

Description

The VSM6602N uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. This device is suitable for use as a Battery protection or in other Switching application.

General Features

● N-Channel

● $V_{DS} = 30V, I_D = 3.5A$

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

$R_{DS(ON)} < 95m\Omega @ V_{GS}=4.5V$

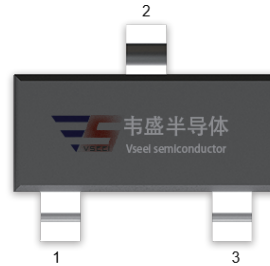
● P-Channel

$V_{DS} = -30V, I_D = -2.7A$

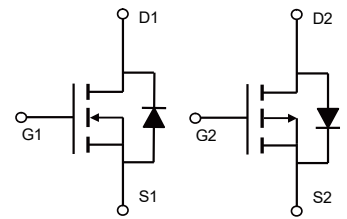
$R_{DS(ON)} < 100m\Omega @ V_{GS}=-10V$

$R_{DS(ON)} < 150m\Omega @ V_{GS}=-4.5V$

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage



SOT-23



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM6602N	VSM6602N-S2	SOT-23	Ø180mm	8mm	3000 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	3.5	-2.7	A
	$T_A=70^\circ\text{C}$		3	-2.1	
Pulsed Drain Current (Note 1)		I_{DM}	20	-15	A
Maximum Power Dissipation	$T_A=25^\circ\text{C}$	P_D	1.2		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 (Note 2)	$R_{\theta JA}$	N-Ch	104	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	P-Ch	104	$^\circ\text{C/W}$

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_{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	1.5	2.2	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.5A$	-	36	58	m Ω
		$V_{GS}=4.5V, I_D=2A$	-	60	95	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=3.1A$	-	4	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	251	-	PF
Output Capacitance	C_{oss}		-	38	-	PF
Reverse Transfer Capacitance	C_{rss}		-	32	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=15V, R_L=3\Omega$ $V_{GS}=10V, R_{GEN}=6\Omega$	-	4.5	-	nS
Turn-on Rise Time	t_r		-	1.5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	18.5	-	nS
Turn-Off Fall Time	t_f		-	15.5	-	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=3.5A,$ $V_{GS}=10V$	-	10.0	-	nC
Gate-Source Charge	Q_{gs}		-	1.9	-	nC
Gate-Drain Charge	Q_{gd}		-	1.8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=3.5A$	-	0.8	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	3.5	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-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	-2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-2.7A$	-	69	100	m Ω
		$V_{GS}=-4.5V, I_D=-2A$	-	110	150	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-10V, I_D=-2.7A$		2	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$	-	278	-	PF
Output Capacitance	C_{oss}		-	43	-	PF
Reverse Transfer Capacitance	C_{rss}		-	35	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, R_L=15\Omega$ $V_{GS}=-10V, R_{GEN}=6\Omega$	-	8	-	nS
Turn-on Rise Time	t_r		-	5	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	12	-	nS
Turn-Off Fall Time	t_f		-	4	-	nS
Total Gate Charge	Q_g	$V_{DS}=-15V, I_D=-2.7A, V_{GS}=-10V$	-	5.8	-	nC
Gate-Source Charge	Q_{gs}		-	1	-	nC
Gate-Drain Charge	Q_{gd}		-	1.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-2.7A$	-	-	-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

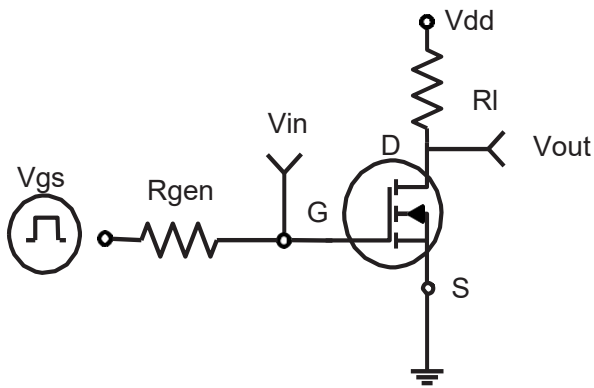


Figure 1: Switching Test Circuit

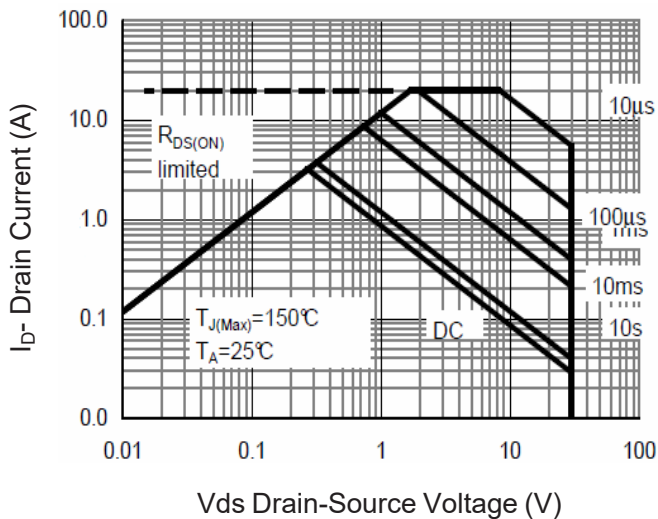


Figure 3 Safe Operation Area

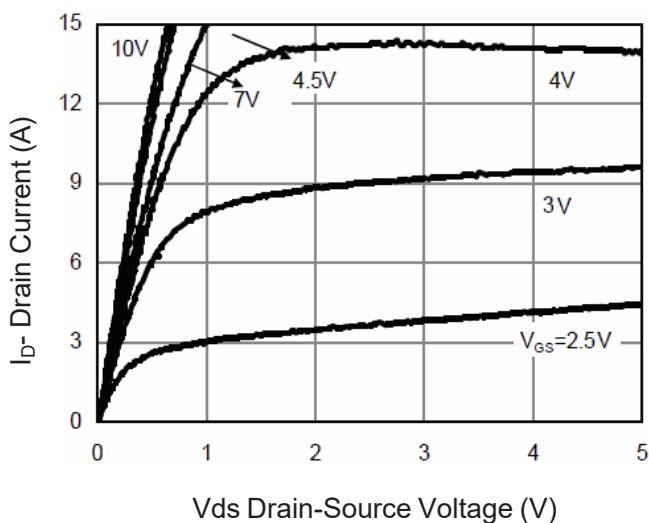


Figure 5 Output Characteristics

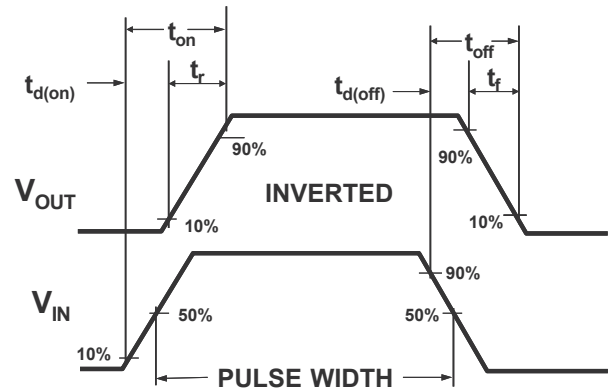


Figure 2: Switching Waveforms

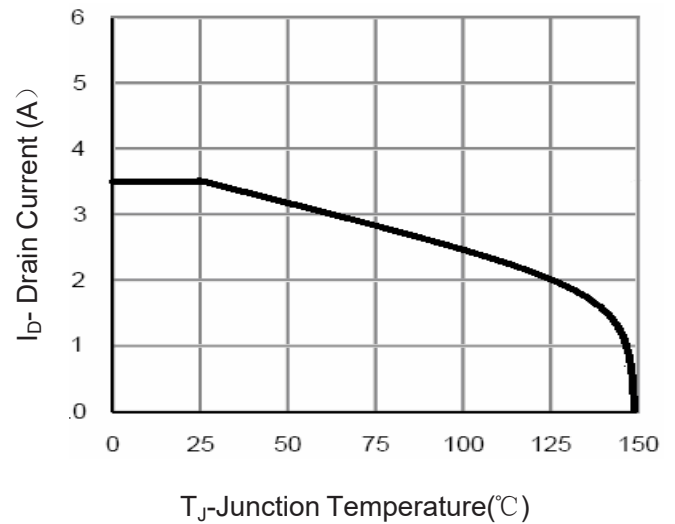


Figure 4 Drain Current

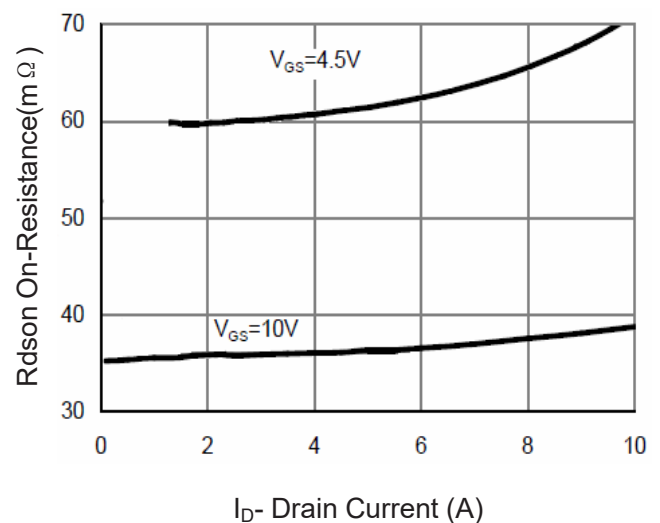
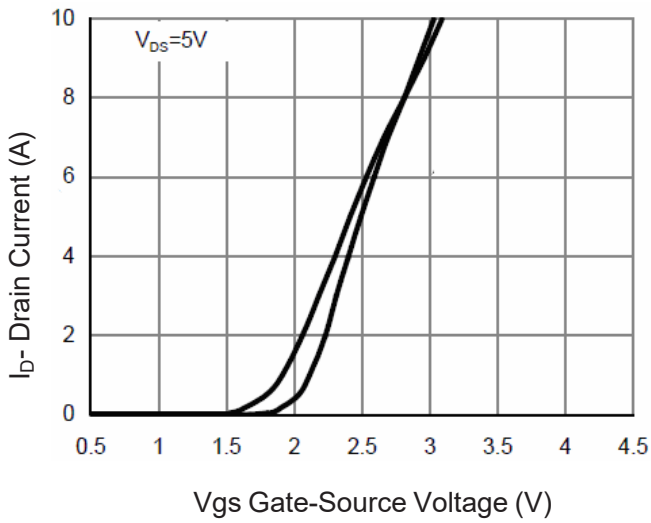
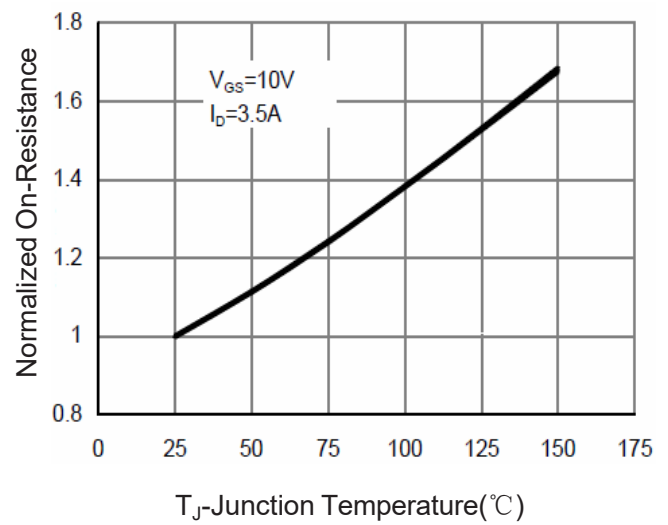
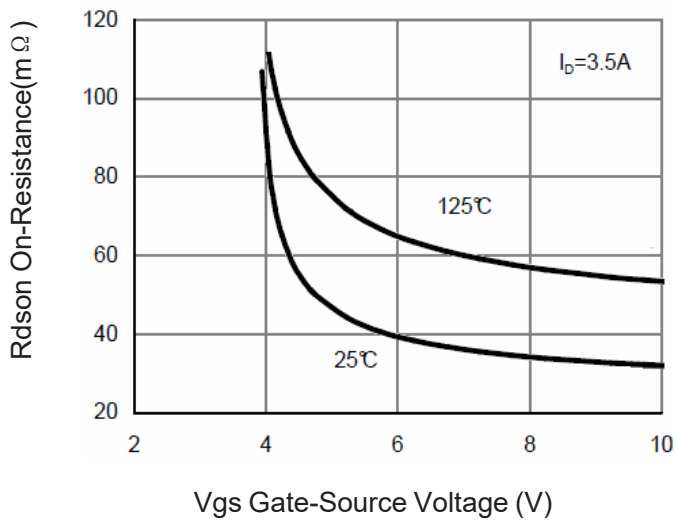
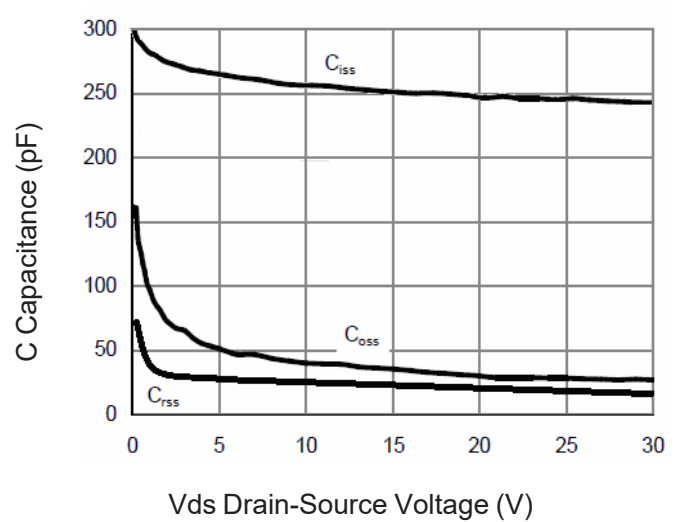
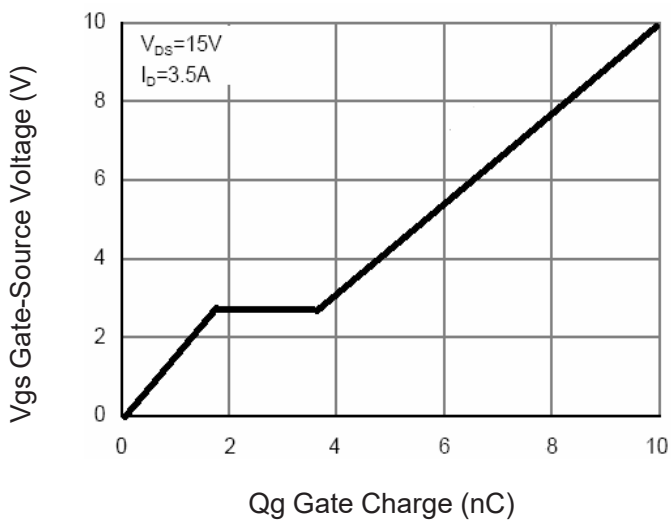
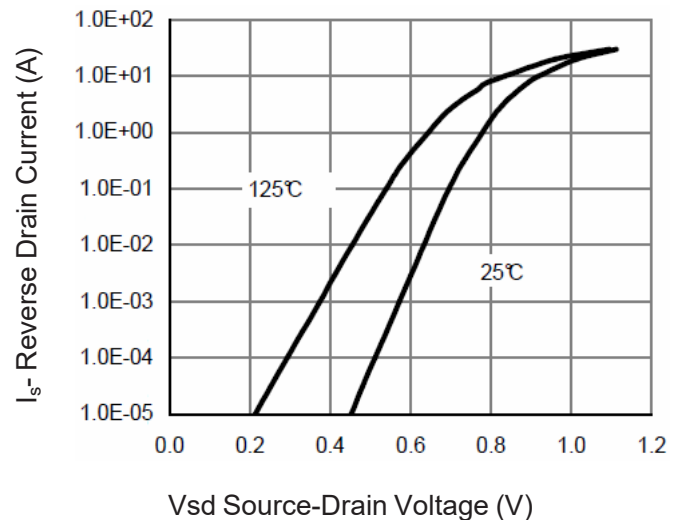


Figure 6 Drain-Source On-Resistance


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

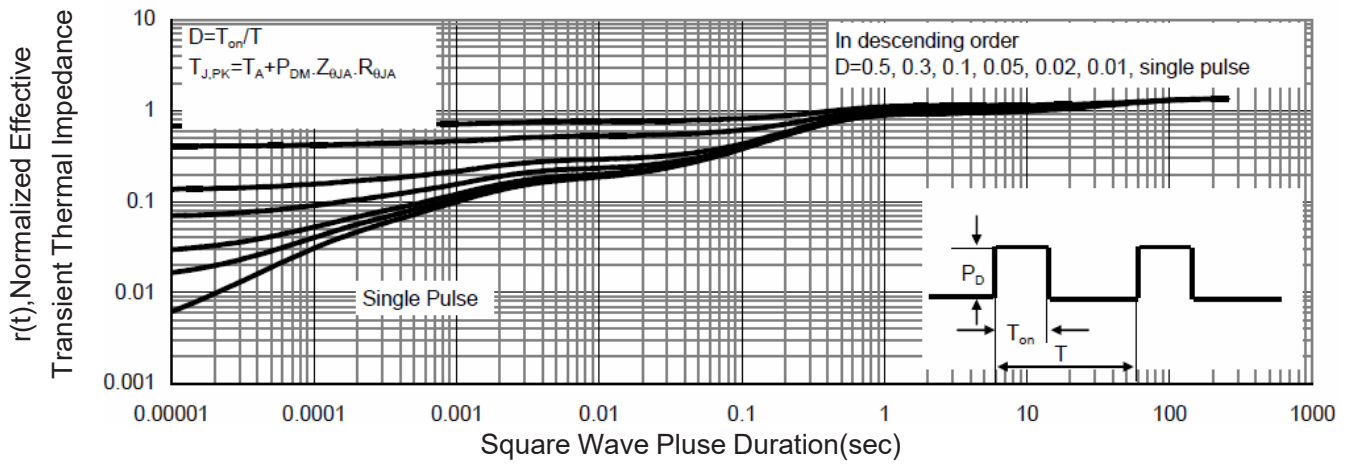


Figure 13 Normalized Maximum Transient Thermal Impedance

P- Channel Typical Electrical and Thermal Characteristics

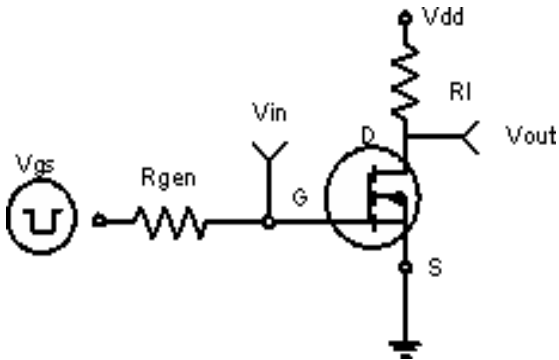


Figure 1: Switching Test Circuit

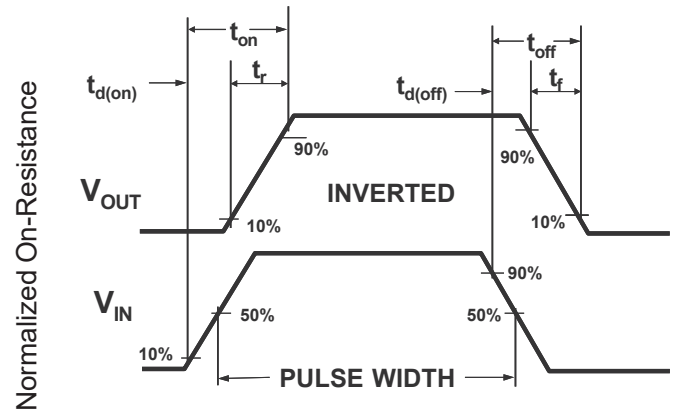


Figure 2: Switching Waveforms

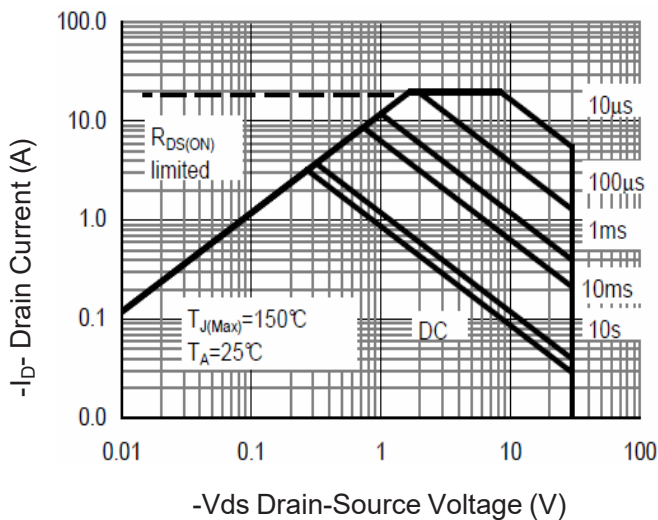


Figure 3 Safe Operation Area

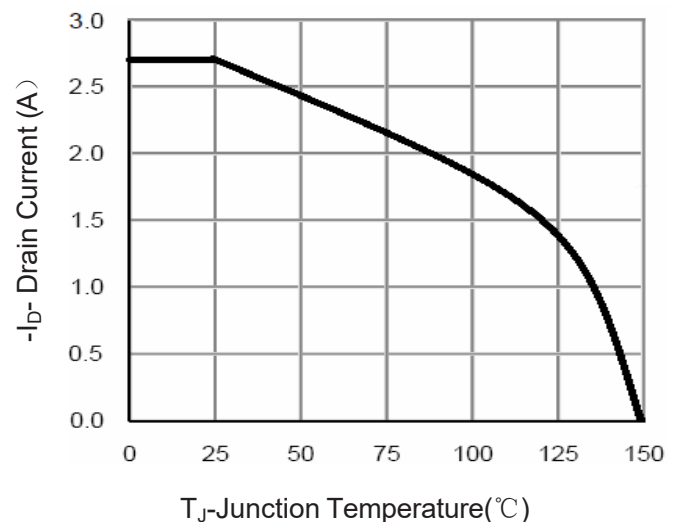


Figure 4 Drain Current

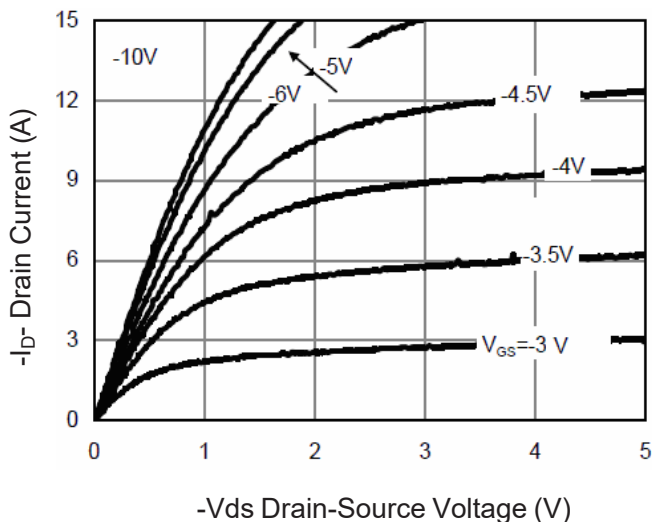


Figure 5 Output Characteristics

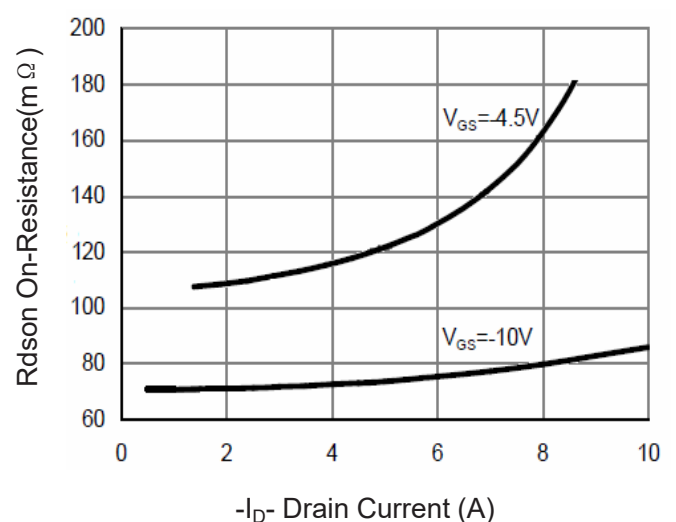
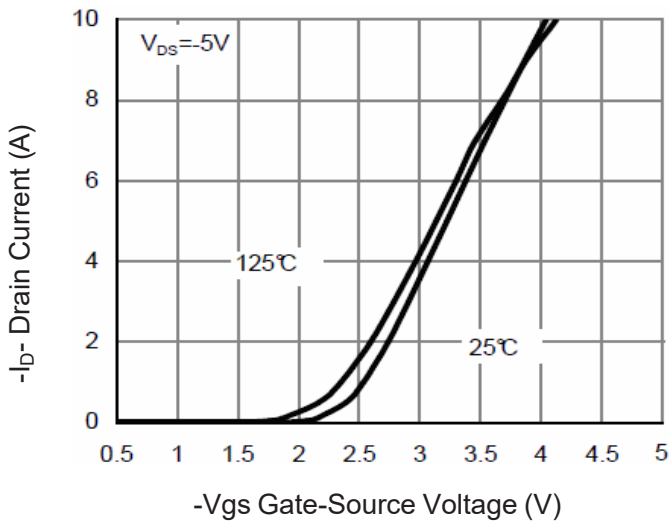
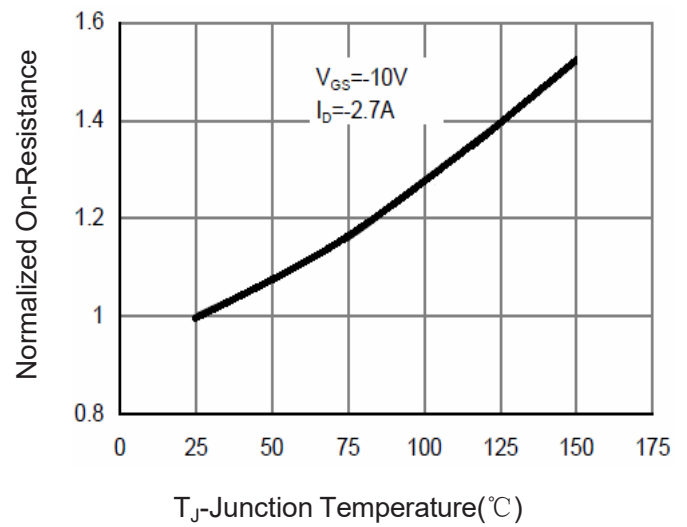
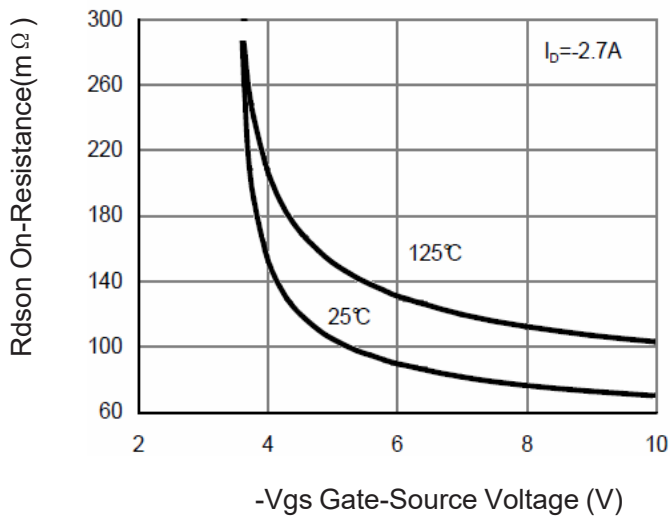
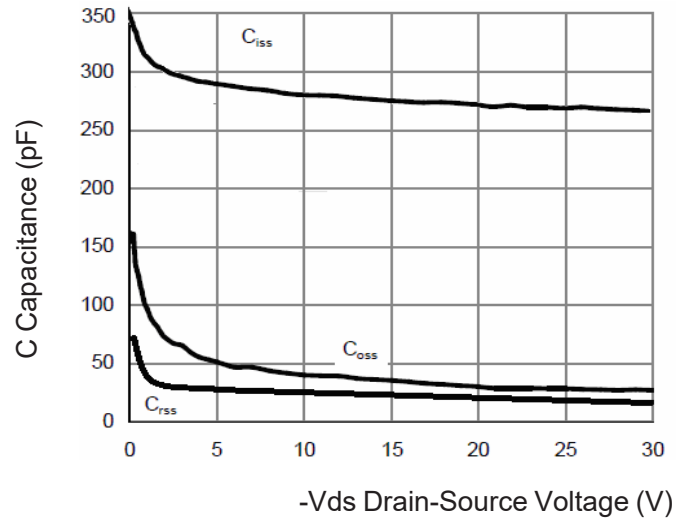
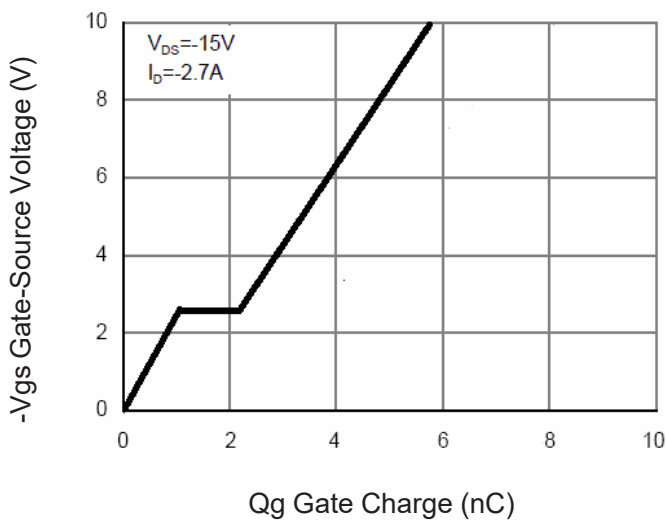
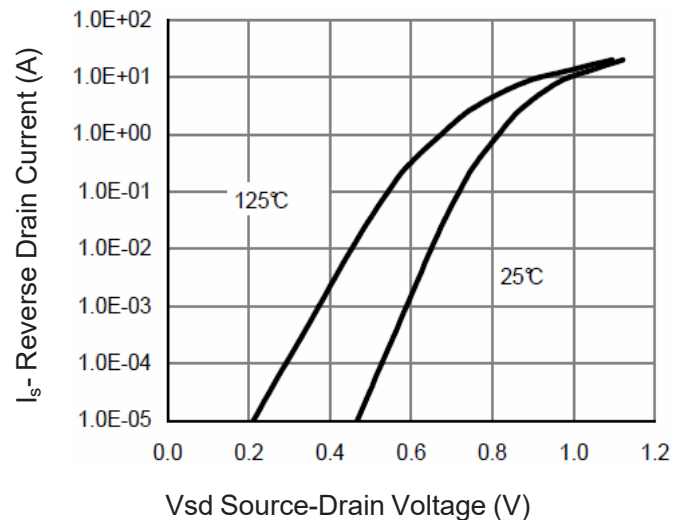


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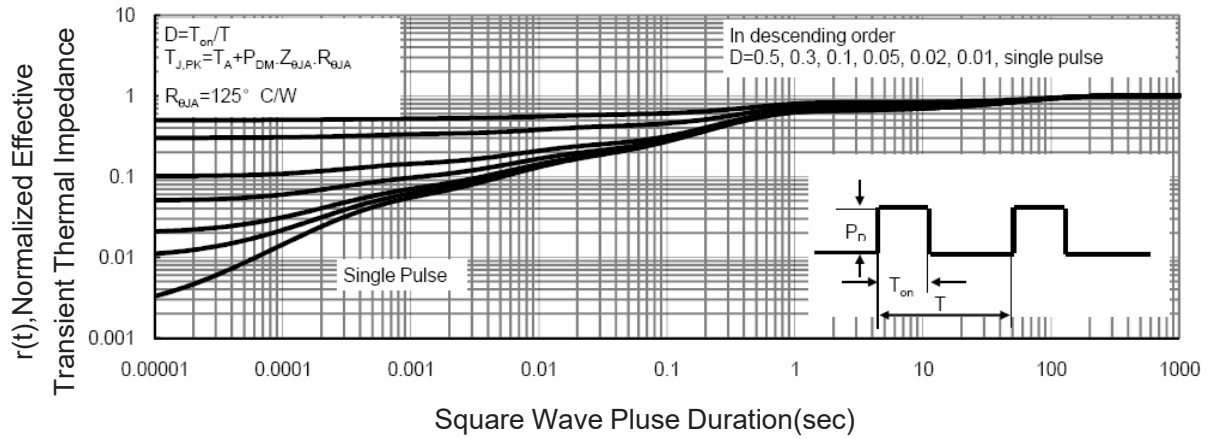


Figure 13 Normalized Maximum Transient Thermal Impedance