

Description

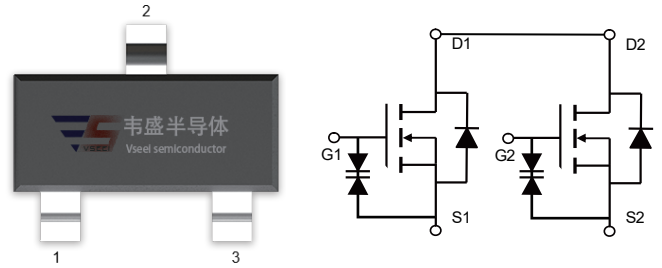
The VSM2006NE uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. This device is suitable for use as a load switch or in PWM applications. It is ESD protected.

General Features

- $V_{DS} = 20\text{ V}, I_D = 7\text{ A}$
 $R_{DS(ON)} < 18.5\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$
 $R_{DS(ON)} < 25\text{ m}\Omega @ V_{GS} = 2.5\text{ V}$
ESD Rating: 2000V HBM
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

Application

- PWM application
- Load switch



SOT-23

Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM2006NE	VSM2006NE-S2	SOT-23	Ø180mm	8mm	3000units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	I_D	7	A
Drain Current-Continuous ($T_A = 75^\circ\text{C}$)	$I_D(75^\circ\text{C})$	4.5	A
Drain Current-Pulsed	I_{DM}	30	A
Maximum Power Dissipation	P_D	1.47	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	85	$^\circ\text{C/W}$
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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}	$V_{GS}=0V, I_D=250\mu A$	20	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=20V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 10V, V_{DS}=0V$	-	-	± 10	μA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5	0.7	1.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_D=7A$	10	13.5	18.5	m Ω
		$V_{GS}=2.5V, I_D=5.5A$	12	19	25	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=7A$	-	20	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=10V, V_{GS}=0V,$ $F=1.0MHz$	-	850	-	pF
Output Capacitance	C_{oss}		-	178	-	pF
Reverse Transfer Capacitance	C_{rss}		-	150	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=10V, R_L=1.35\Omega$ $V_{GS}=5V, R_{GEN}=3\Omega$	-	6	-	nS
Turn-on Rise Time	t_r		-	13	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	52	-	nS
Turn-Off Fall Time	t_f		-	16	-	nS
Total Gate Charge	Q_g	$V_{DS}=10V, I_D=7A,$ $V_{GS}=4.5V$	-	12.5	-	nC
Gate-Source Charge	Q_{gs}		-	1.3	-	nC
Gate-Drain Charge	Q_{gd}		-	3.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=1A$	-	-	1.2	V
Diode Forward Current	I_S		-	-	7	A

Notes:

1. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.
2. Guaranteed by design, not subject to production.
3. These curves are based on the junction-to-ambient thermal impedance, assuming a maximum junction temperature of $T_{J(MAX)}=150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

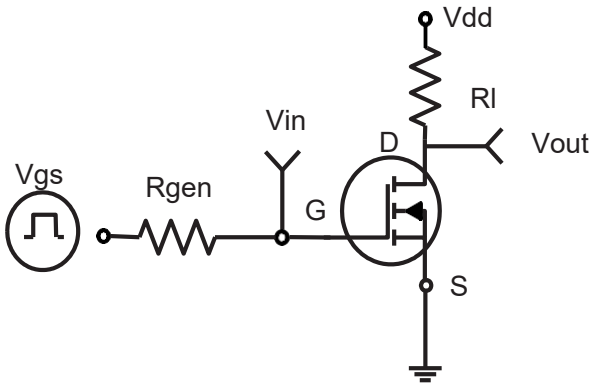


Figure 1: Switching Test Circuit

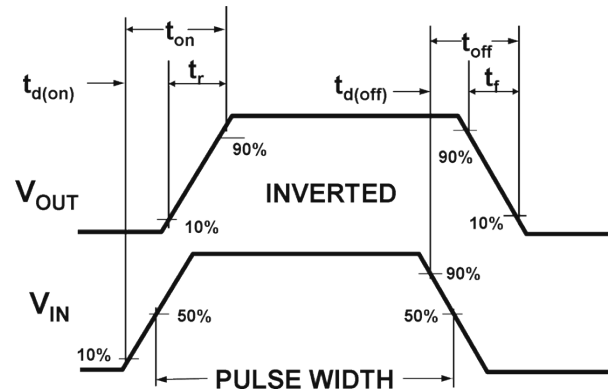


Figure 2: Switching Waveforms

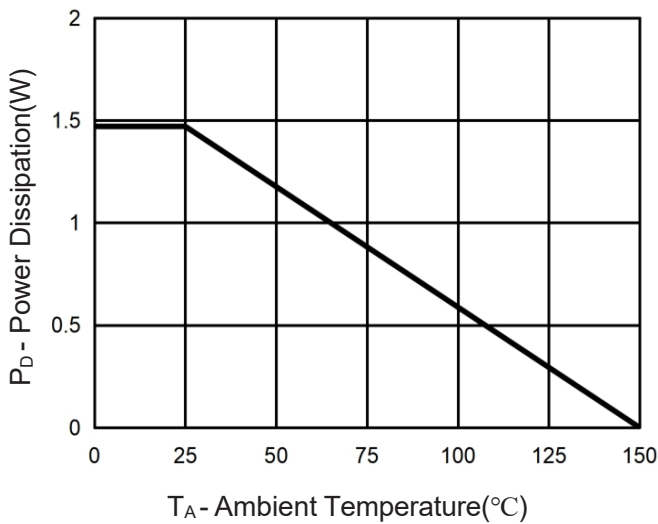


Figure 3 Power De-rating

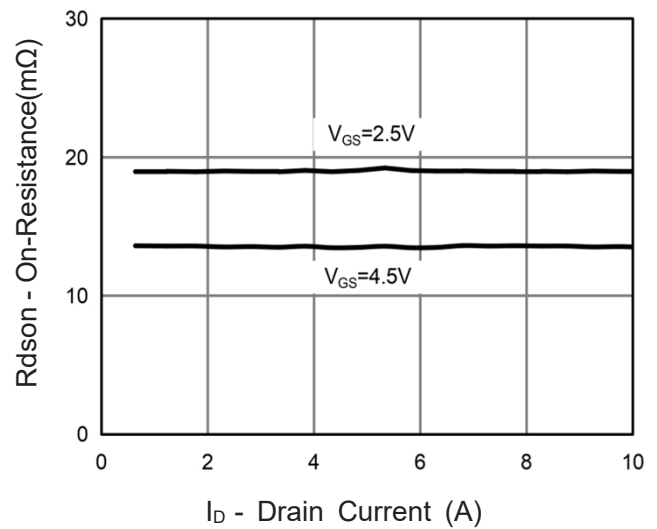


Figure 4 Drain-Source On-Resistance

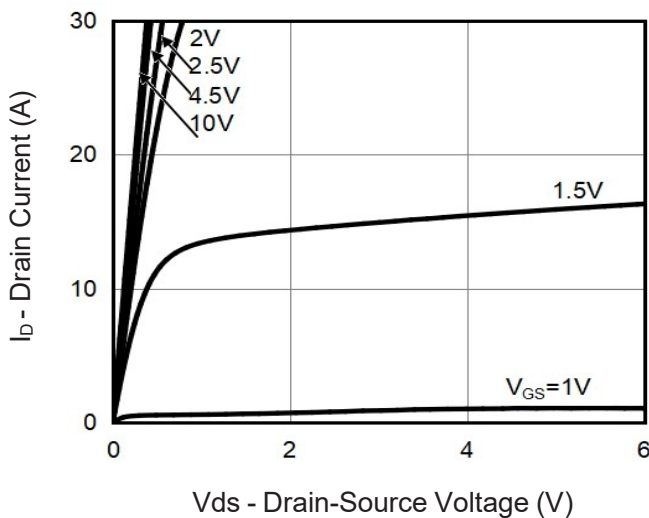


Figure 5 Output Characteristics

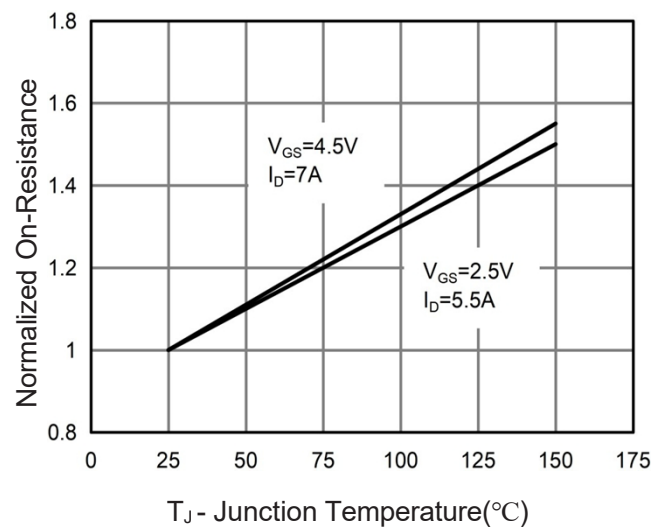
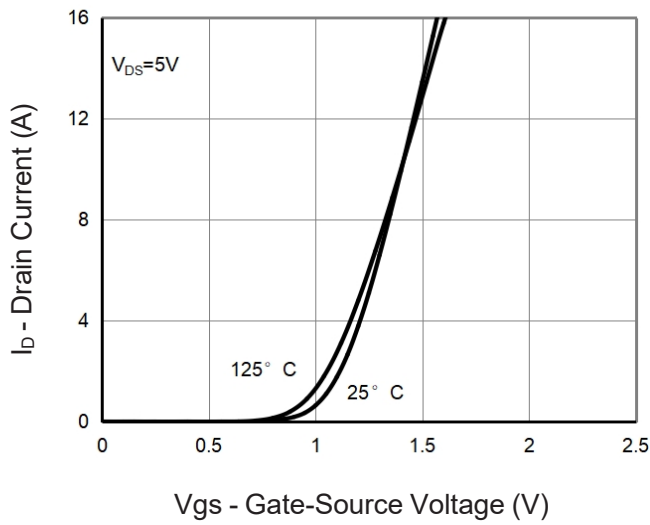
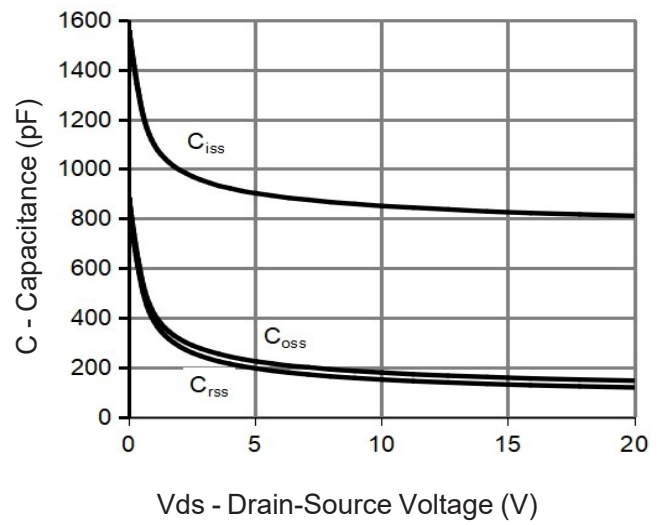
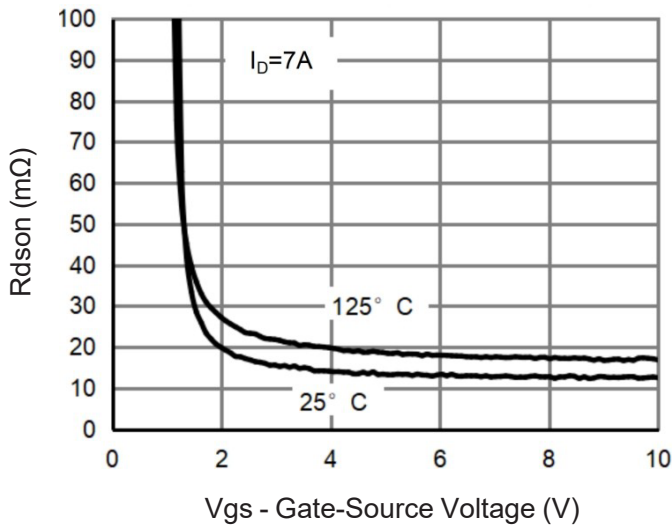
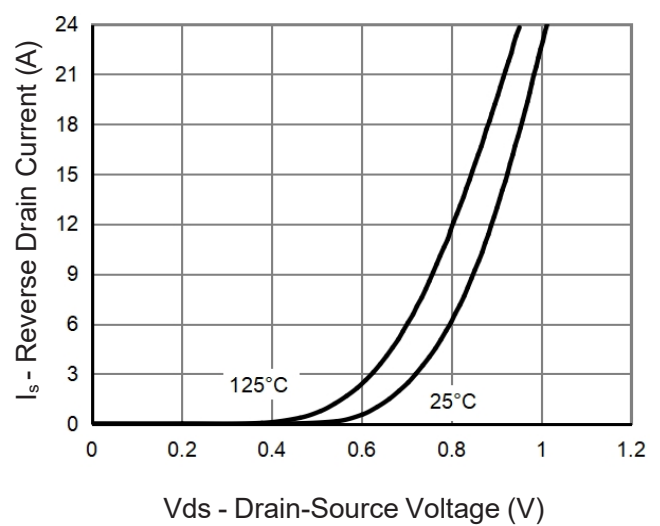
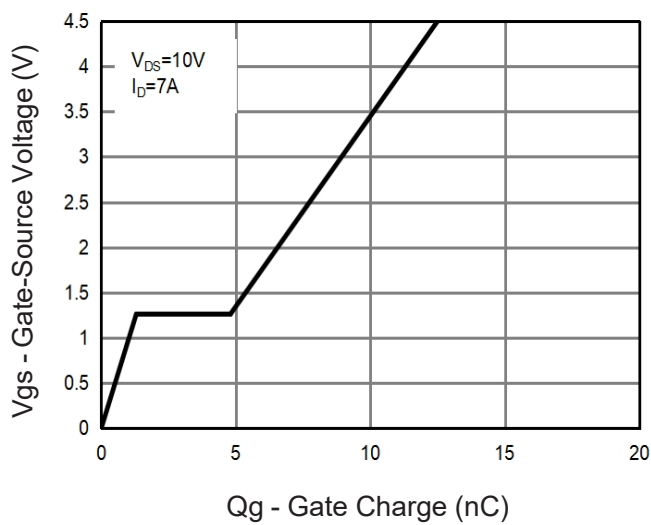
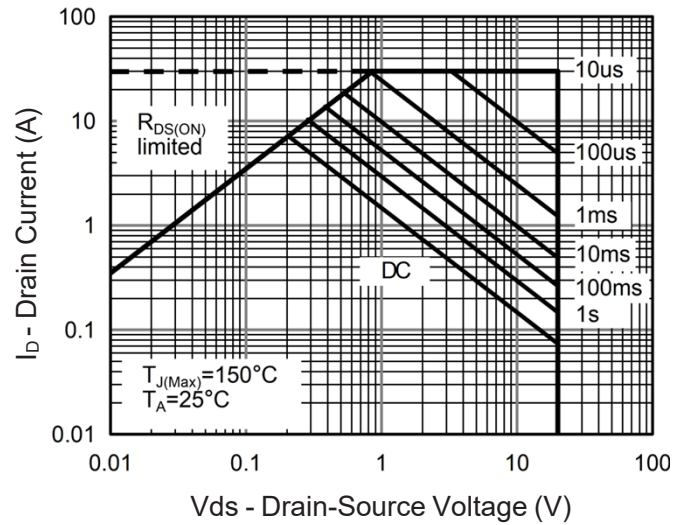


Figure 6 Drain-Source On-Resistance


Figure 7 Transfer Characteristics

Figure 8 Capacitance vs VDS

Figure 9 Rdson vs VGS

Figure 10 Source-Drain Diode Forward

Figure 11 Gate Charge

Figure 12 Safe Operation Area

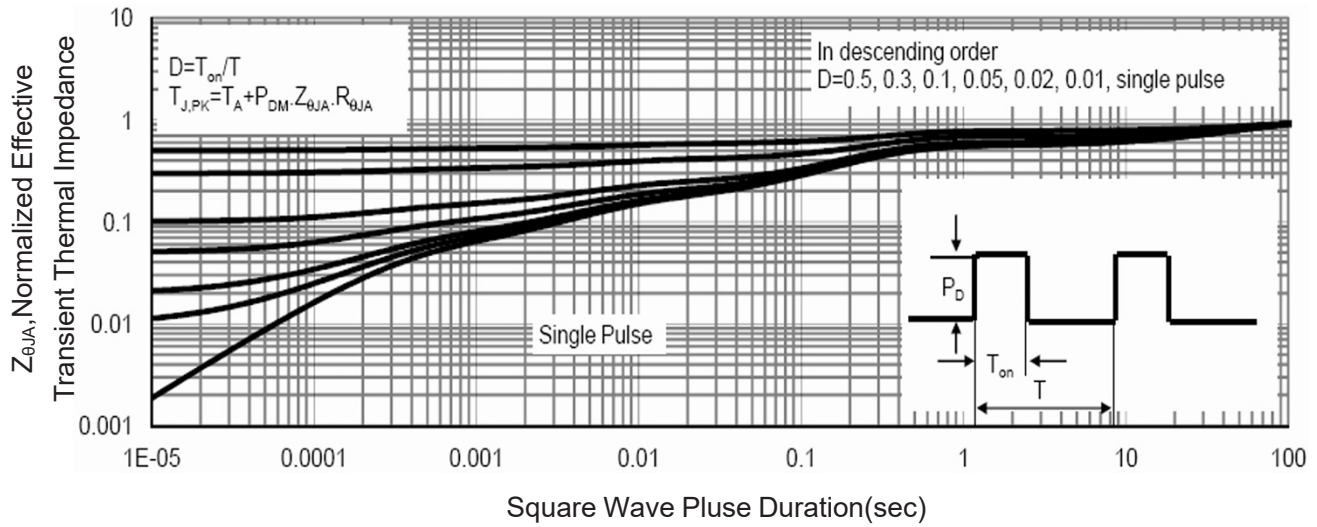


Figure 13 Normalized Maximum Transient Thermal Impedance