C}$	I_D	10	-9.1	A
	$T_A=70^\circ\text{C}$		7.9	-7.2	
Pulsed Drain Current (Note 1)		I_{DM}	30	-30	A
Maximum Power Dissipation	$T_A=25^\circ\text{C}$	P_D	2.5	2.5	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-Ambient ^(Note2)	$R_{\theta JA}$	N-Ch	50	$^{\circ}\text{C/W}$
		P-Ch	50	

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_{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	1.6	3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$	-	7.5	13.5	m Ω
		$V_{GS}=4.5V, I_D=5A$	-	11	20	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=10A$	15	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	1550	-	PF
Output Capacitance	C_{oss}		-	300	-	PF
Reverse Transfer Capacitance	C_{rss}		-	180	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=25V, I_D=1A$ $V_{GS}=10V, R_{GEN}=6\Omega$	-	30	-	nS
Turn-on Rise Time	t_r		-	20	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	100	-	nS
Turn-Off Fall Time	t_f		-	80	-	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=10A,$ $V_{GS}=4.5V$	-	13	-	nC
Gate-Source Charge	Q_{gs}		-	5.5	-	nC
Gate-Drain Charge	Q_{gd}		-	3.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=6A$	-	0.8	1.2	V

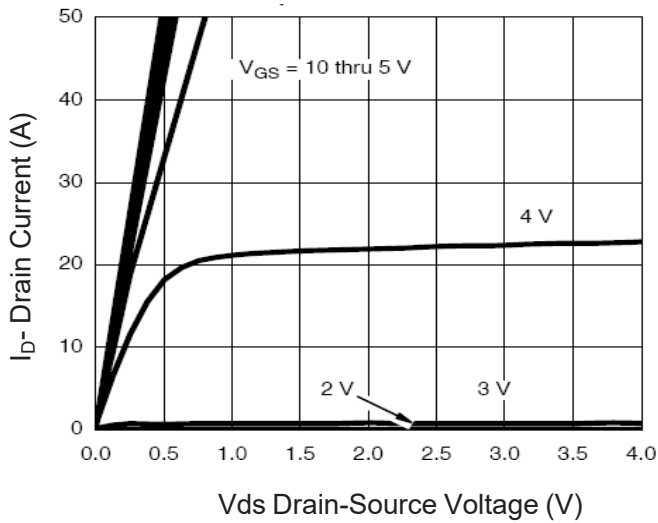
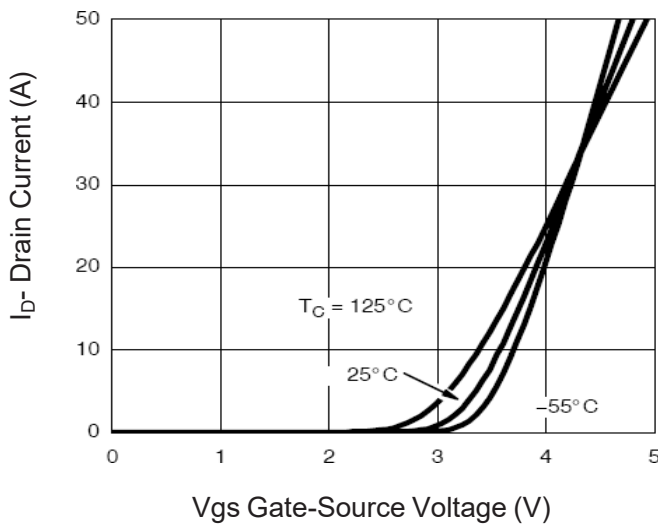
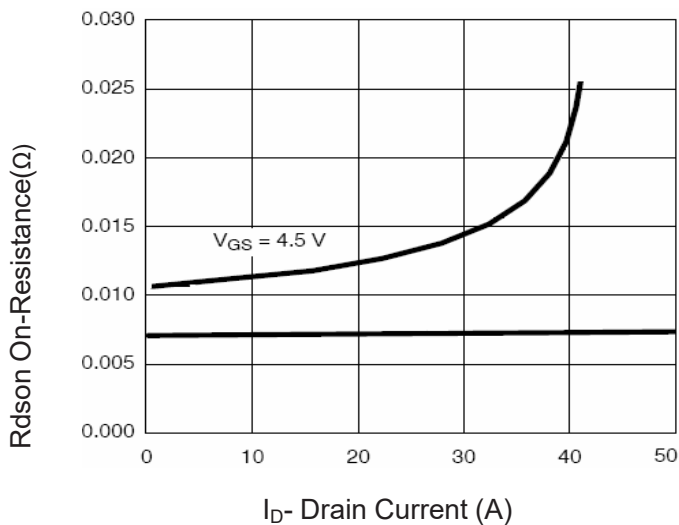
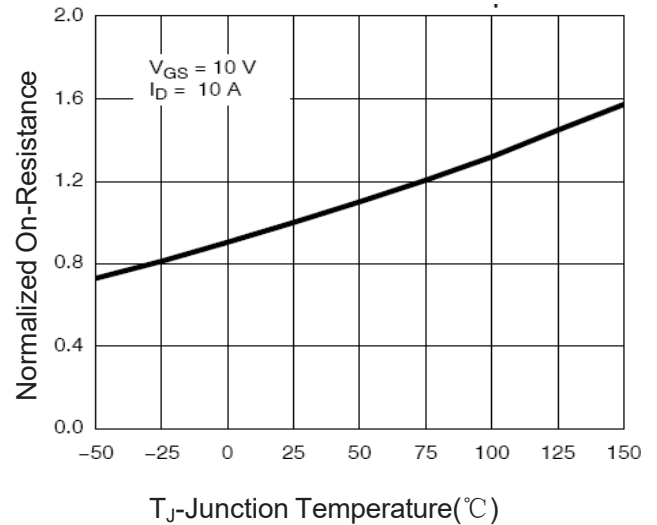
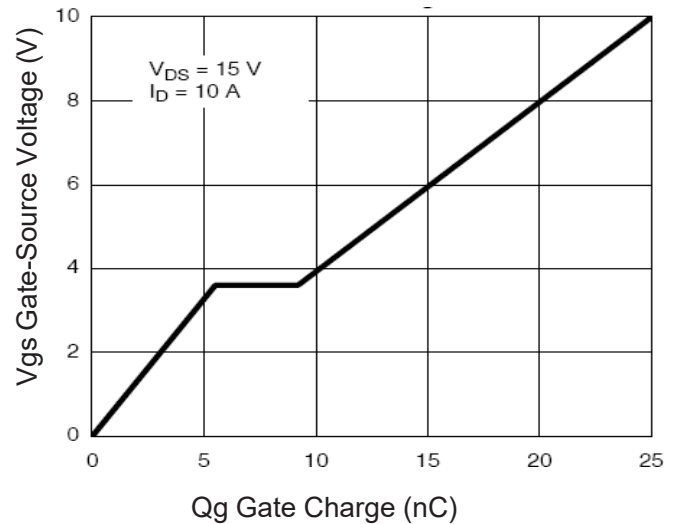
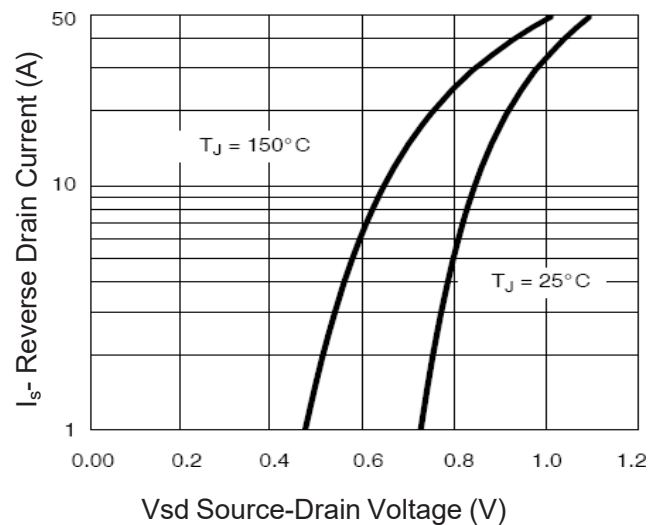
P-CH Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

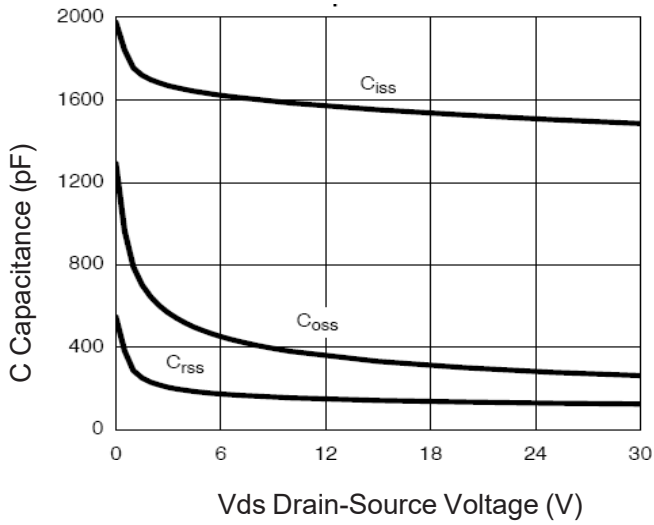
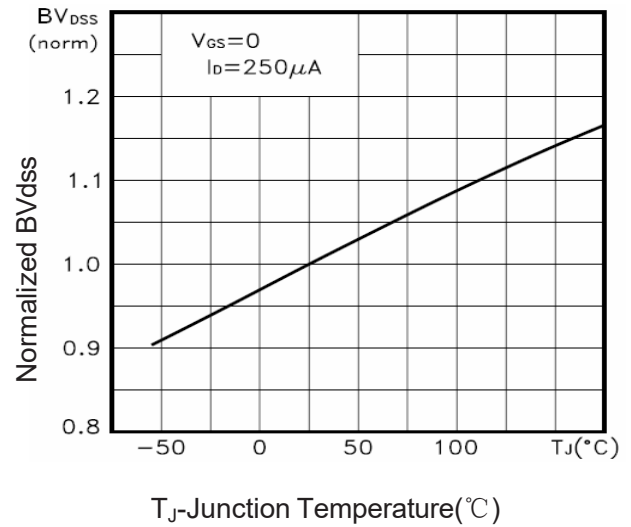
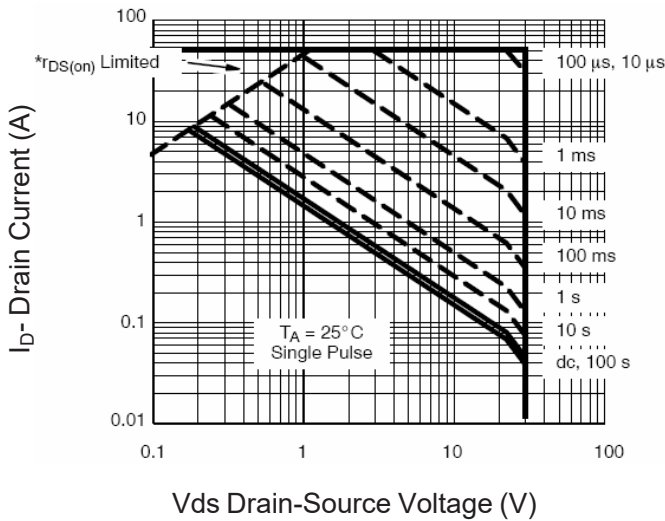
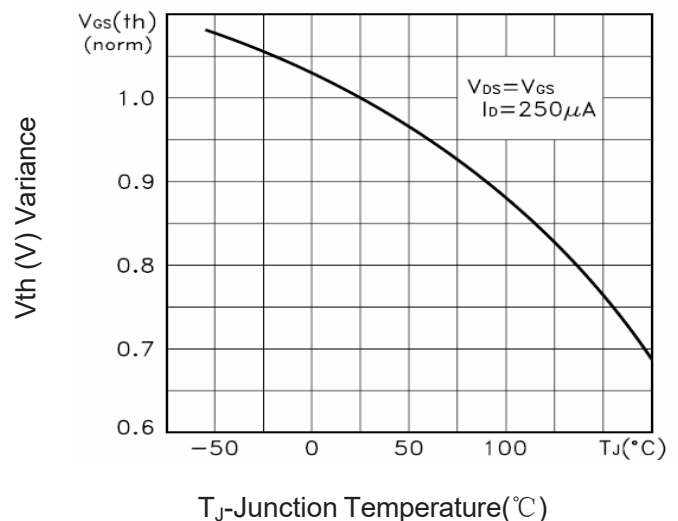
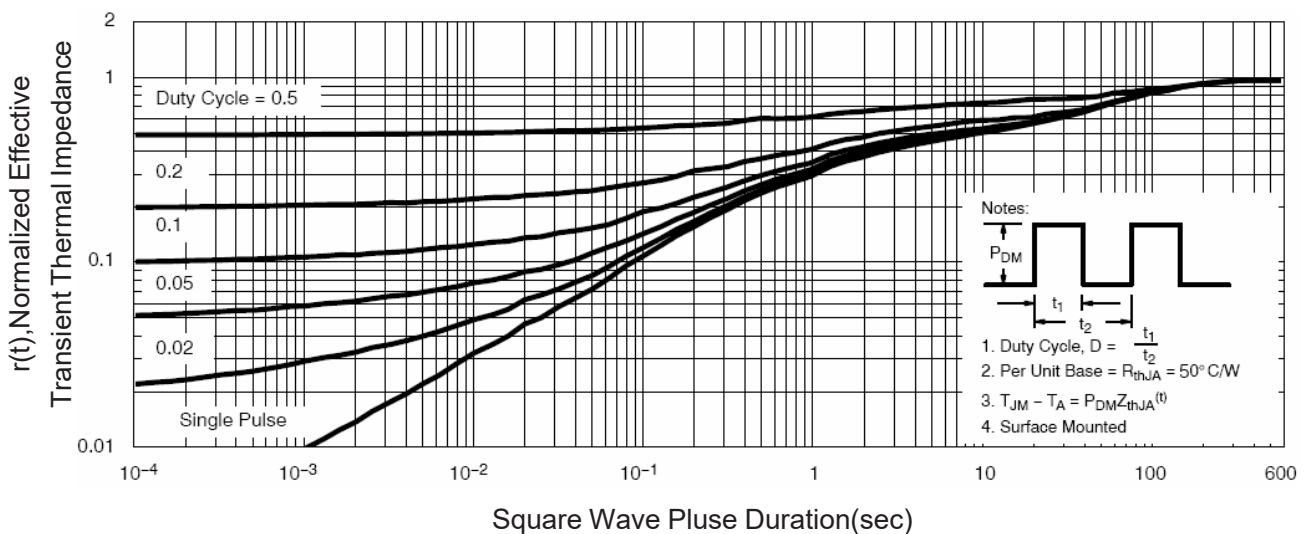
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.5	-3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-9.1A$	-	15	20	m Ω
		$V_{GS}=-4.5V, I_D=-5A$	-	21	35	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-15V, I_D=-9.1A$	10	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$	-	1600	-	PF
Output Capacitance	C_{oss}		-	350	-	PF
Reverse Transfer Capacitance	C_{rss}		-	300	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, I_D=-1A,$ $V_{GS}=-10V, R_{GEN}=6\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	15	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	110	-	nS
Turn-Off Fall Time	t_f		-	70	-	nS
Total Gate Charge	Q_g	$V_{DS}=-15V, I_D=-9.1A$ $V_{GS}=-10V$	-	30	-	nC
Gate-Source Charge	Q_{gs}		-	5.5	-	nC
Gate-Drain Charge	Q_{gd}		-	8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-6A$	-	-	-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 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

P-Channel Typical Electrical and Thermal Characteristics

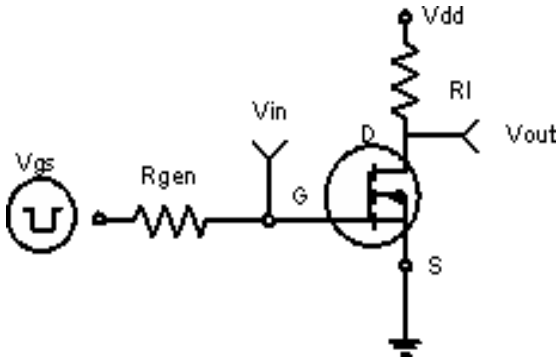


Figure 1: Switching Test Circuit

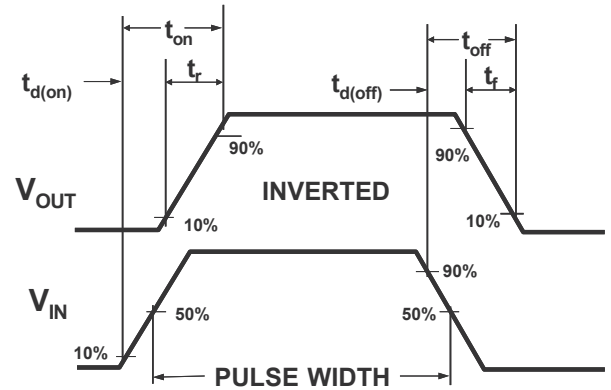


Figure 2: Switching Waveforms

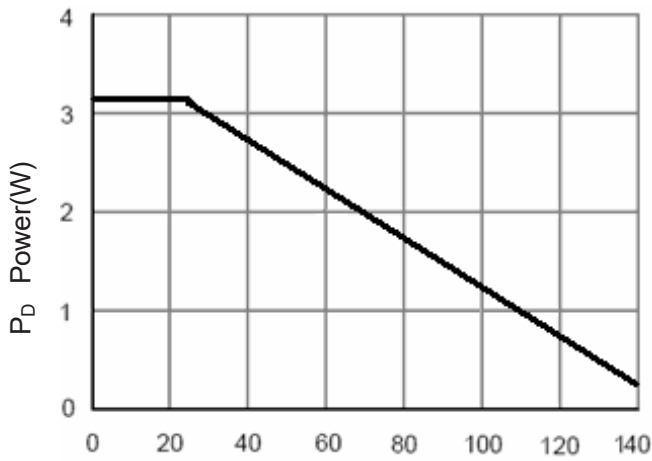


Figure 3 Power Dissipation

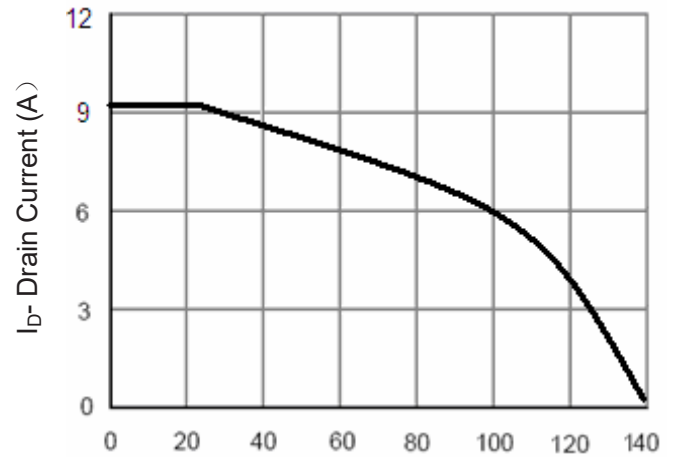


Figure 4 Drain Current

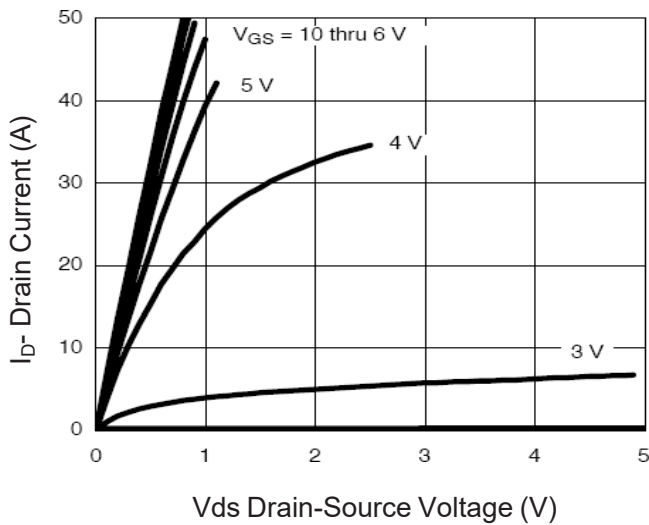


Figure 5 Output Characteristics

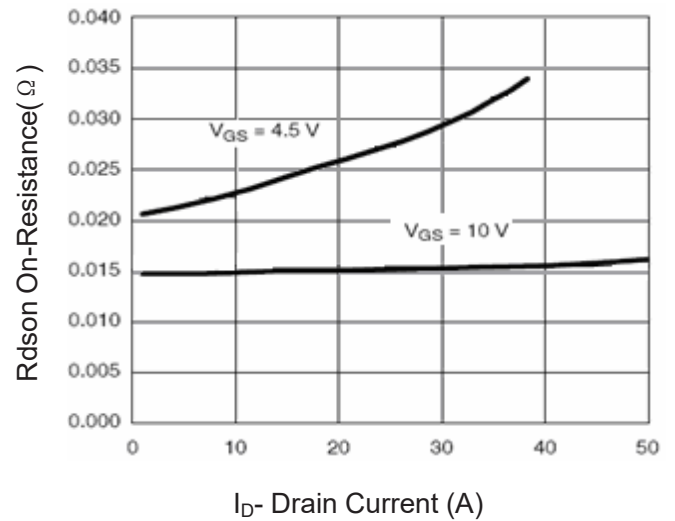
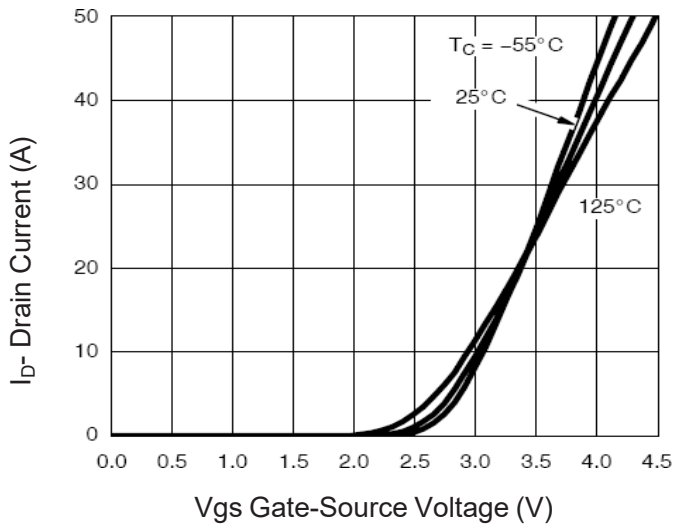
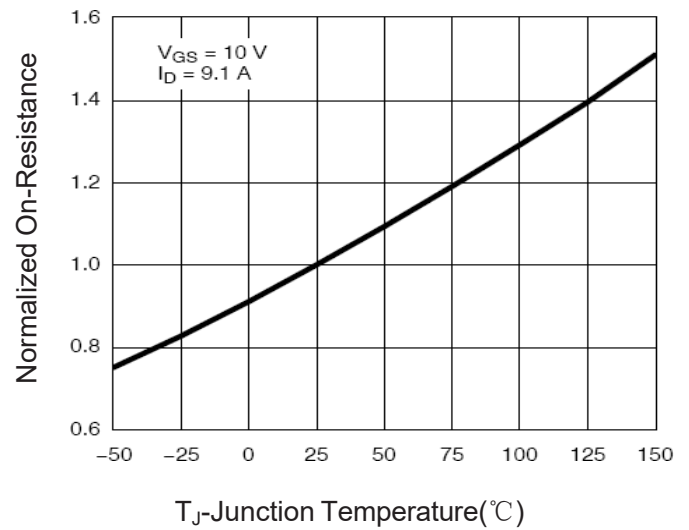
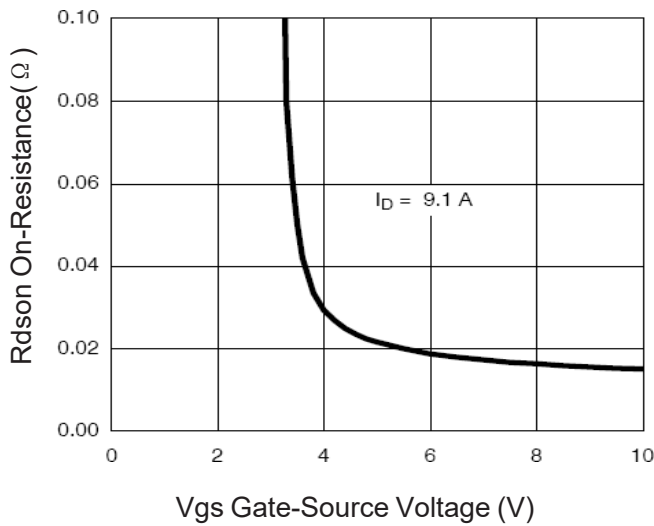
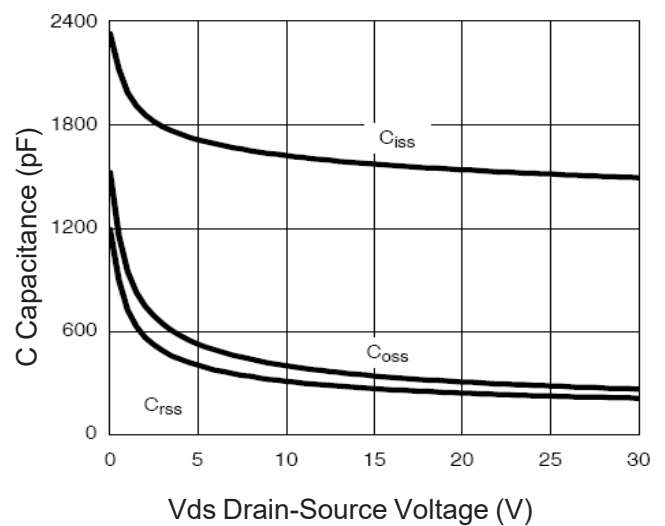
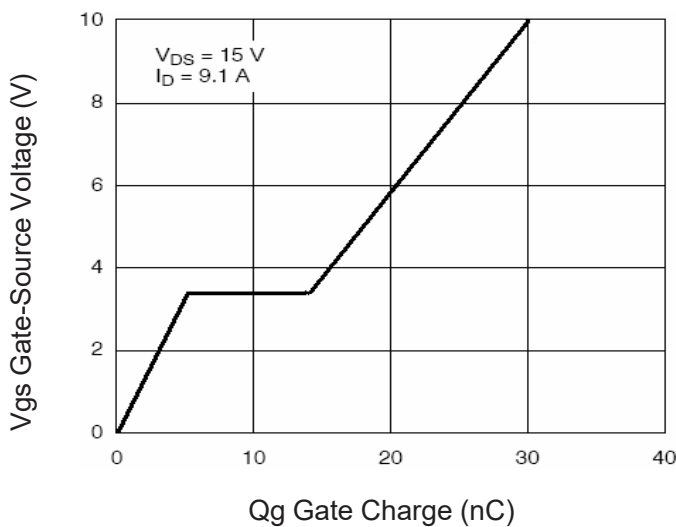
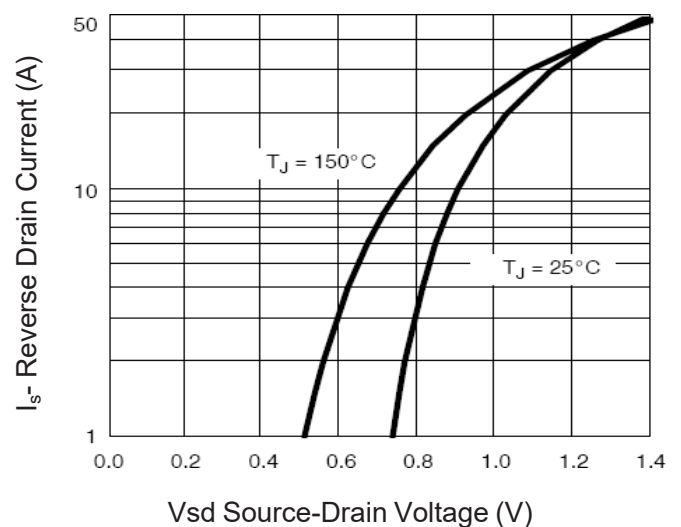


Figure 6 Drain-Source On-Resistance


Figure 7 Transfer Characteristics

Figure 8 Drain-Source On-Resistance

Figure 9 Rdson vs Vgs

Figure 10 Capacitance vs Vds

Figure 11 Gate Charge

Figure 12 Source- Drain Diode Forward

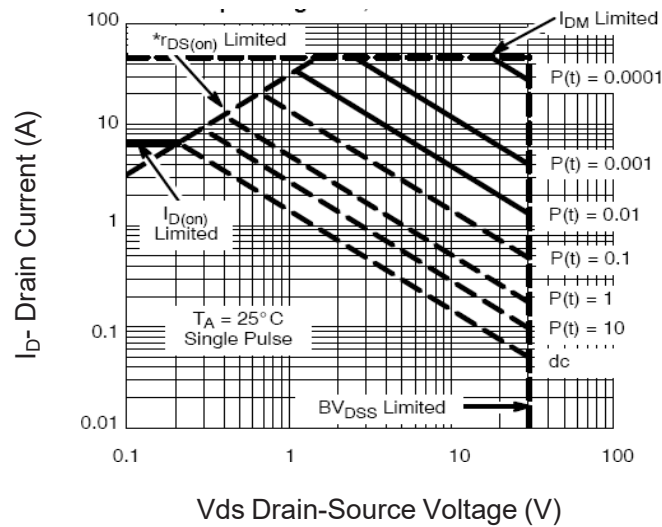


Figure 13 Safe Operation Area

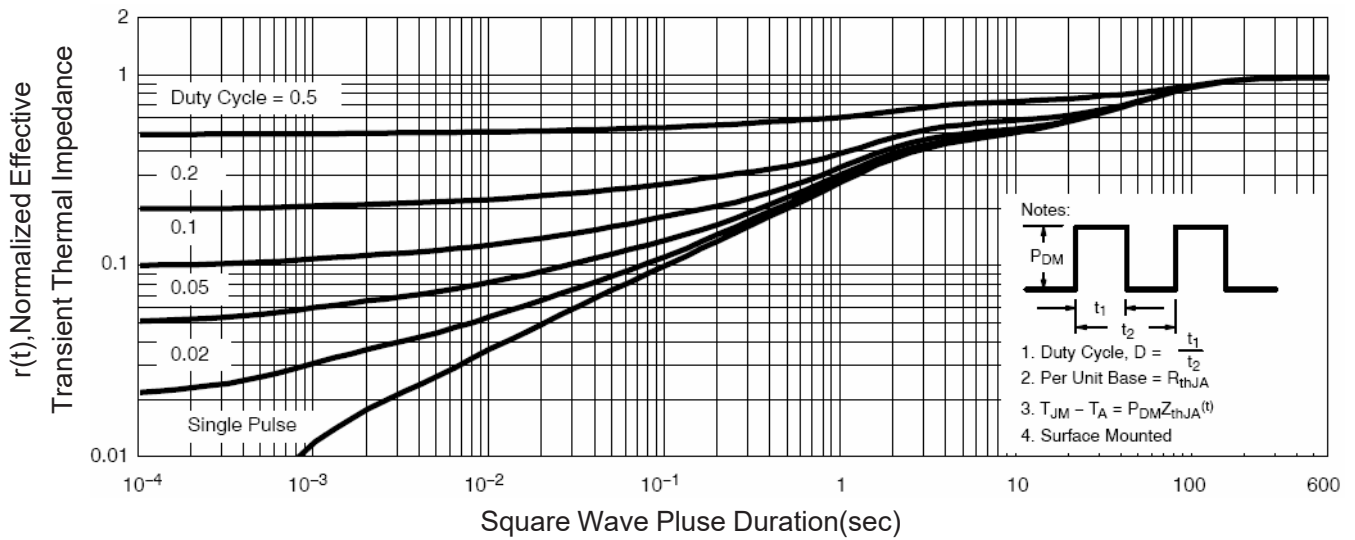


Figure 14 Normalized Maximum Transient Thermal Impedance