

Description

The VSM180P03 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.

Application

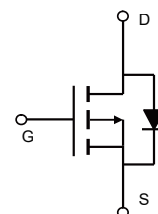
- DC/DC Converter
- Battery and loading switching

General Features

- $V_{DS} = -30V, I_D = -180A$
 $R_{DS(ON)} = 1.4m\Omega$ (typical) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 2.5m\Omega$ (typical) @ $V_{GS} = -4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating



DFN5x6



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM180P03	VSM180P03-D56	DFN5x6	Ø330mm	12mm	5000 units

Absolute Maximum Ratings ($T_C = 25^\circ C$ 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	-180	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D (100^\circ C)$	-122	A
Pulsed Drain Current	I_{DM}	-720	A
Maximum Power Dissipation	P_D	108	W
Derating factor		0.86	W/°C
Single pulse avalanche energy (Note 5)	E_{AS}	784	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 1)	$R_{\theta JC}$	1.16	°C/W
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Electrical Characteristics (T_C=25°C unless otherwise noted)

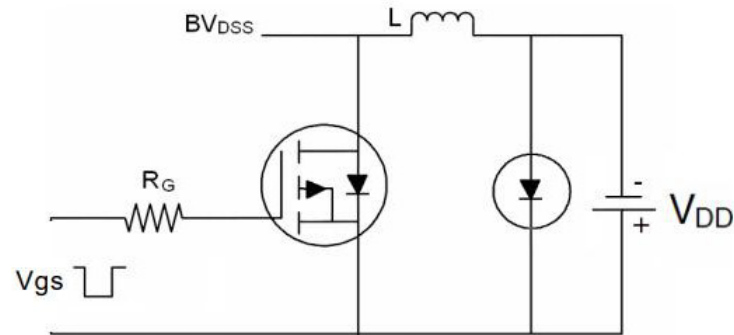
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =-250μA	-30	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-30V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.2	-1.8	-2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-20A	-	1.4	1.8	mΩ
		V _{GS} =-4.5V, I _D =-20A	-	2.5	3.3	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-10V, I _D =-20A	-	80	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =-15V, V _{GS} =0V, F=1.0MHz	-	9030	-	PF
Output Capacitance	C _{oss}		-	1154	-	PF
Reverse Transfer Capacitance	C _{rss}		-	958	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-15V, I _D =-20A V _{GS} =-10V, R _{GEN} =3Ω	-	35	-	nS
Turn-on Rise Time	t _r		-	28	-	nS
Turn-Off Delay Time	t _{d(off)}		-	106	-	nS
Turn-Off Fall Time	t _f		-	38	-	nS
Total Gate Charge	Q _g	V _{DS} =-15V, I _D =-20A, V _{GS} =-10V	-	187	-	nC
Gate-Source Charge	Q _{gs}		-	24.4	-	nC
Gate-Drain Charge	Q _{gd}		-	42	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-20A	-	-0.8	-1.2	V
Diode Forward Current	I _S		-	-	-180	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = -20A di/dt = 100A/μs	-	32	-	nS
Reverse Recovery Charge	Q _{rr}		-	65	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

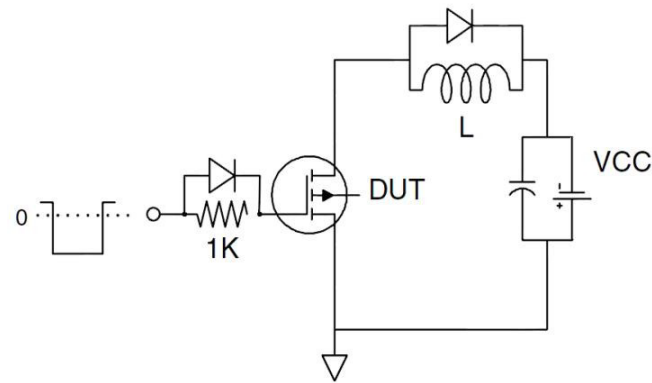
1. EAS condition : T_J=25°C, V_{DD}=-15V, V_G=-10V, L=0.5mH, R_g=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_J(MAX)=150°C. The SOA curve provides a single pulse rating.

Test Circuit

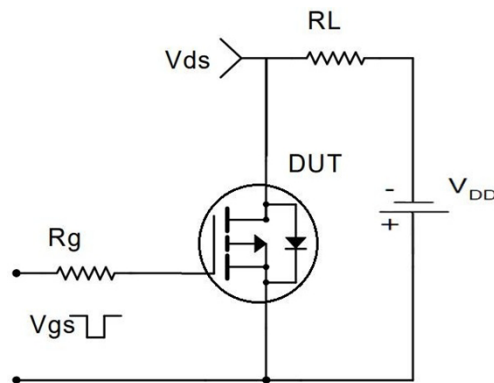
1) E_{AS} test Circuit



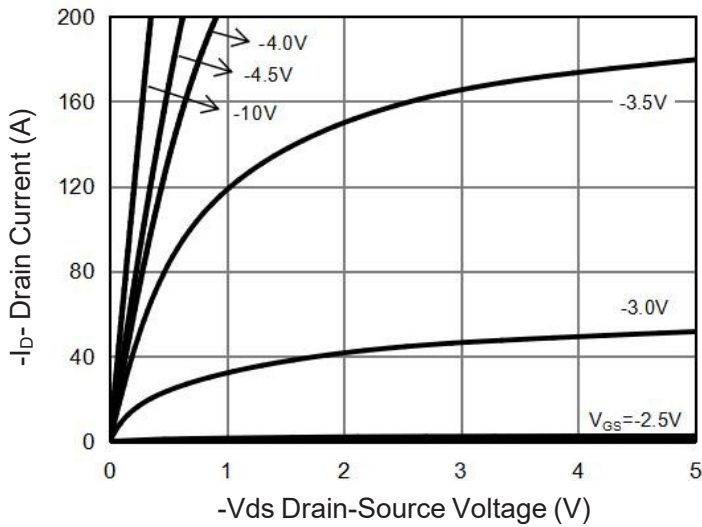
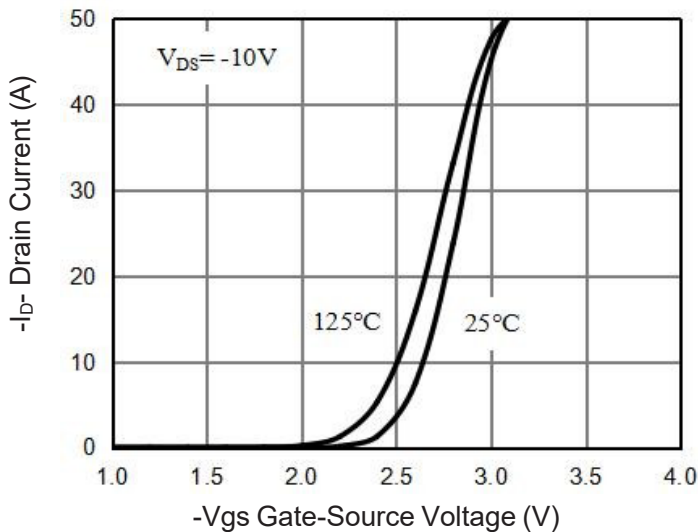
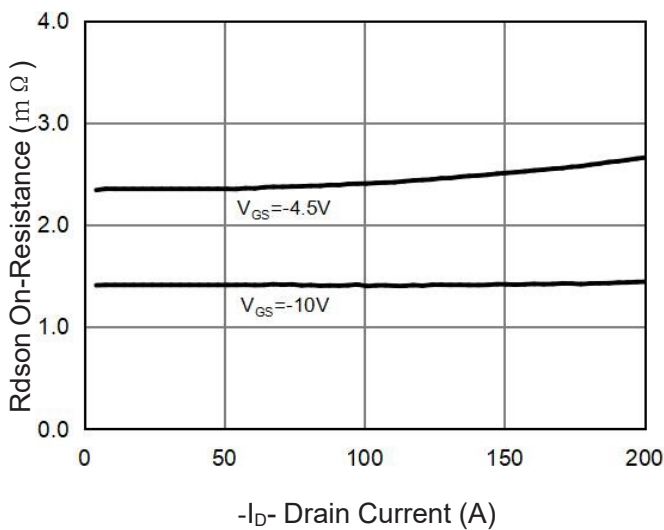
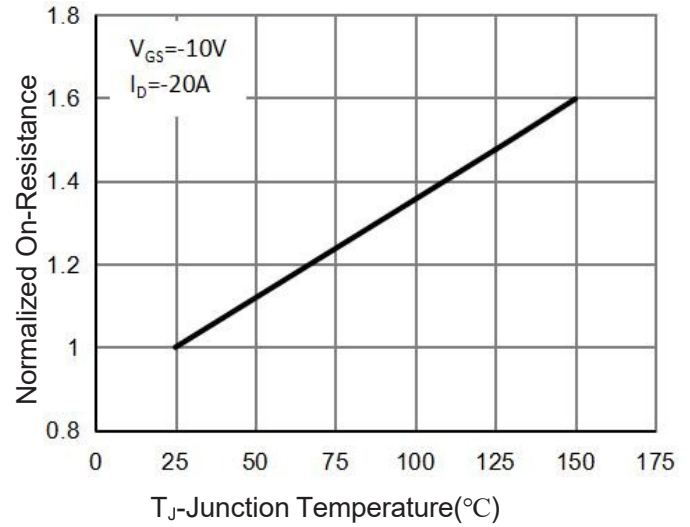
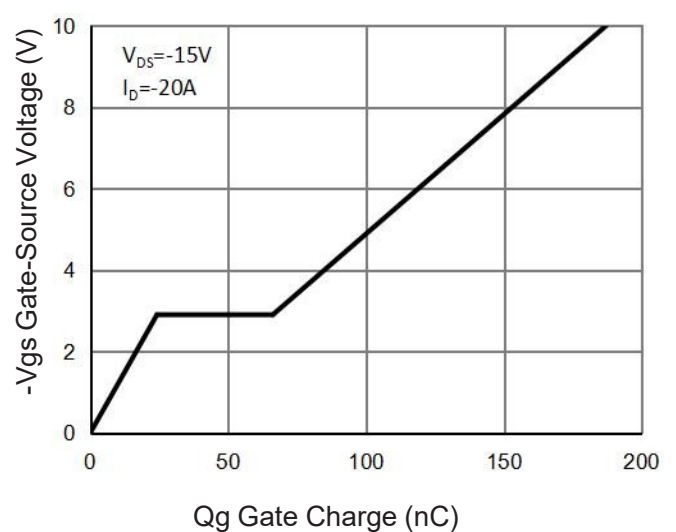
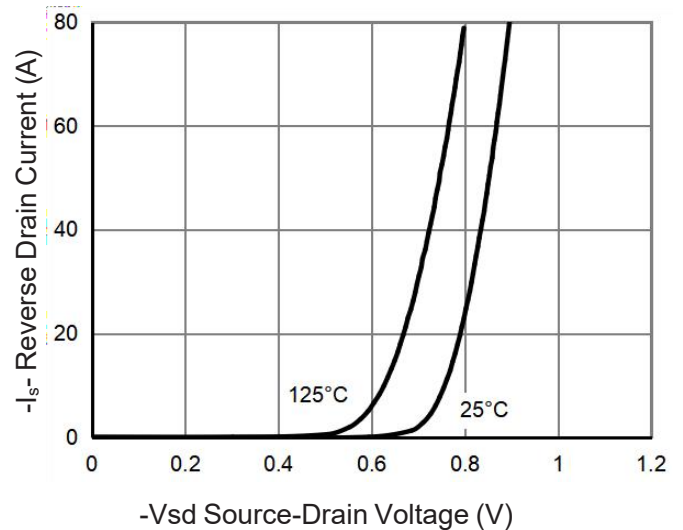
2) Gate charge test Circuit

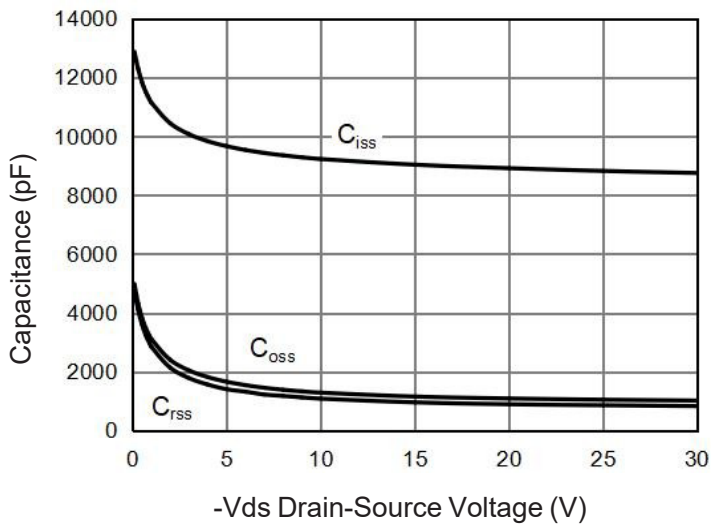
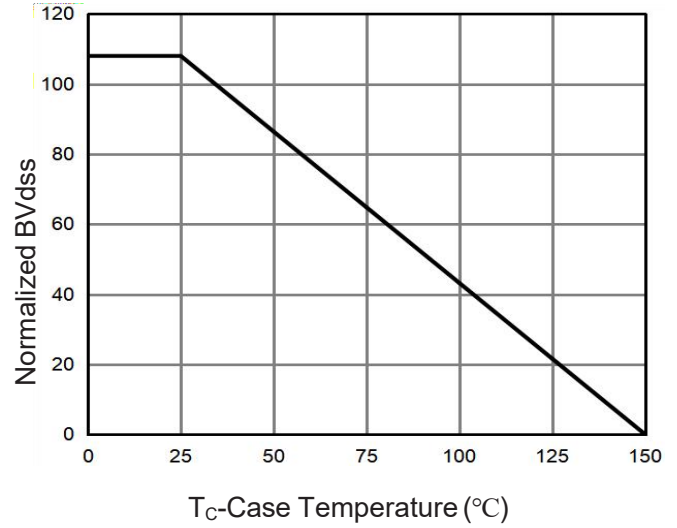
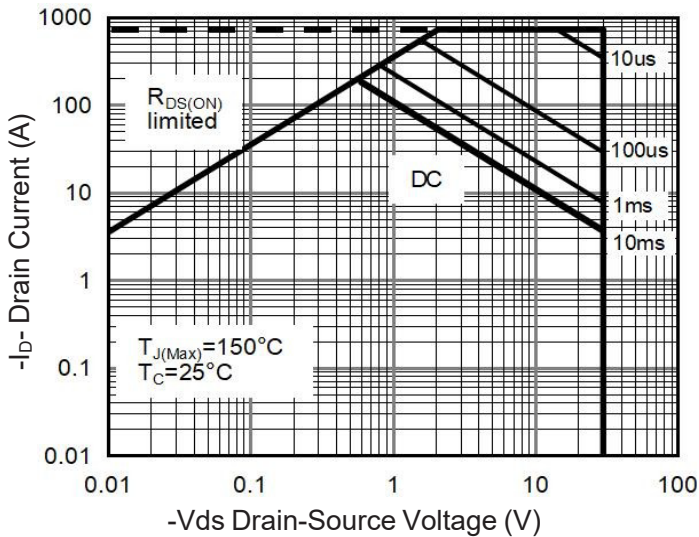
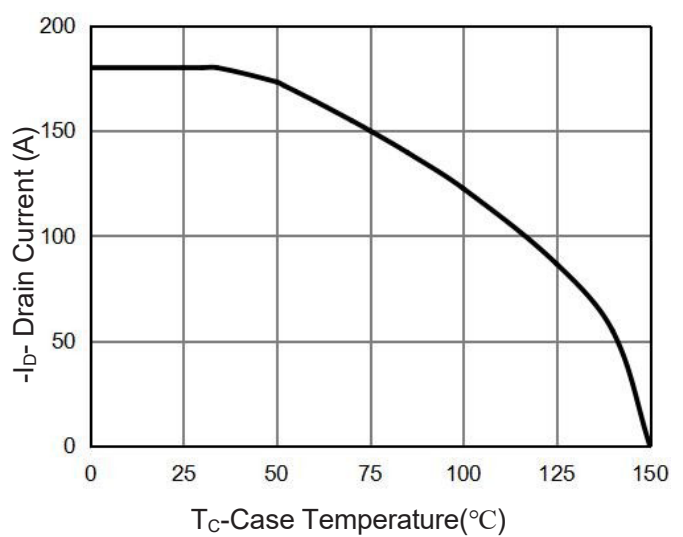
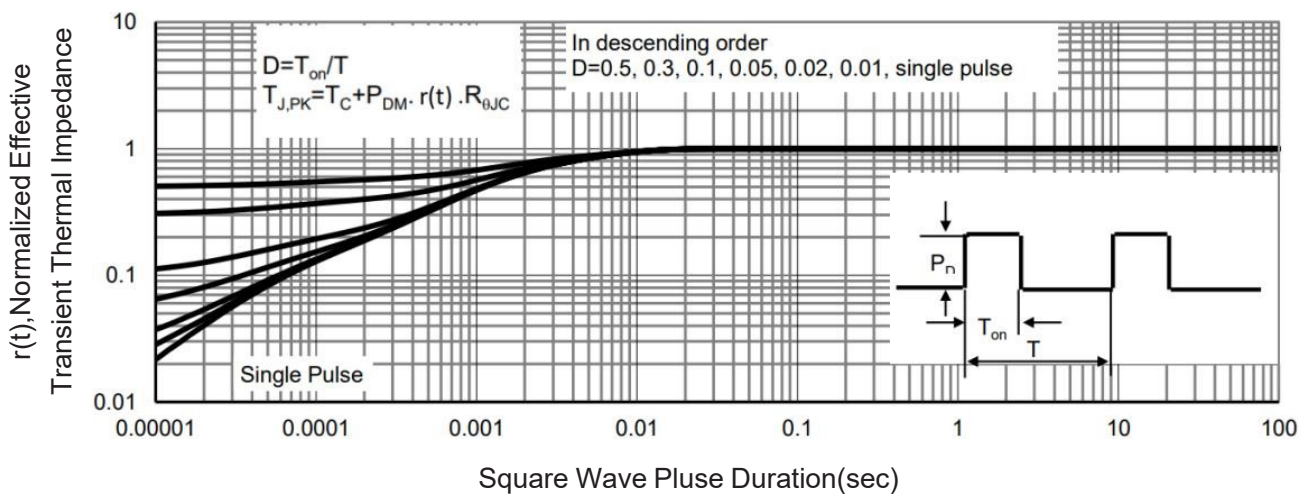


3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)


Figure 1 Output Characteristics

Figure 2 Transfer Characteristics

Figure 3 Rdson- Drain Current

Figure 4 Rdson-Junction Temperature

Figure 5 Gate Charge

Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 BV_{DSS} vs Junction Temperature

Figure 8 Safe Operation Area (Note3)

Figure 10 ID Current Derating

Figure 11 Normalized Maximum Transient Thermal Impedance