

Description

The VSM15P10 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

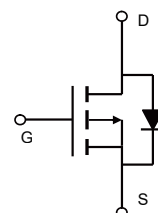
- $V_{DS} = -100V, I_D = -15A$
 $R_{DS(ON)} < 170m\Omega @ V_{GS} = -10V$ (Typ:144m Ω)
 $R_{DS(ON)} < 185m\Omega @ V_{GS} = -4.5V$ (Typ:155m Ω)
- Super high dense cell design
- Advanced trench process technology
- Reliable and rugged
- High density cell design for ultra low On-Resistance

Application

- Portable equipment and battery powered systems



TO-220



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM15P10	VSM15P10-TC	TO-220	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	-15	A
Drain Current-Continuous($T_c=100^{\circ}C$)	$I_D(100^{\circ}C)$	-10	A
Pulsed Drain Current	I_{DM}	-60	A
Maximum Power Dissipation	P_D	85	W
Single pulse avalanche energy ^(Note 1)	E_{AS}	64	mJ
Derating factor		0.68	W/ $^{\circ}C$
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.47	$^{\circ}C/W$
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Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	50	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

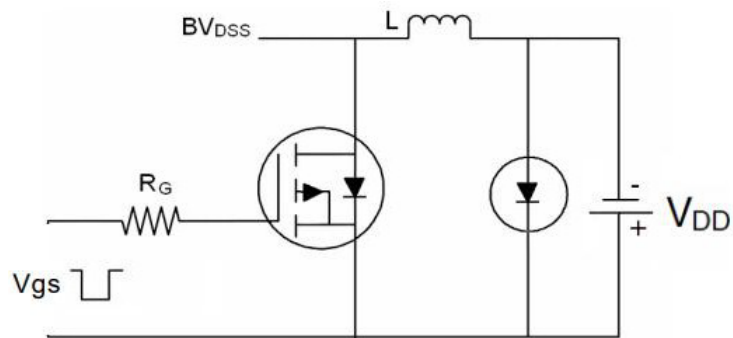
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-100	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-100V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.3	-1.9	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-12A	-	144	170	mΩ
		V _{GS} =-4.5V, I _D =-12A	-	155	185	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-18V, I _D =-12A	-	33	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =-50V, V _{GS} =0V, F=1.0MHz	-	1835	-	pF
Output Capacitance	C _{oss}		-	43.7	-	pF
Reverse Transfer Capacitance	C _{rss}		-	39.8	-	pF
Switching Characteristics (Note 3)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-50V, I _D =-15A V _{GS} =-10V, R _{GEN} =2Ω	-	6	-	nS
Turn-on Rise Time	t _r		-	3	-	nS
Turn-Off Delay Time	t _{d(off)}		-	40	-	nS
Turn-Off Fall Time	t _f		-	25	-	nS
Total Gate Charge	Q _g	V _{DS} =-50V, I _D =-12A, V _{GS} =-10V	-	36.6	-	nC
Gate-Source Charge	Q _{gs}		-	6.56	-	nC
Gate-Drain Charge	Q _{gd}		-	7.7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-15A	-	-	-1.2	V
Diode Forward Current	I _S	-	-	-	-15	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =-15A di/dt = 100A/μs	-	69	-	nS
Reverse Recovery Charge	Q _{rr}		-	218	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

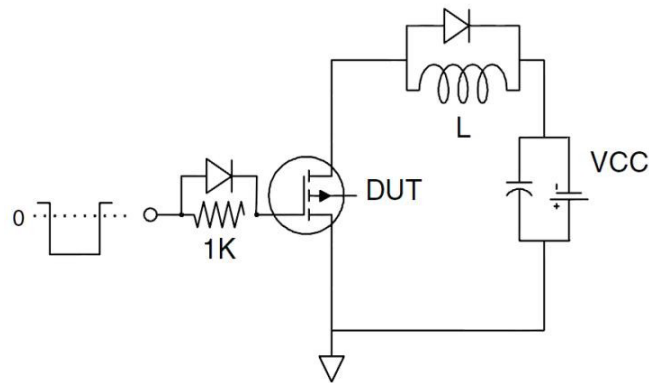
1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=-50V, V_G=15V, L=0.5\text{mH}, R_g=25\Omega$.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The maximum allowed junction temperature 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.
3. Guaranteed by design, not subject to production.
4. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Test Circuit

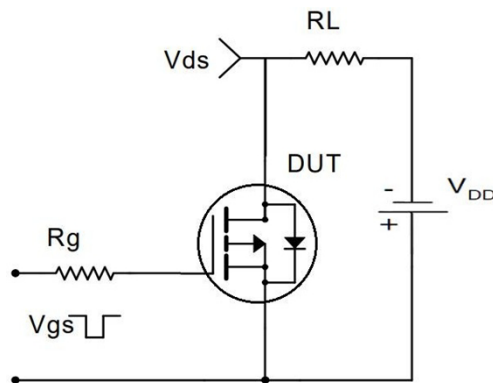
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

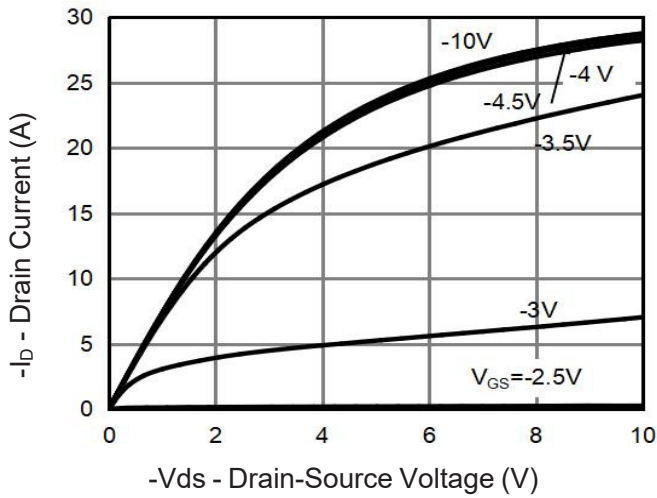


Figure 1 Output Characteristics

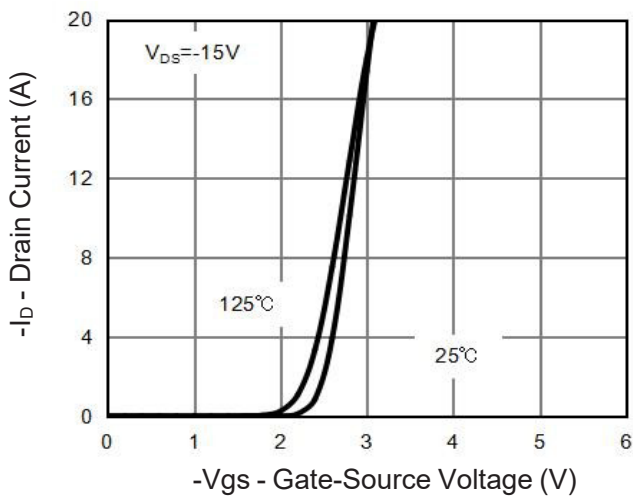


Figure 2 Transfer Characteristics

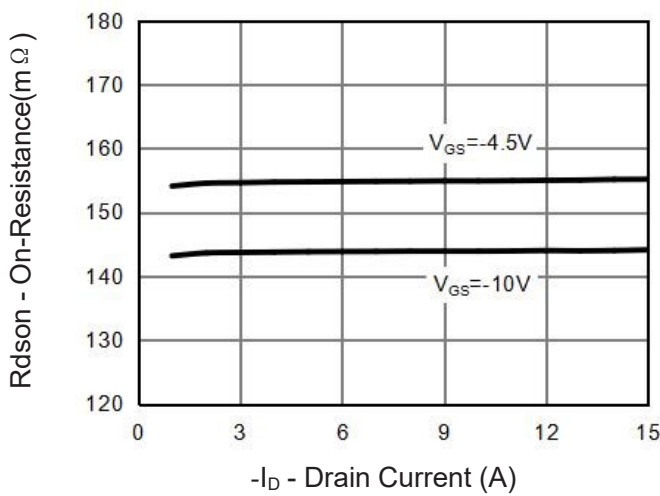


Figure 3 Rdson vs Drain Current

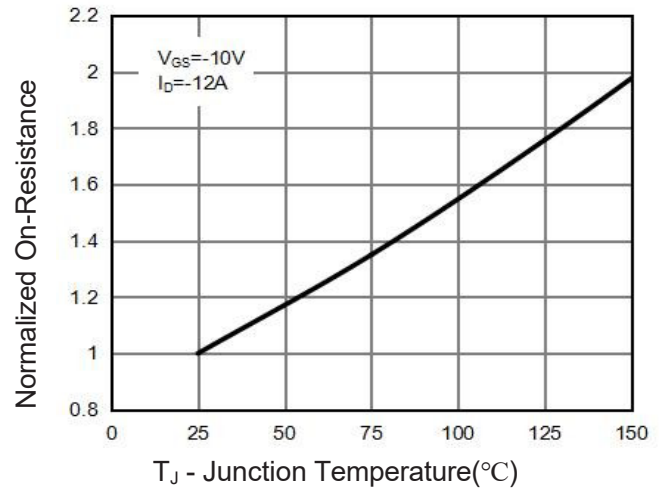


Figure 4 Rdson vs Junction Temperature

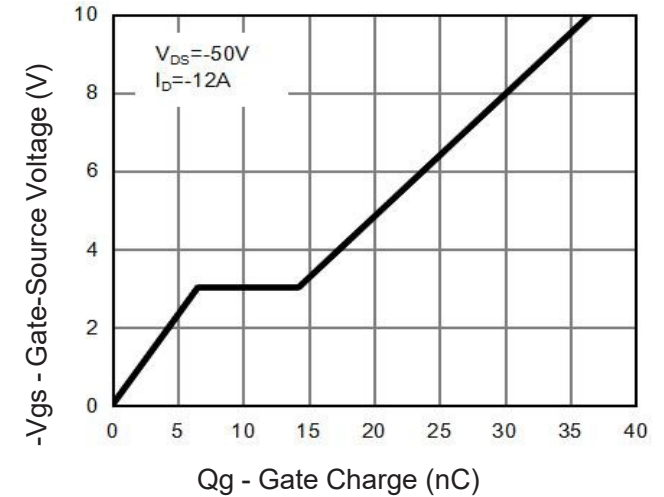


Figure 5 Gate Charge

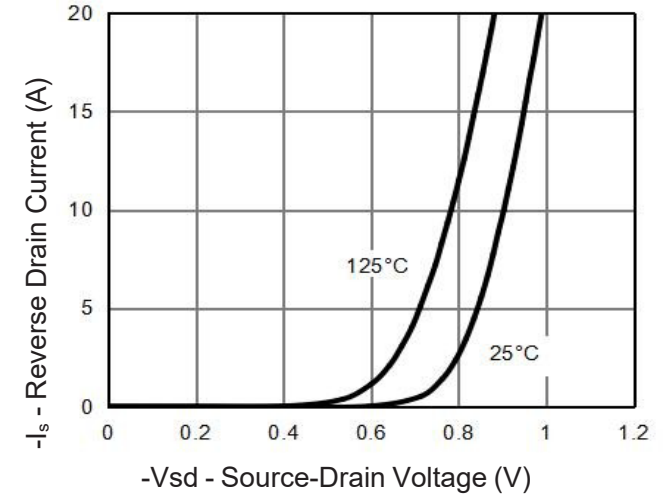
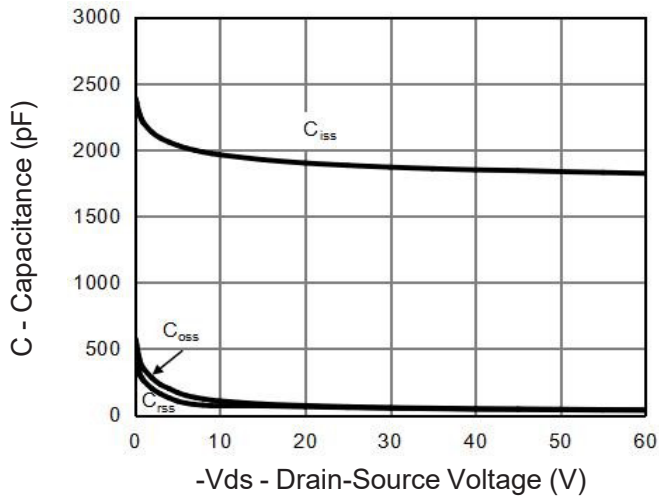
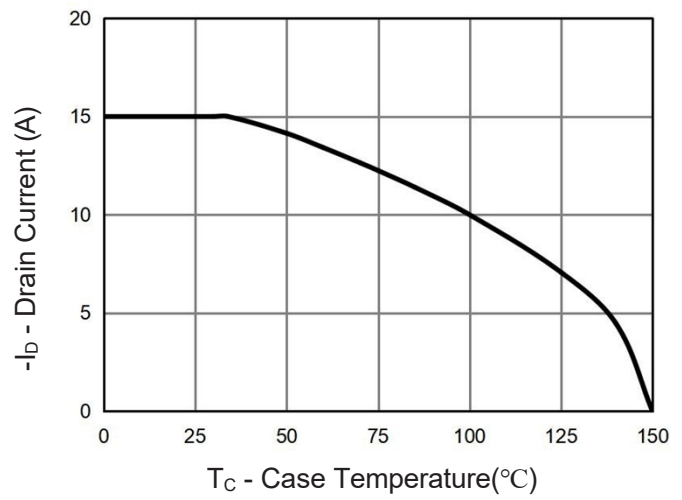
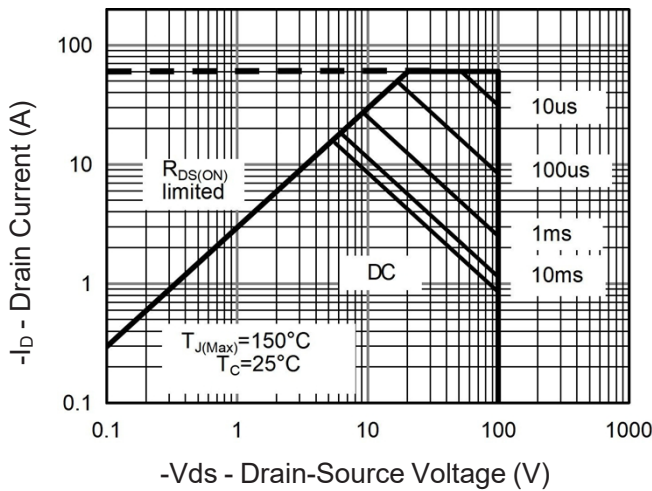
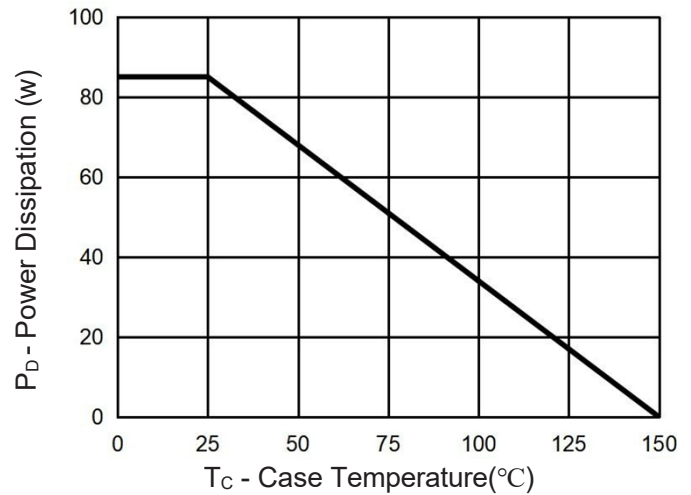
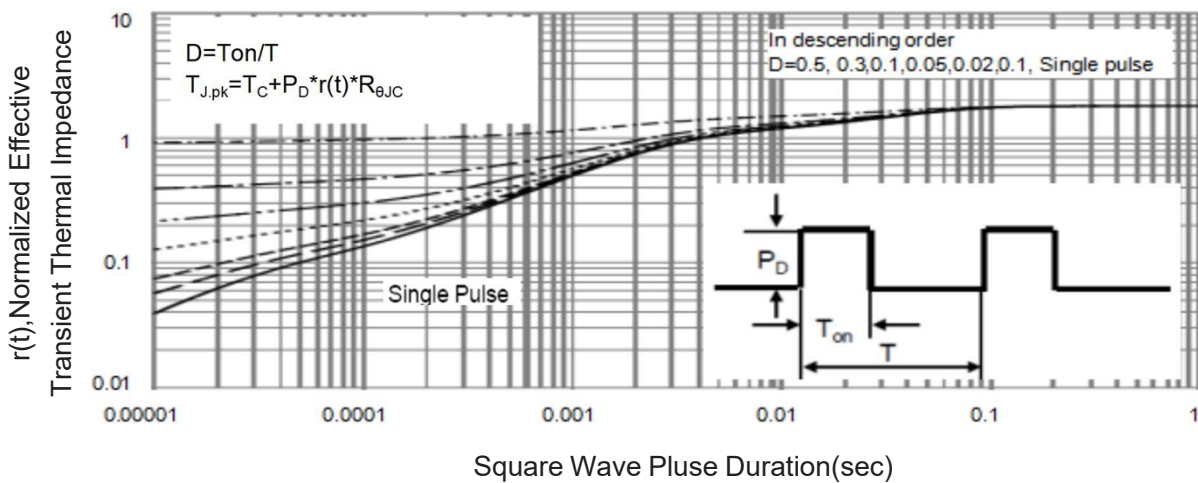


Figure 6 Source-Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Drain Current De-rating

Figure 8 Safe Operation Area (Note 4)

Figure 10 Power De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance