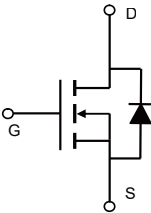


Description

Features 40V, 8A $R_{DS(ON)} < 22m\Omega @ V_{GS} = 10V$ $R_{DS(ON)} < 27m\Omega @ V_{GS} = 4.5V$ - Advanced Trench Technology - Excellent $R_{DS(ON)}$ and Low Gate Charge - Lead Free	Applications - Load Switch - PWM Application - Power Management
 SOT-23-6	 Schematic

Package Marking and Ordering Information

Device Marking	Device	Outline	Package	Reel Size	Reel(pcs)	Per Carton (pcs)
VSM170N04A	VSM170N04A-S6	TAPING	SOT-23-6	7"	3000	120000

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

Symbol	Parameter	Value	Units
V_{DS}	Drain-to-Source Voltage	40	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_A = 25^\circ\text{C}$	A
		$T_A = 100^\circ\text{C}$	
I_{DM}	Pulsed Drain Current ⁽¹⁾	32	A
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽²⁾	73	$^\circ\text{C/W}$
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 150	$^\circ\text{C}$

Electrical Characteristics ($T_J = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0V	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 40V, V _{GS} = 0V	-	-	1.0	μA
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = ±20V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	1.3	1.8	2.2	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽³⁾	V _{GS} = 10V, I _D = 4A	-	17	22	mΩ
		V _{GS} = 4.5V, I _D = 3A	-	21	27	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 20V, f = 1MHz	-	1112	-	pF
C _{oss}	Output Capacitance		-	74	-	pF
C _{rss}	Reverse Transfer Capacitance		-	61	-	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 10V V _{DS} = 20V, I _D = 5A	-	22	-	nC
Q _{gs}	Gate Source Charge		-	4	-	nC
Q _{gd}	Gate Drain("Miller") Charge		-	4	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 20V I _D = 5A, R _{GEN} = 3 Ω	-	7	-	ns
t _r	Turn-On Rise Time		-	11	-	ns
t _{d(off)}	Turn-Off DelayTime		-	25	-	ns
t _f	Turn-Off Fall Time		-	3	-	ns
Drain-Source Diode Characteristics and Max Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	8	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	32	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _S = 8A	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	I _F = 5A, di/dt = 100A/us	-	10	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	5	-	nC

1704 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

2. $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB

3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.

Typical Performance Characteristics

Figure 1: Output Characteristics

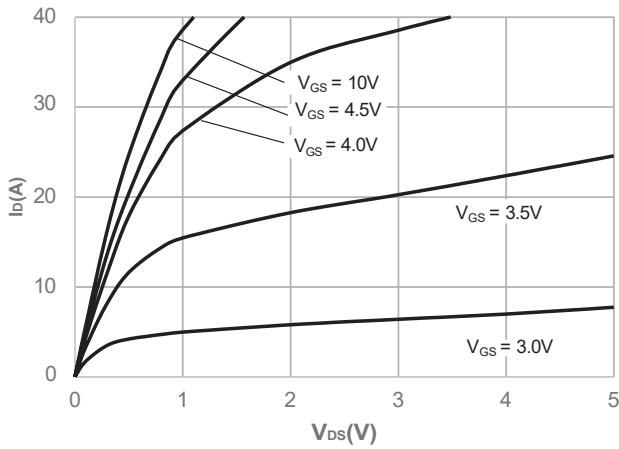


Figure 2: Typical Transfer Characteristics

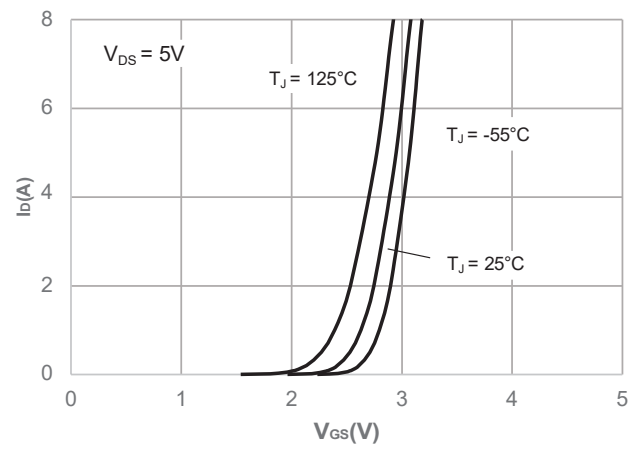


Figure 3: On-resistance vs. Drain Current

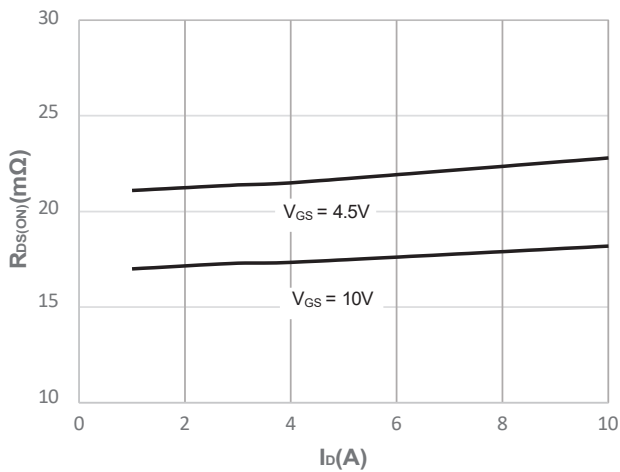


Figure 4: Body Diode Characteristics

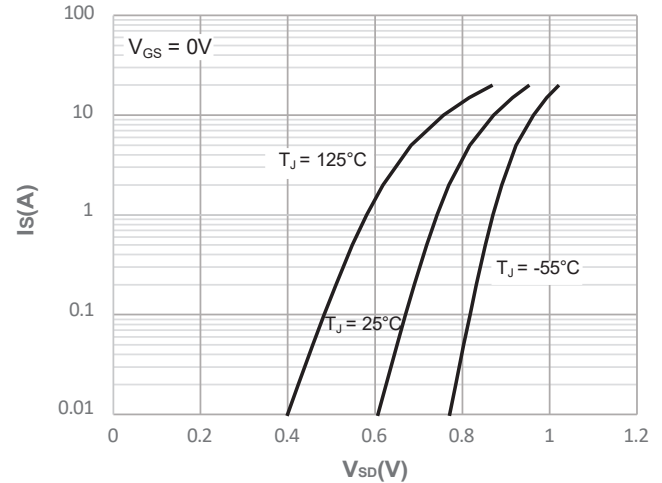


Figure 5: Gate Charge Characteristics

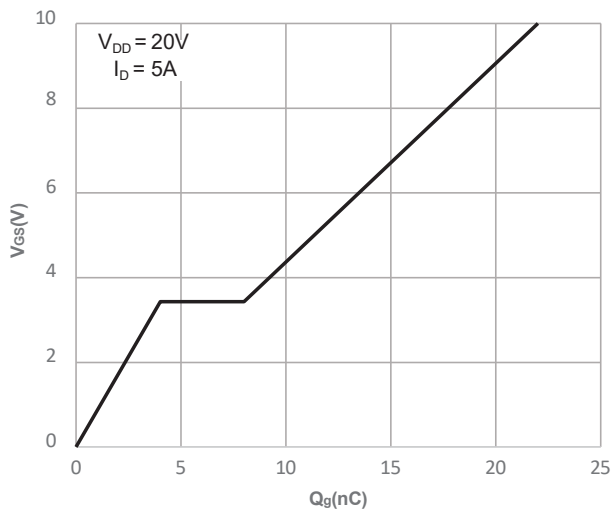
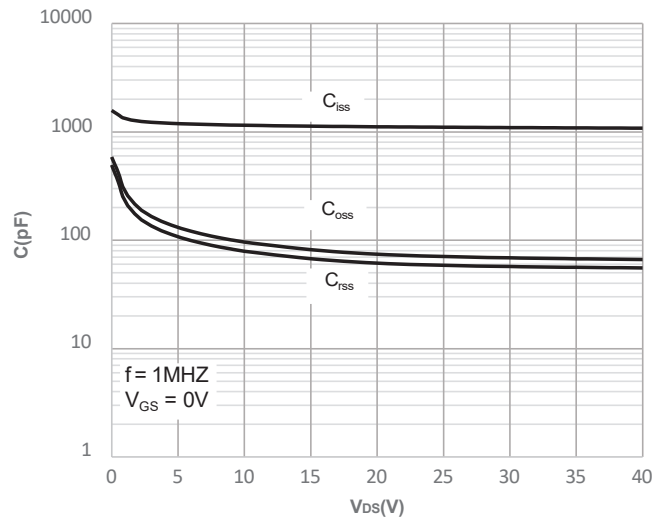


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

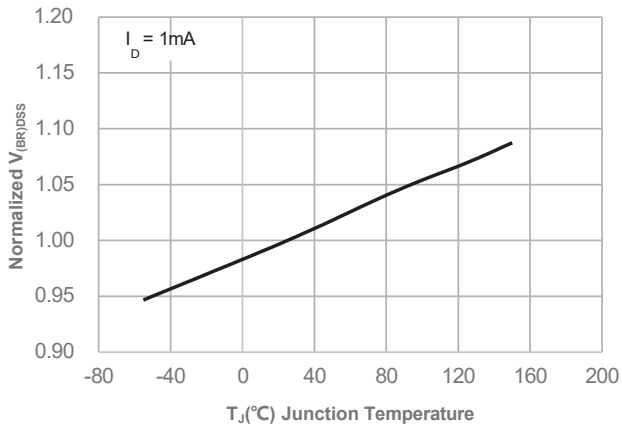


Figure 8: Normalized on Resistance vs. Junction Temperature

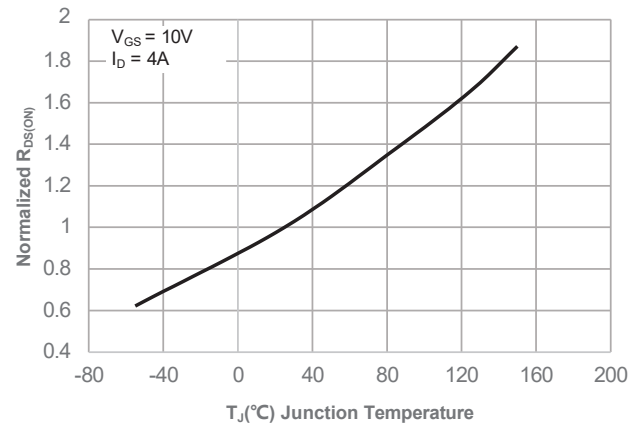


Figure 9: Maximum Safe Operating Area

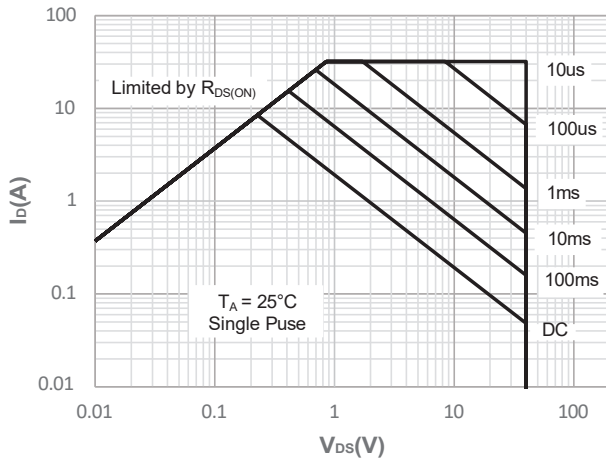


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

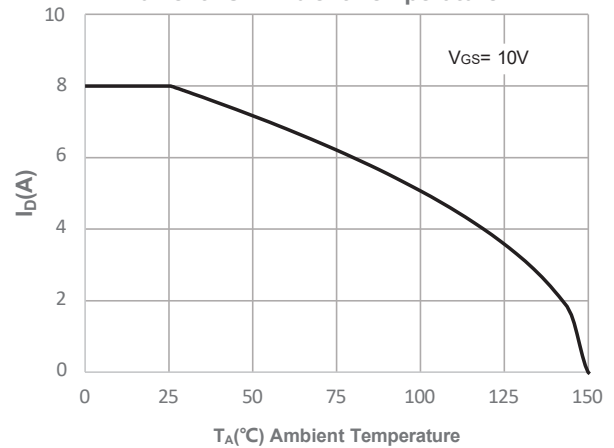


Figure 11: Normalized Maximum Transient Thermal Impedance

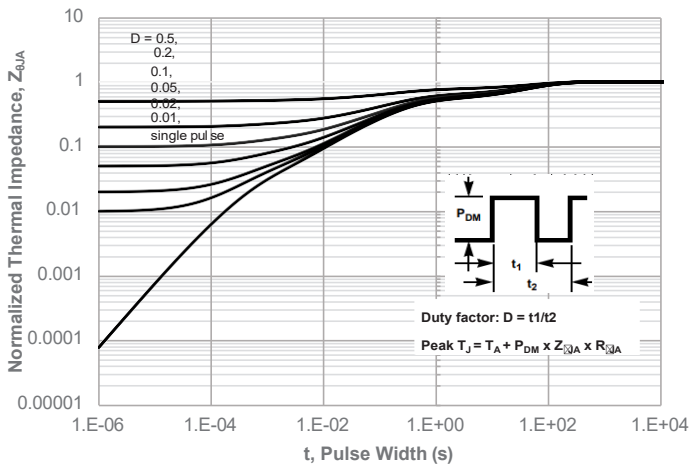
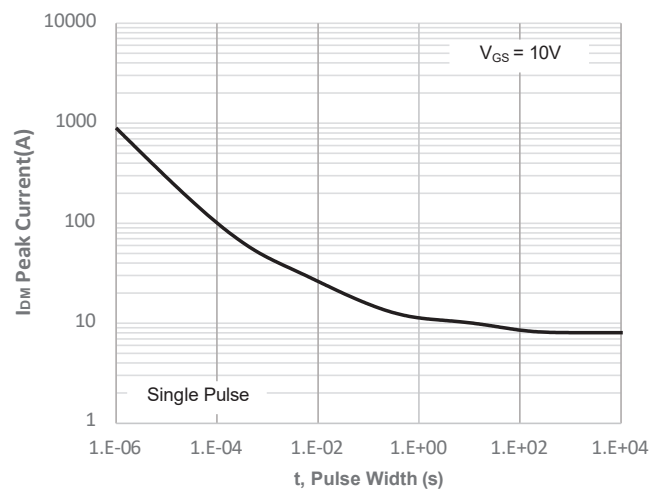


Figure 12: Peak Current Capacity



Test Circuit

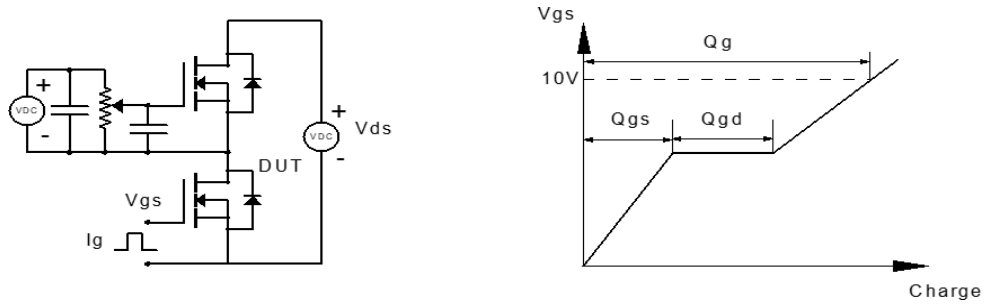


Figure 1: Gate Charge Test Circuit & Waveform

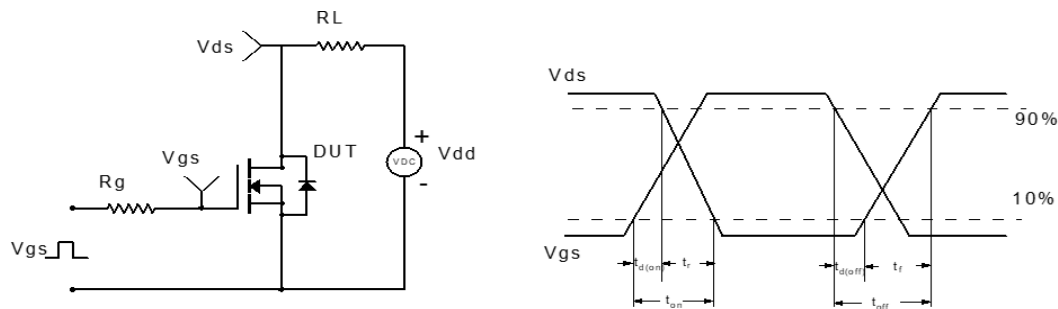


Figure 2: Resistive Switching Test Circuit & Waveform

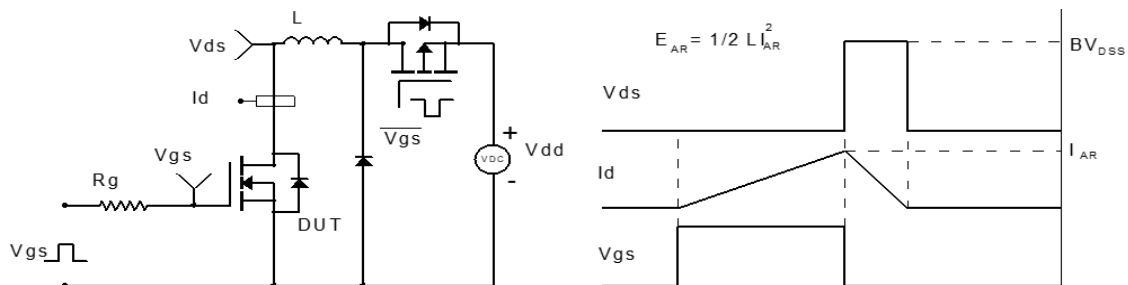


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

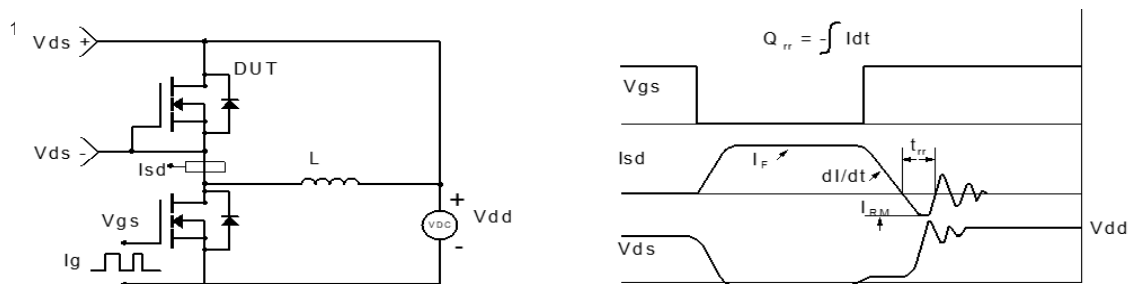


Figure 4: Diode Recovery Test Circuit & Waveform