

Description

The VSM10N03 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

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

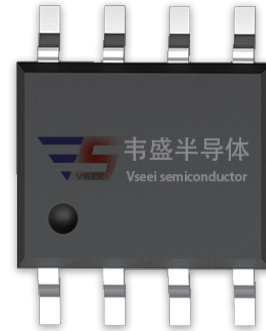
$$R_{DS(ON)} < 35m\Omega @ V_{GS}=-4.5V$$

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

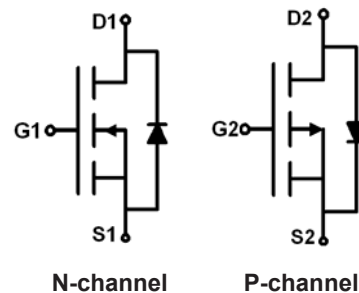
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

- Battery protection
- Load switch
- Power management



SOP-8



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM10N03-S8	VSM10N03	SOP-8	Ø330mm	12mm	2500 units

Absolute Maximum Ratings ($T_A=25^{\circ}C$ 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	$T_A=25^{\circ}C$	I_D	10	-9.1	A
	$T_A=70^{\circ}C$		7.9	-7.2	
Pulsed Drain Current ^(Note 1)		I_{DM}	30	-30	A
Maximum Power Dissipation	$T_A=25^{\circ}C$	P_D	2.5	2.5	W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 150	-55 To 150	$^{\circ}C$

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 =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 =10A	-	7.5	13.5	mΩ
		V _{GS} =4.5V, I _D =5A	-	11	20	mΩ
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} =6Ω	-	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

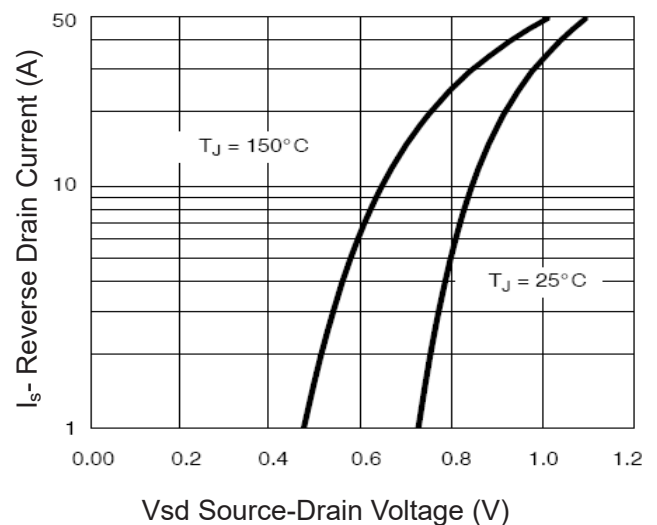
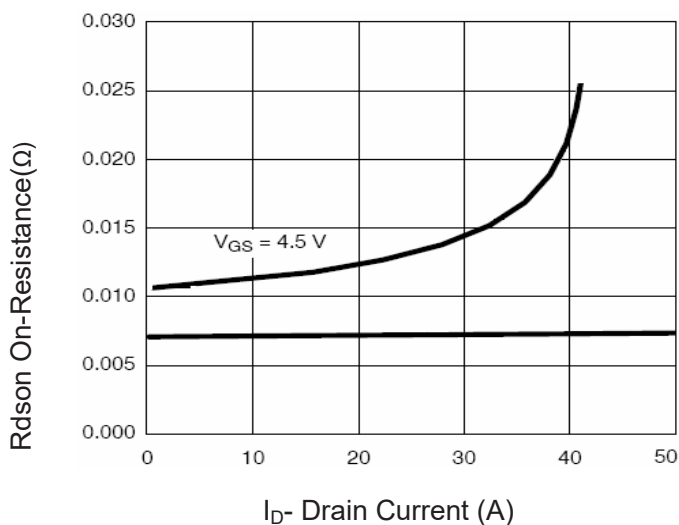
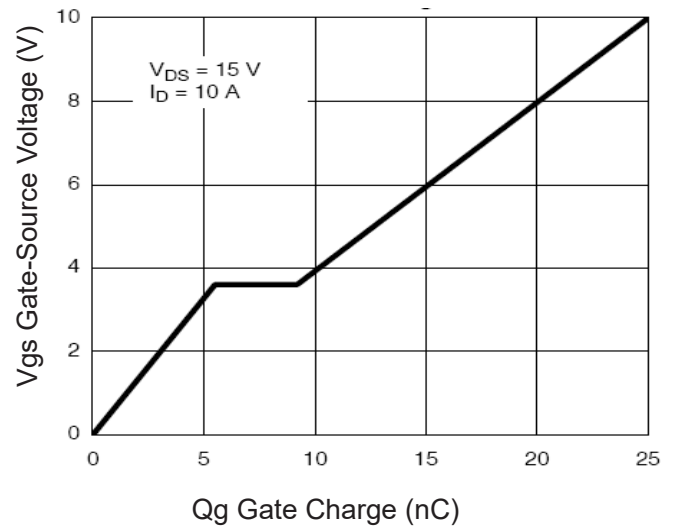
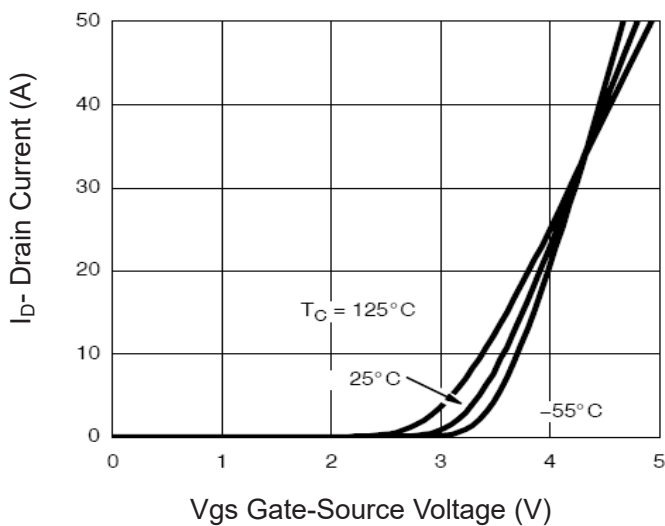
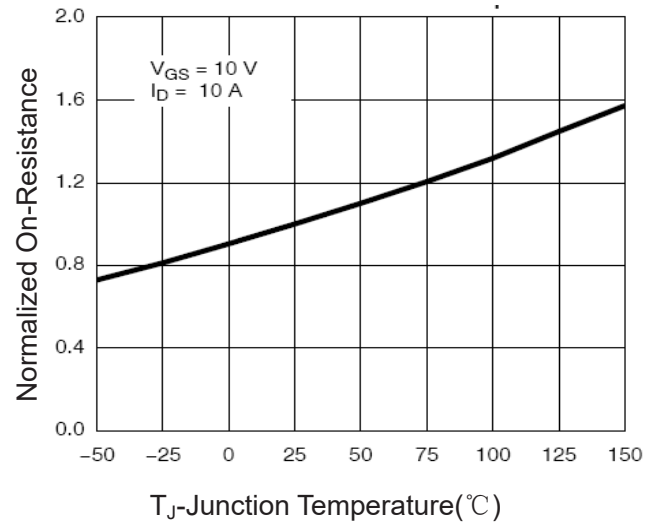
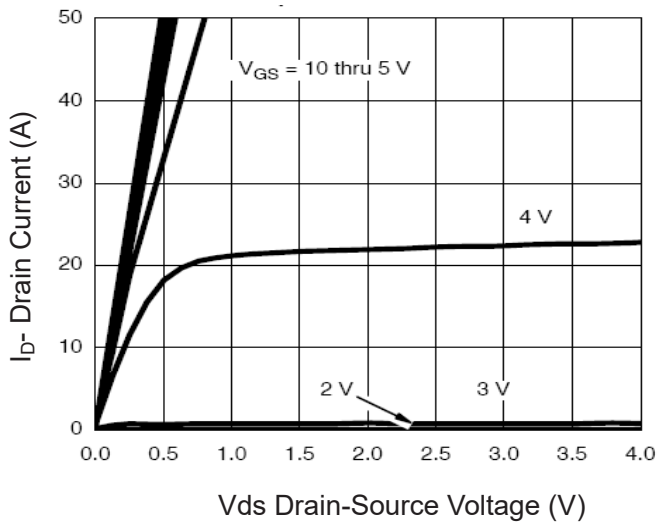
P-CH Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

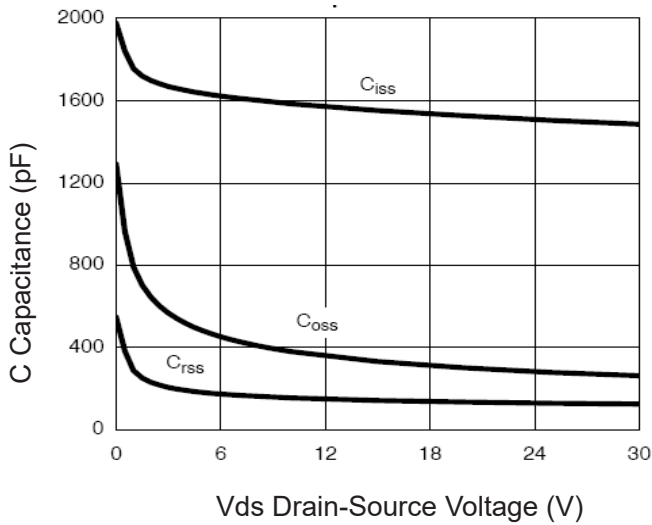
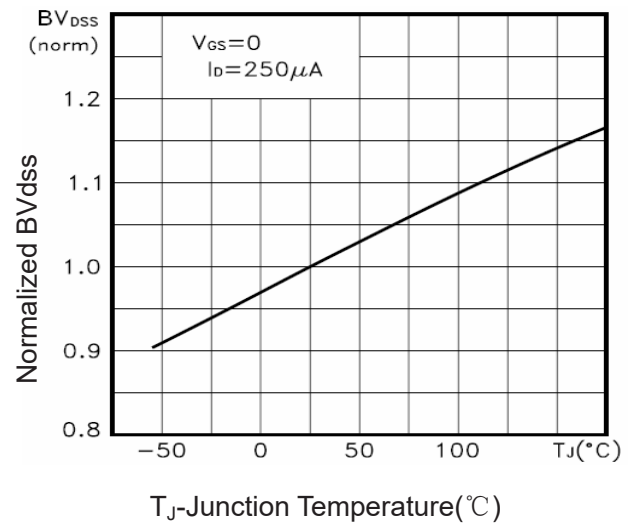
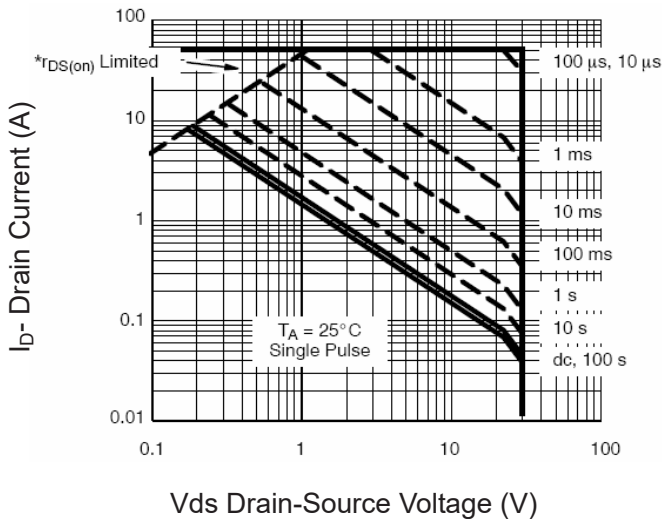
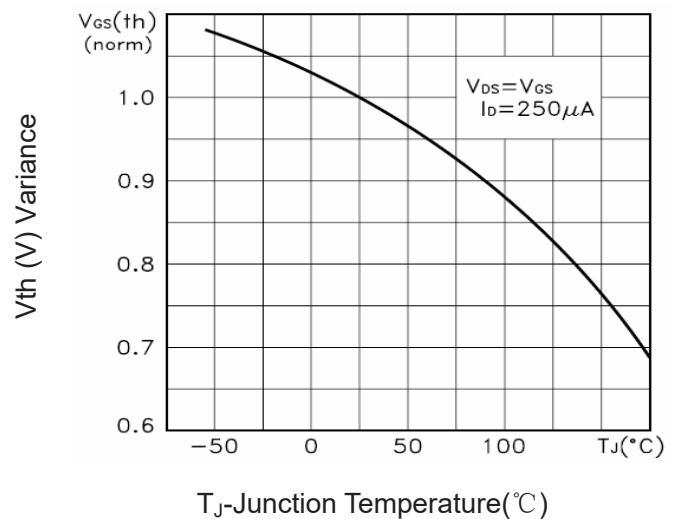
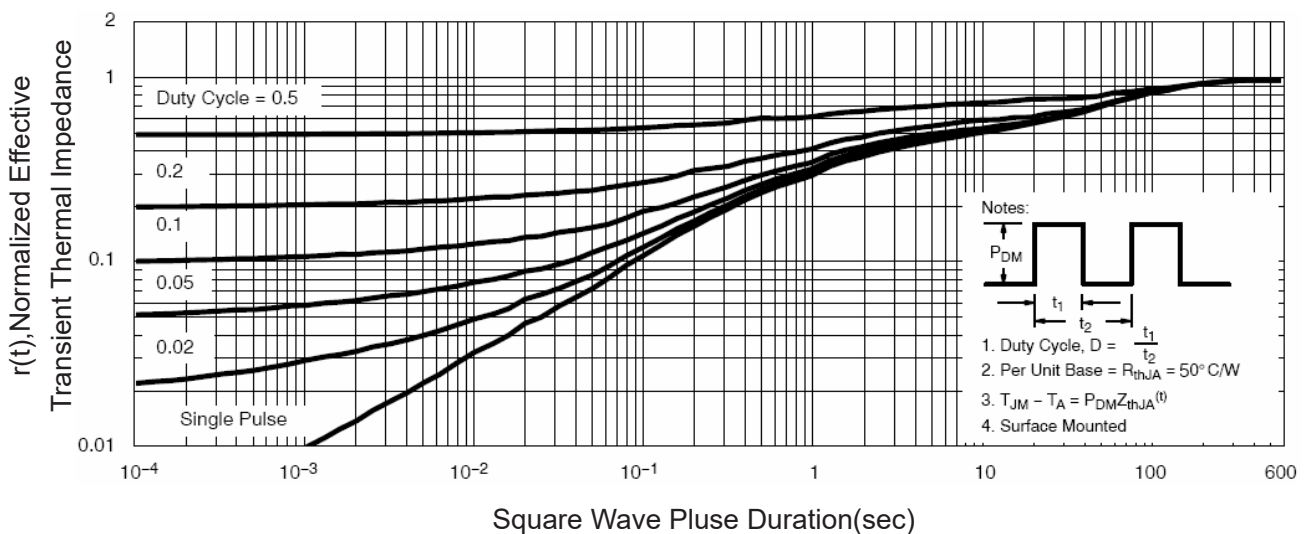
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-30	-33	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-30V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1	-1.5	-3	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-9.1A	-	15	20	mΩ
		V _{GS} =-4.5V, I _D =-5A	-	21	35	mΩ
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} =6Ω	-	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 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

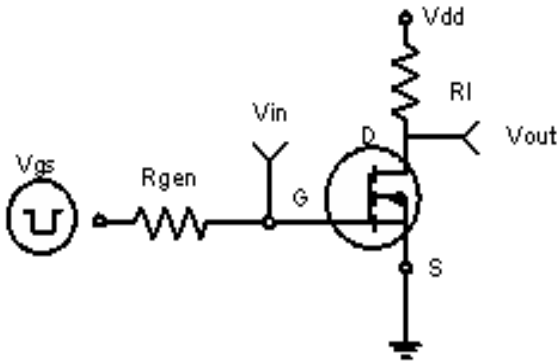


Figure 1: Switching Test Circuit

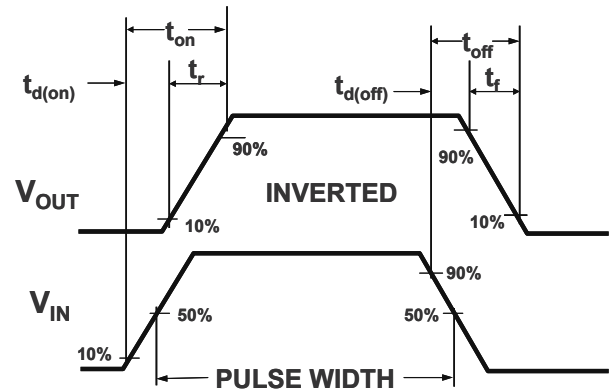


Figure 2: Switching Waveforms

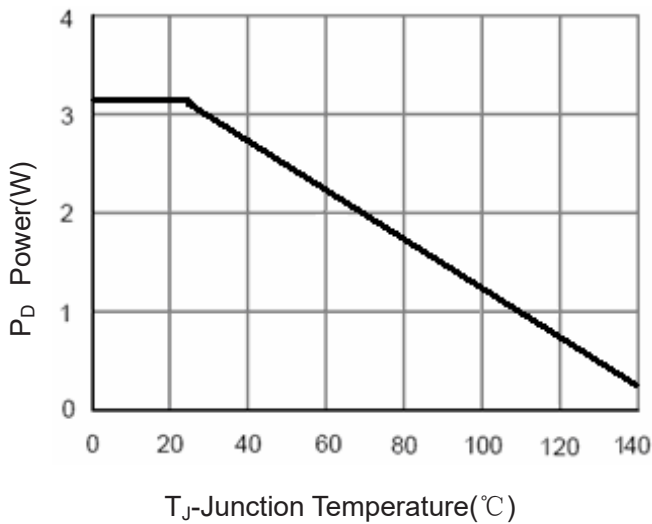


Figure 3 Power Dissipation

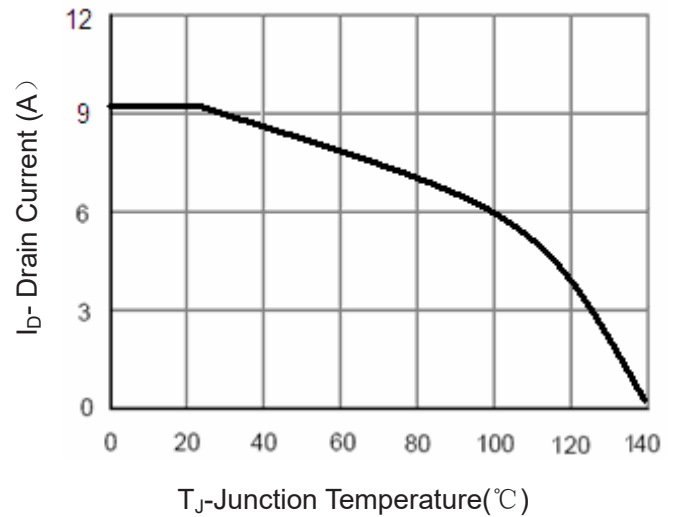


Figure 4 Drain Current

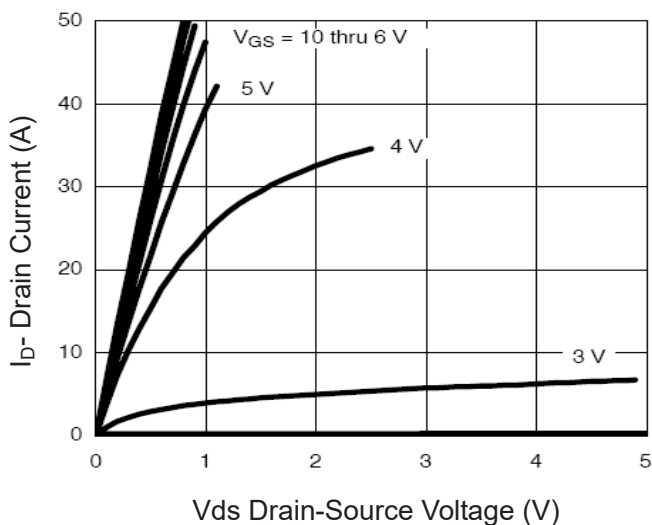


Figure 5 Output Characteristics

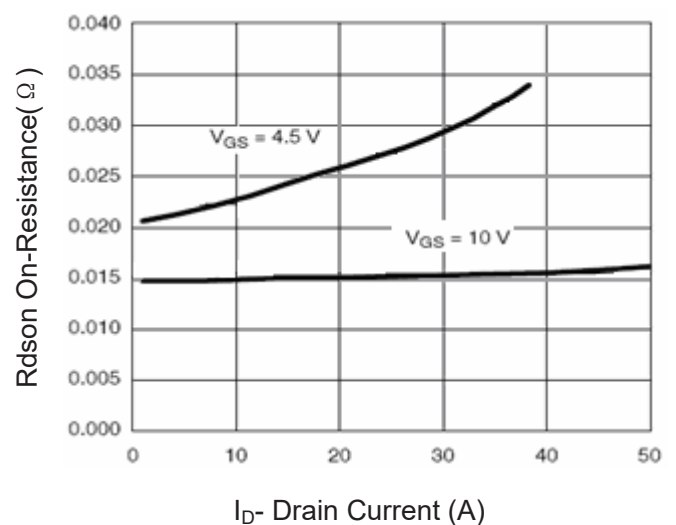
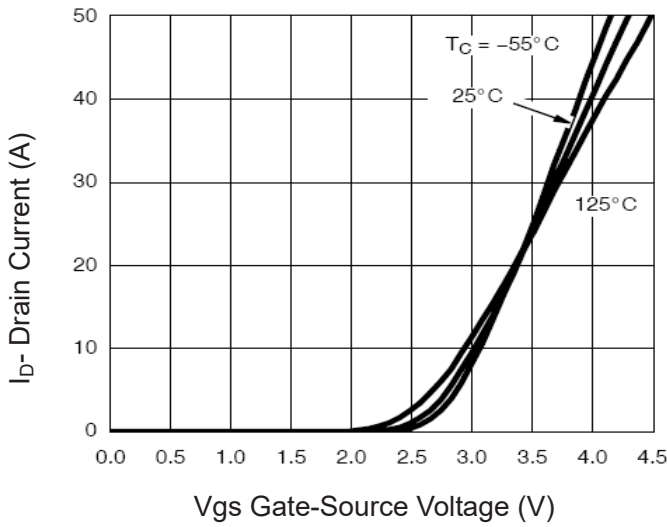
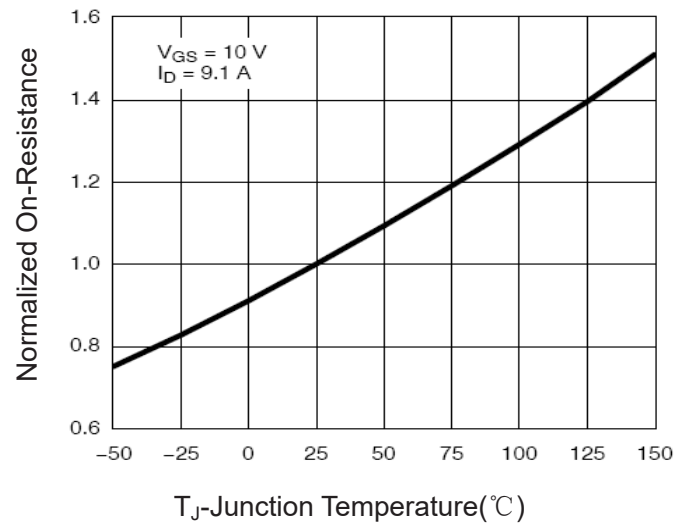
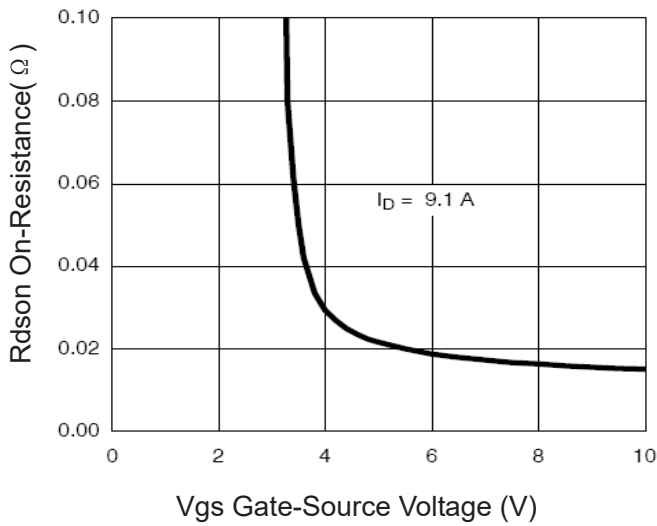
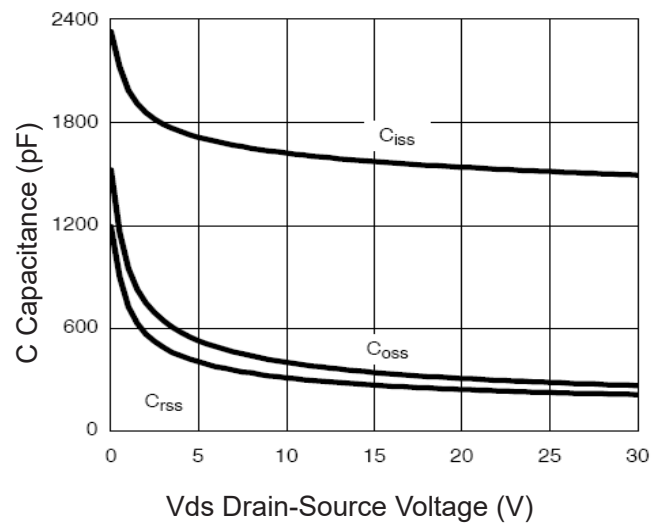
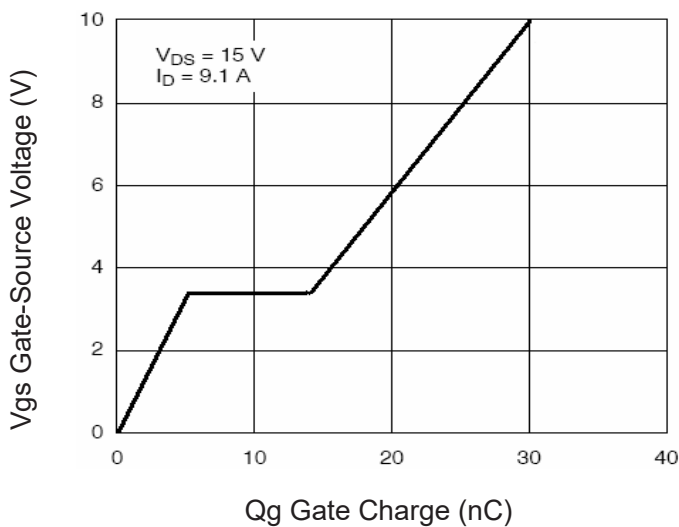
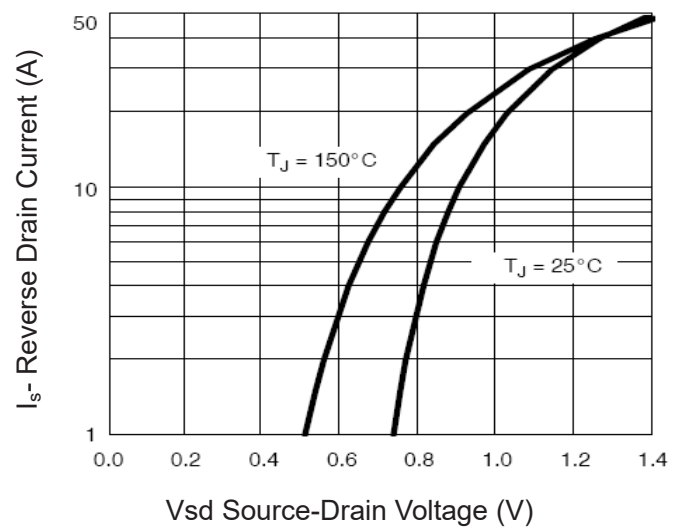
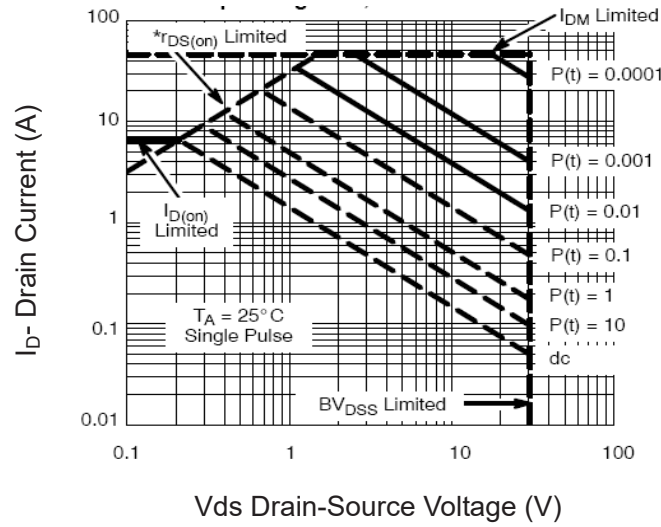
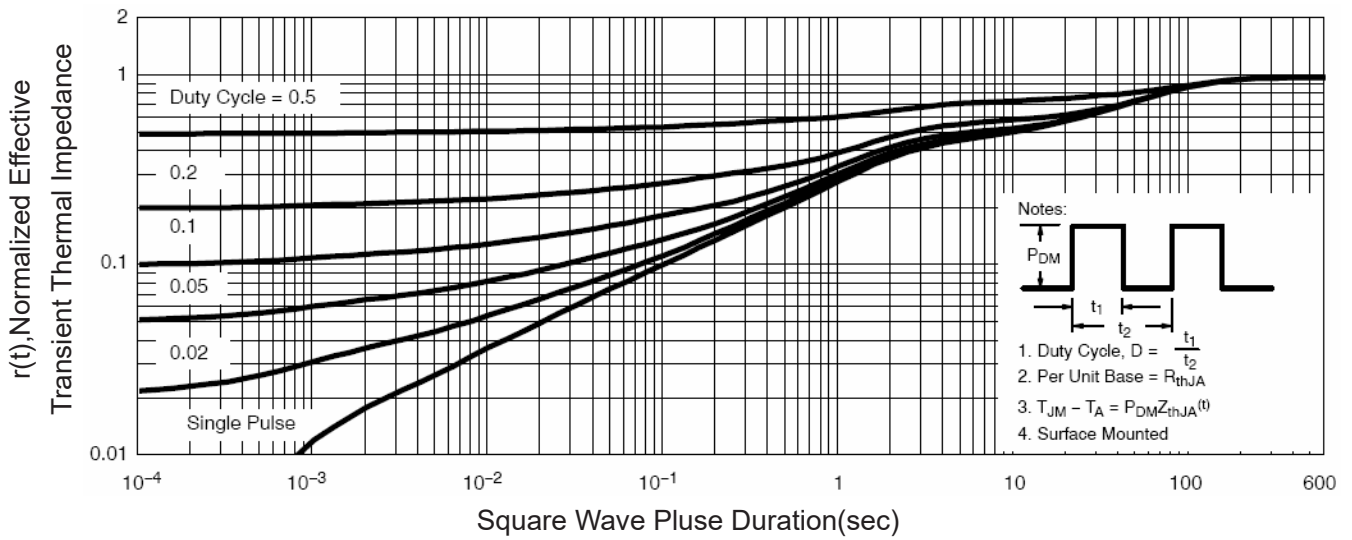


Figure 6 Drain-Source On-Resistance


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