

Description

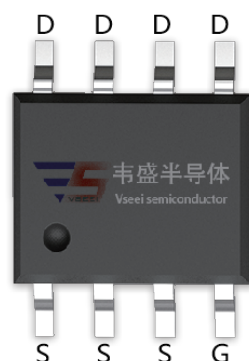
The VSM6P03 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in load switch and battery protection applications.

General Features

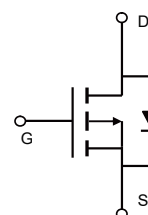
- $V_{DS} = -30V, I_D = -6.5A$
 $R_{DS(ON)} < 42m\Omega @ V_{GS} = -10V$
 $R_{DS(ON)} < 72m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low R_{ds}
- Fully characterized avalanche voltage and current

Application

- Load switch
- battery protection



SOP-8



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM6P03	VSM6P03-S8	SOP-8	Ø330mm	12mm	4000units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-6.5	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D (100^\circ C)$	-4.5	A
Pulsed Drain Current	I_{DM}	-30	A
Maximum Power Dissipation	P_D	3.1	W
Avalanche Current ^(Note 1)	I_{AR}	-8	A
Single pulse avalanche energy ^(Note 5)	E_{AS}	72	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	40	$^\circ C/W$
Thermal Resistance, Junction-to-Lead ^(Note 2)	$R_{\theta JL}$	24	$^\circ C/W$

Electrical Characteristics (T_A=25°C unless otherwise noted)

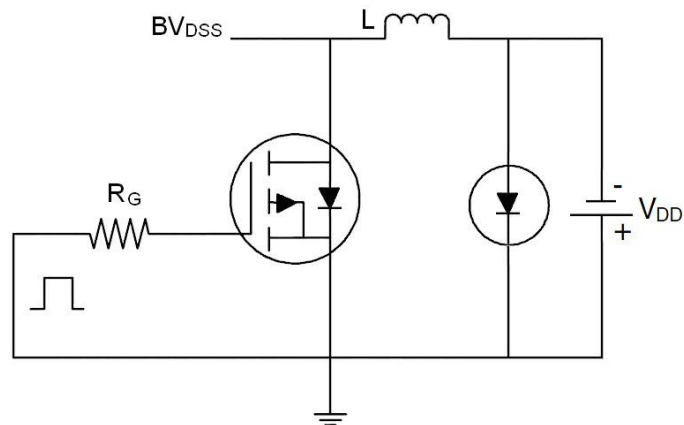
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-30	-33	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-30V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.3	-1.65	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-6.5A	-	30	42	mΩ
		V _{GS} =-4.5V, I _D =-5A	-	53	72	
Gate resistance	R _G		-	4.3	-	Ω
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-6.5A	14	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =-15V, V _{GS} =0V, F=1.0MHz	-	660	-	PF
Output Capacitance	C _{oss}		-	100	-	PF
Reverse Transfer Capacitance	C _{rss}		-	65	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-15V, I _D =-6.5A V _{GS} =-10V, R _{GEN} =3Ω	-	7.5	-	nS
Turn-on Rise Time	t _r		-	5.5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	19	-	nS
Turn-Off Fall Time	t _f		-	7	-	nS
Total Gate Charge	Q _g	V _{DS} =-15V, I _D =-6.5A, V _{GS} =-10V	-	9.2	-	nC
Gate-Source Charge	Q _{gs}		-	1.6	-	nC
Gate-Drain Charge	Q _{gd}		-	2.2	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-6.5A	-	-	-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-6.5	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, IF =-6.5A	-	12	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	8	-	nC

Notes:

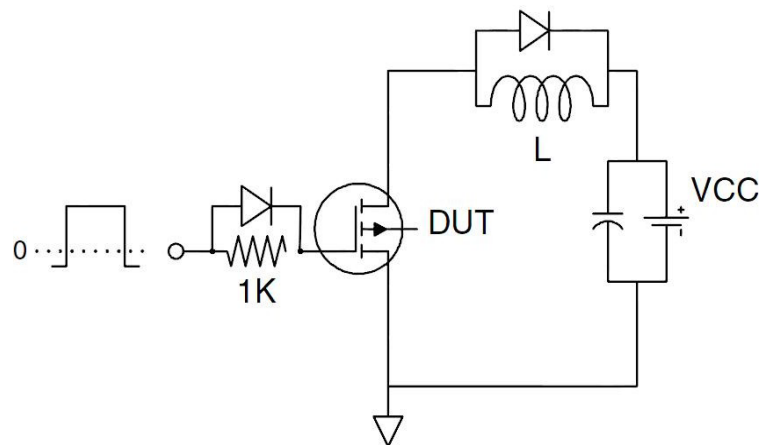
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of R_{θJA} is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C. The value in any given application depends on the user's specific board design. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : T_J=25°C, V_{DD}=-15V, V_G=-10V, L=0.5mH, R_g=25Ω

Test Circuit

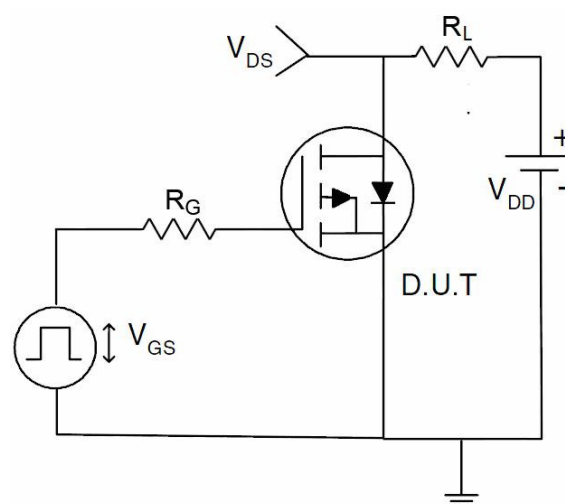
1) E_{AS} Test Circuit



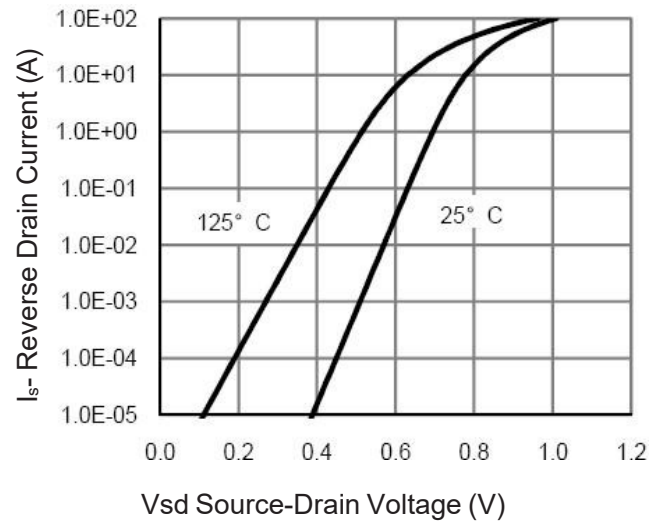
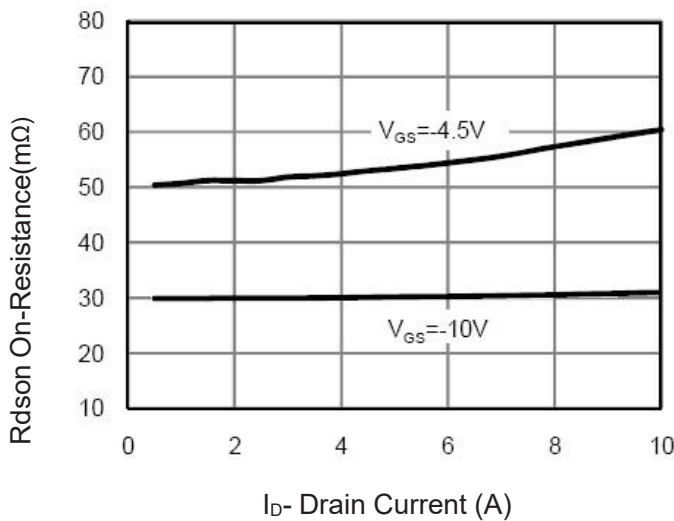
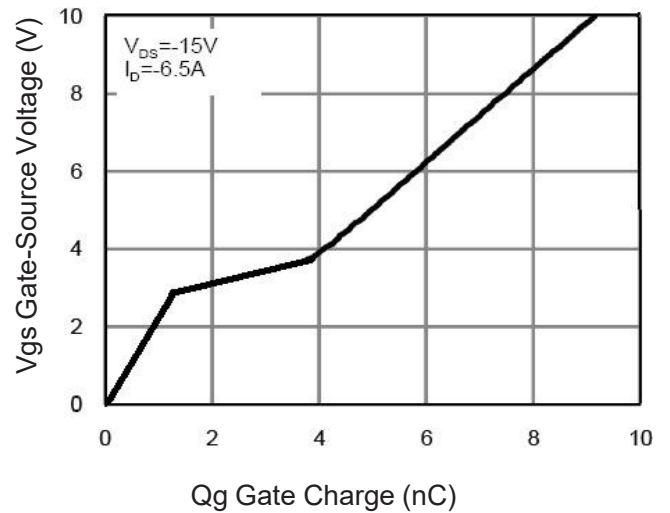
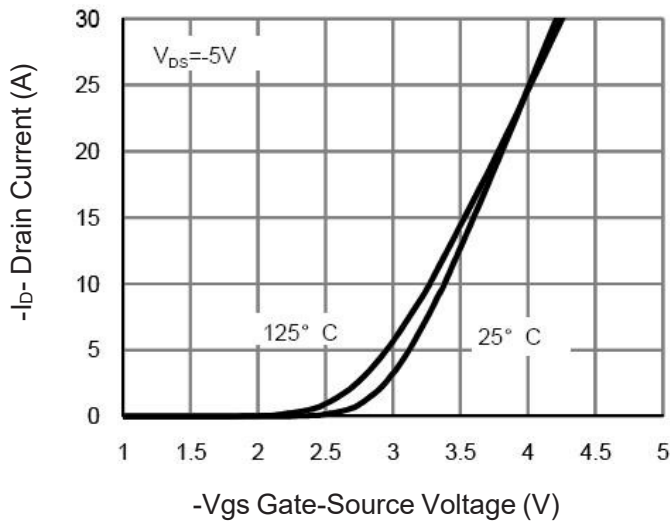
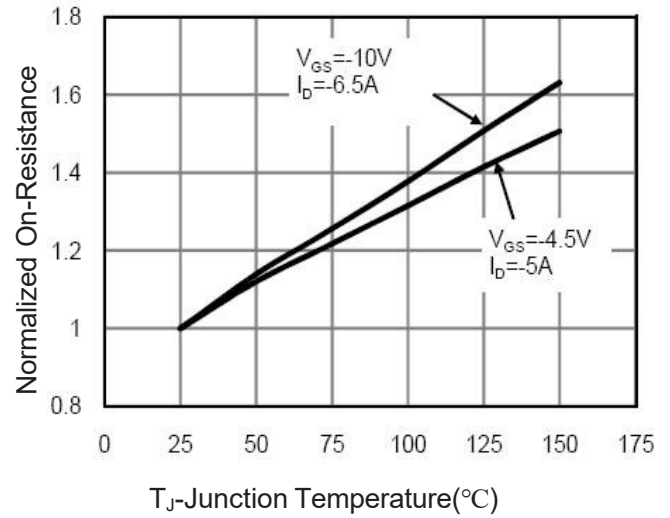
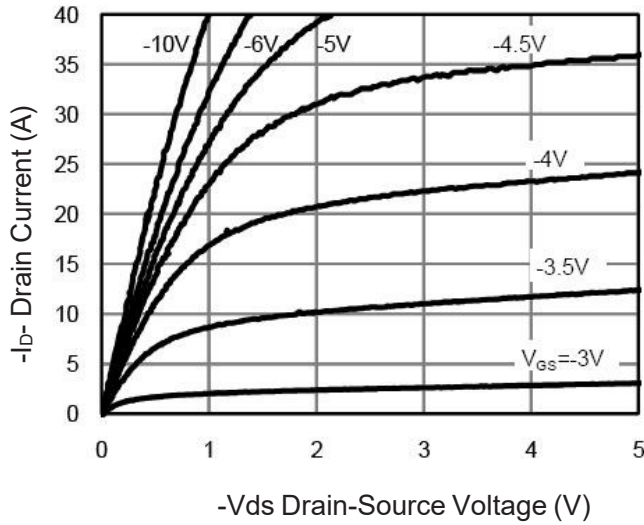
2) Gate Charge Test Circuit

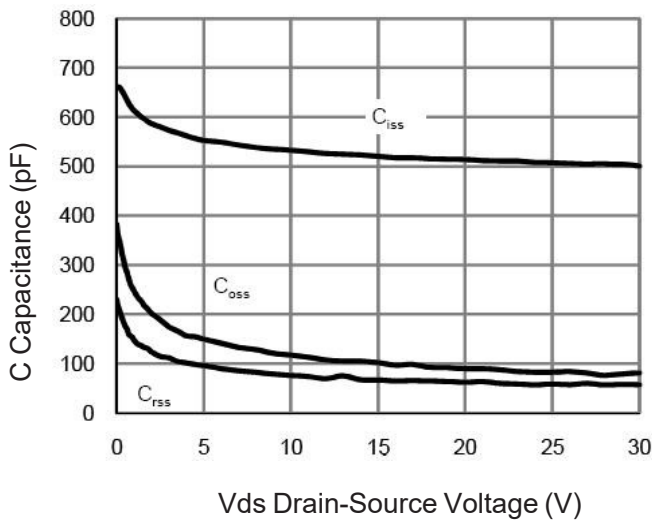
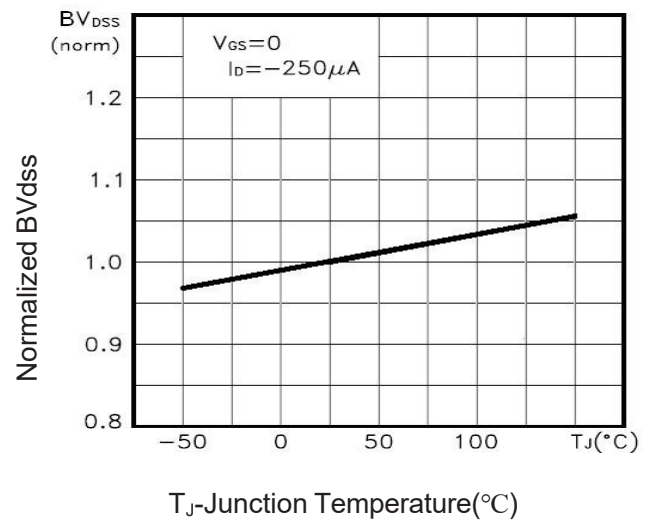
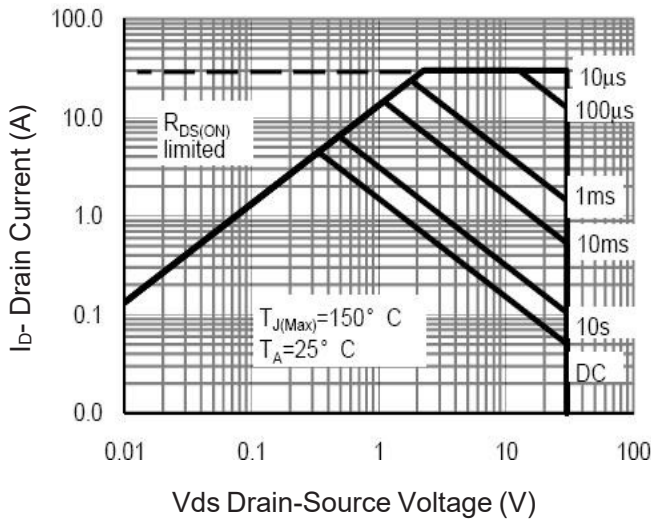
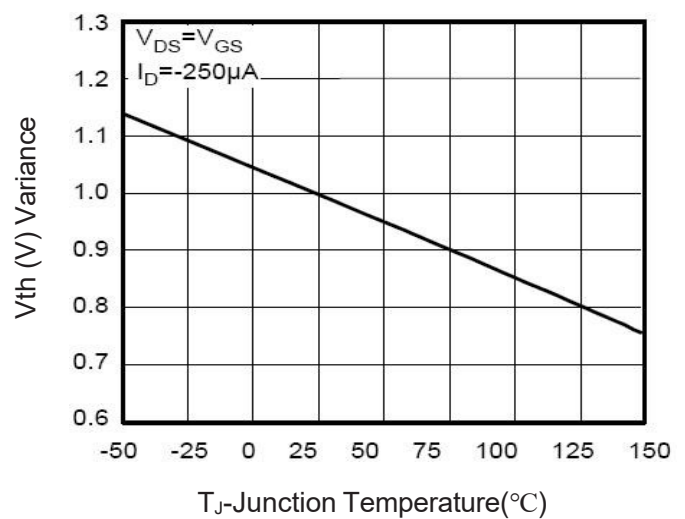
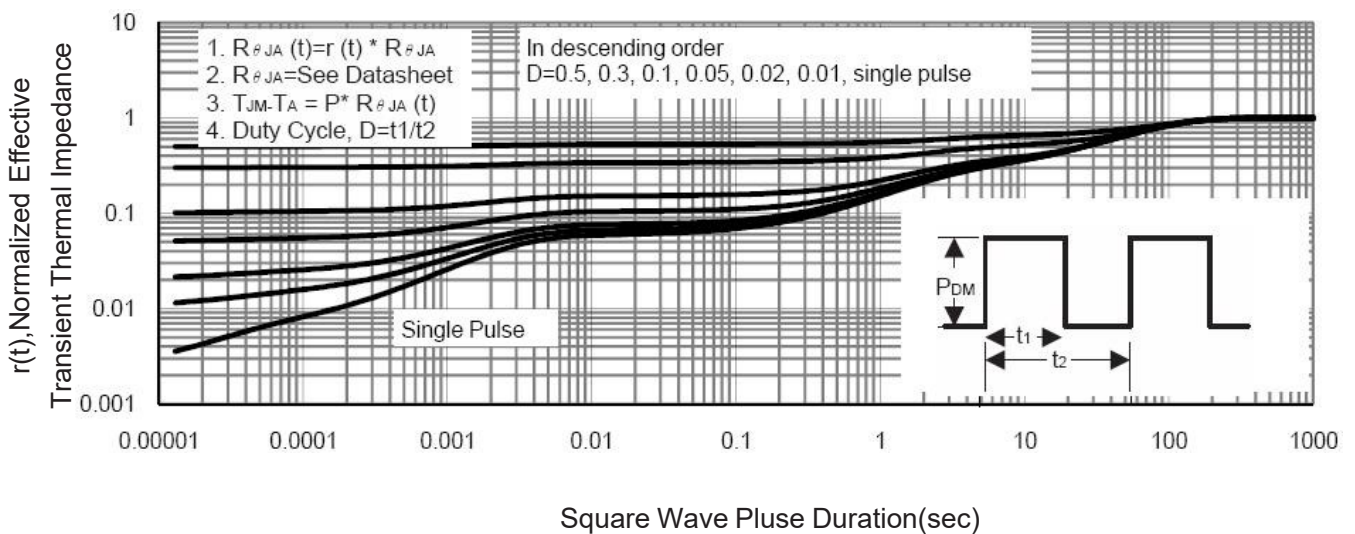


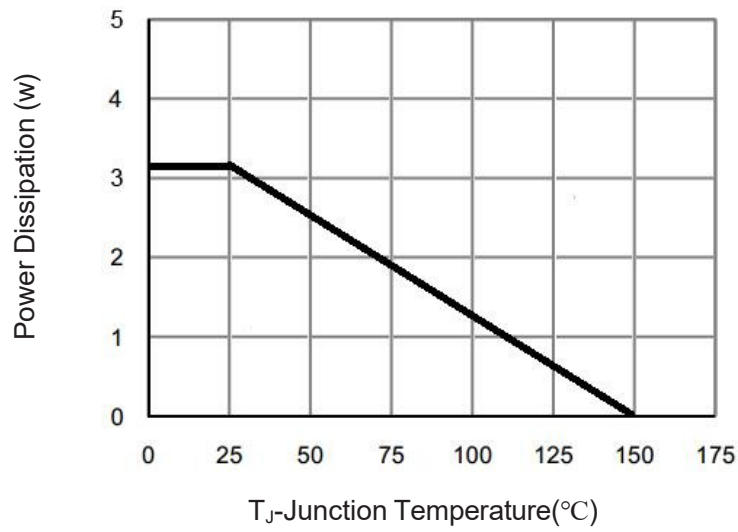
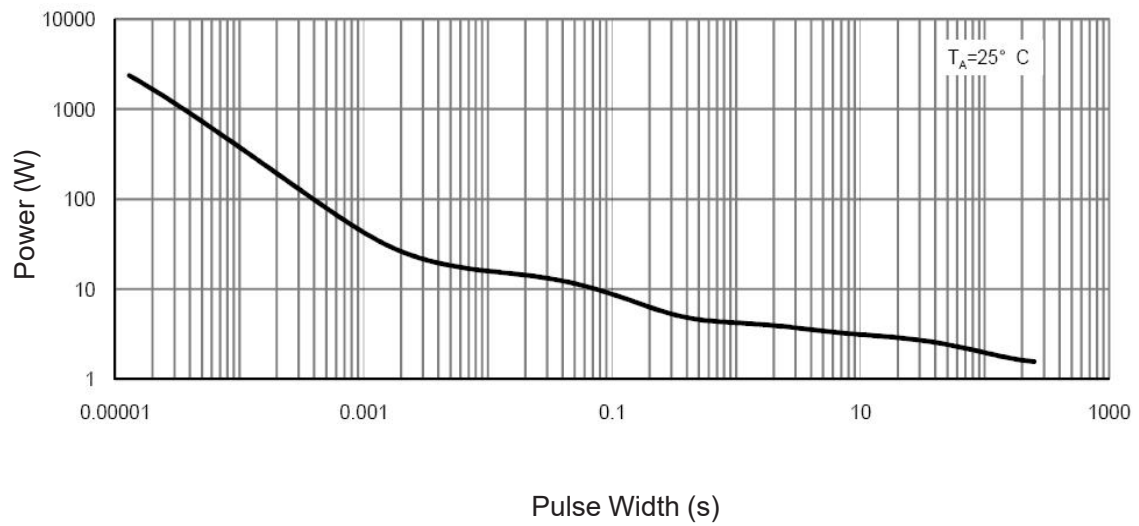
3) Switch Time Test Circuit



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


Figure 12 Power De-rating

Figure 13 Single Pulse Power Rating Junction-to-Ambient