

Features

- Ultra-low $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested, 100% R_g Tested
- PPb-free and Lead-free
- Halogen-free and RoHS-compliant

Applications

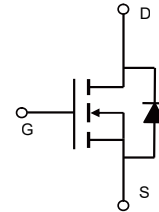
- Power Management in Power Computing, Tool, E-vehicle, IE, RIE, 4.0, etc.
- Current Switching in DC/DC Converter, Sub-systems
- Load Power Switching, Management Quick/Wireless in Telecom., Charging, Industrial Motor Automation, Driving CE

Product Summary

Parameter	Value	Unit
V_{DS}	100	V
$V_{GS(th)}$ Typ	3.0	V
I_D (@ $V_{GS} = 10V$) ⁽¹⁾	113	A
$R_{DS(ON)}$ Typ (@ $V_{GS} = 10V$)	6.3	mΩ



TO-263



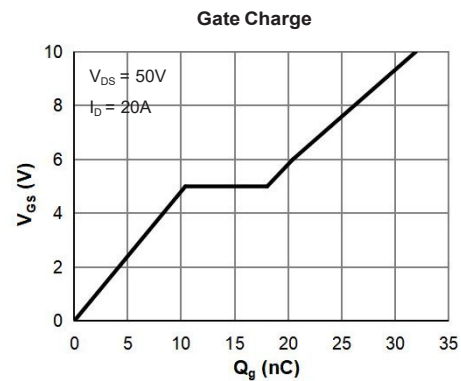
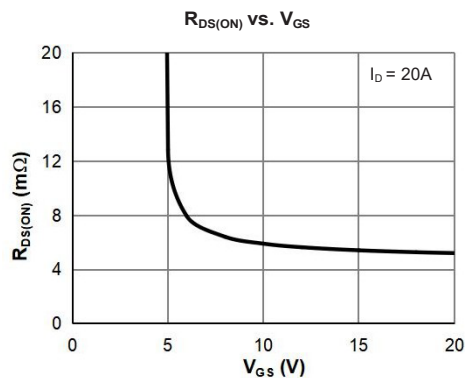
Schematic

Ordering Information

Device	Package	# of Pins	Marking	MSL	T_J (°C)	Media	Quantity (pcs)
VSM113N10-T3	TO-263	3	VSM113N10	3	-55 to 150	13-inch Reel	800

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	100	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ⁽¹⁾	$T_C = 25^\circ\text{C}$	113	A
	$T_C = 100^\circ\text{C}$	71	
Pulsed Drain Current ⁽²⁾	I_{DM}	452	A
Avalanche Energy ⁽³⁾	E_{AS}	216	mJ
Power Dissipation ⁽⁴⁾	$T_C = 25^\circ\text{C}$	227	W
	$T_C = 100^\circ\text{C}$	90	
Junction & Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C



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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\text{V}$	100			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 80\text{V}$, $V_{GS} = 0\text{V}$ $T_J = 55^\circ\text{C}$			1.0 5.0	μA
Gate-Body Leakage Current	I_{GSS}	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$			± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2.0	3.0	4.0	V
Static Drain-Source ON-Resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$ TO-220-3L		6.3	8.0	$\text{m}\Omega$
		$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$ TO-263-3L		6.1	8.0	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{V}$, $I_D = 20\text{A}$		28		S
Diode Forward Voltage	V_{SD}	$I_S = 1\text{A}$, $V_{GS} = 0\text{V}$		0.70	1.0	V
Diode Continuous Current	I_S	$T_C = 25^\circ\text{C}$			113	A

DYNAMIC PARAMETERS ⁽⁵⁾

Input Capacitance	C_{iss}	$V_{GS} = 0\text{V}$, $V_{DS} = 50\text{V}$, $f = 1\text{MHz}$		1998		pF
Output Capacitance	C_{oss}			777		pF
Reverse Transfer Capacitance	C_{rss}			20		pF
Gate Resistance	R_g	$V_{GS} = 0\text{V}$, $V_{DS} = 0\text{V}$, $f = 1\text{MHz}$		2.1		Ω

SWITCHING PARAMETERS ⁽⁵⁾

Total Gate Charge (@ $V_{GS} = 10\text{V}$)	Q_g	$V_{GS} = 0$ to 10V $V_{DS} = 50\text{V}$, $I_D = 20\text{A}$		32		nC
Total Gate Charge (@ $V_{GS} = 6\text{V}$)	Q_g			20		nC
Gate Source Charge	Q_{gs}			10		nC
Gate Drain Charge	Q_{gd}			8		nC
Turn-On DelayTime	$t_{D(on)}$	$V_{GS} = 10\text{V}$, $V_{DS} = 50\text{V}$ $R_L = 2.5\ \Omega$, $R_{GEN} = 3\ \Omega$		13		ns
Turn-On Rise Time	t_r			21		ns
Turn-Off DelayTime	$t_{D(off)}$			54		ns
Turn-Off Fall Time	t_f			24		ns
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 15\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$		47		ns
Body Diode Reverse Recovery Charge	Q_{rr}	$I_F = 15\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$		62		nC

Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	45	55	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.48	0.55	$^\circ\text{C}/\text{W}$

Notes:

1. Computed continuous current assumes the condition of T_{J_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under $T_{J_Max} = 150^\circ\text{C}$.
3. E_{AS} of 216 mJ is based on starting $T_J = 25^\circ\text{C}$, $L = 3.0\text{mH}$, $I_{AS} = 12\text{A}$, $V_{GS} = 10\text{V}$, $V_{DD} = 50\text{V}$; 100% test at $L = 0.1\text{mH}$, $I_{AS} = 42\text{A}$.
4. The power dissipation P_D is based on $T_{J_Max} = 150^\circ\text{C}$.
5. This value is guaranteed by design hence it is not included in the production test.

Typical Electrical & Thermal Characteristics

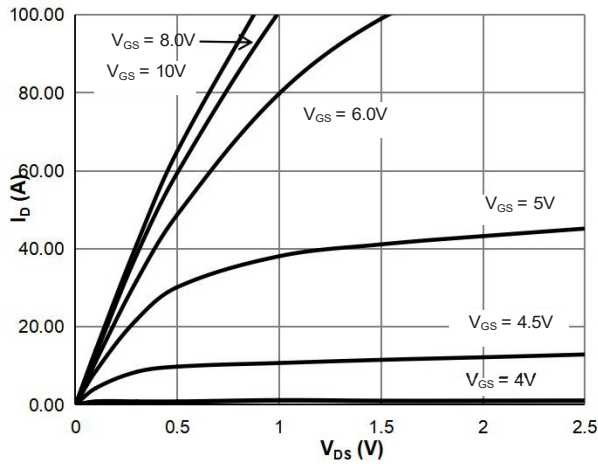


Figure 1: Saturation Characteristics

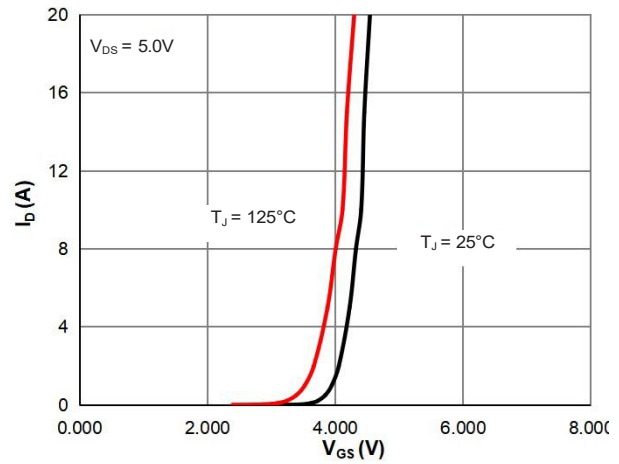


Figure 2: Transfer Characteristics

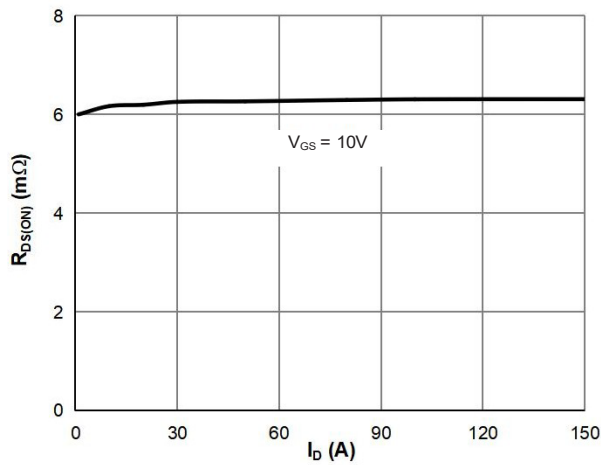


Figure 3: $R_{DS(ON)}$ vs. Drain Current

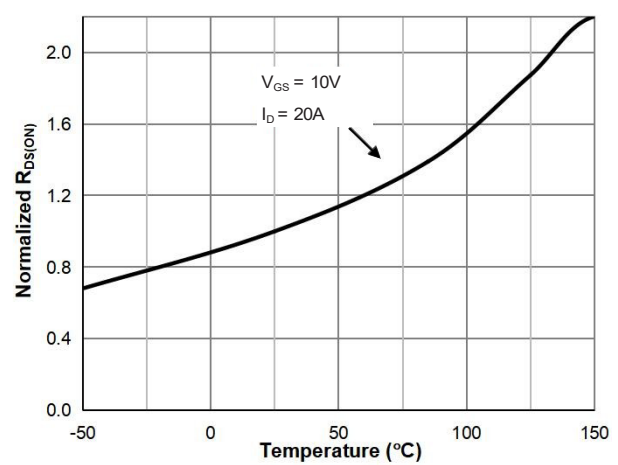


Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

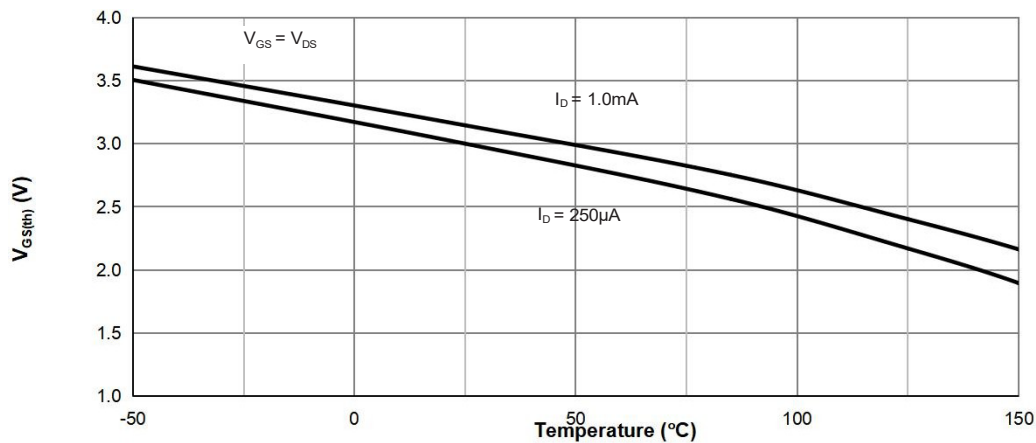


Figure 5: $V_{GS(th)}$ vs. Junction Temperature

Typical Electrical & Thermal Characteristics

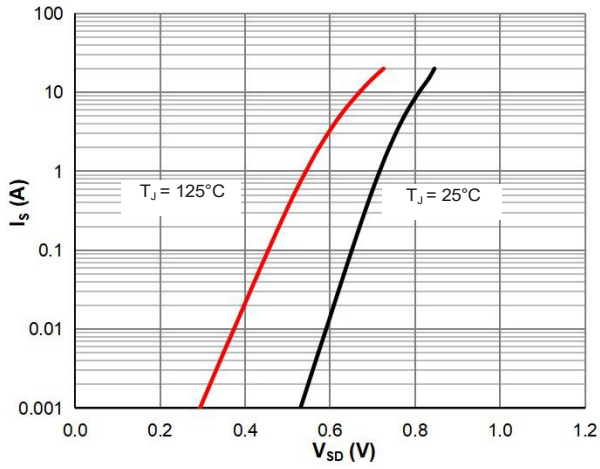


Figure 7: Body-Diode Characteristics

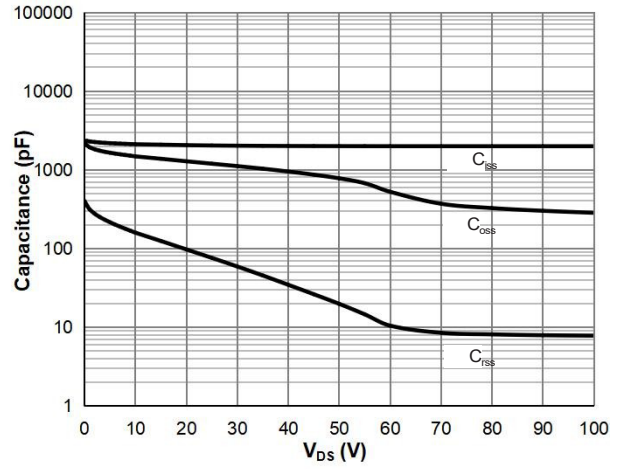


Figure 8: Capacitance Characteristics

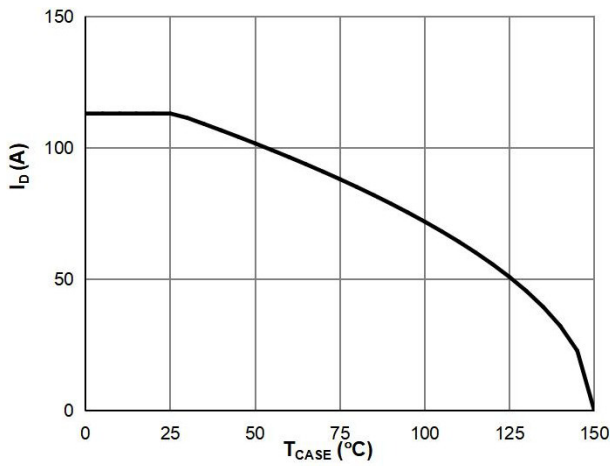


Figure 9: Current De-rating

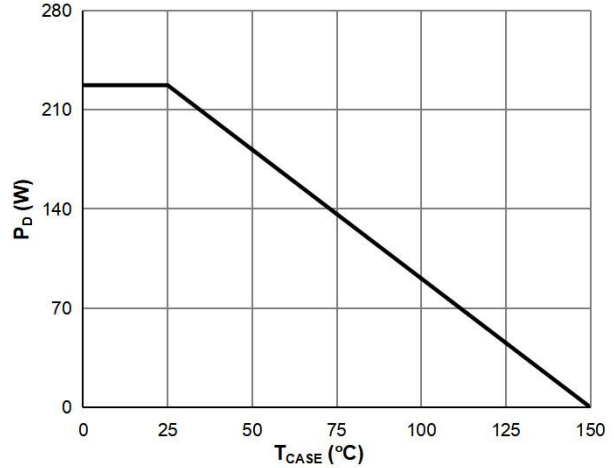


Figure 10: Power De-rating

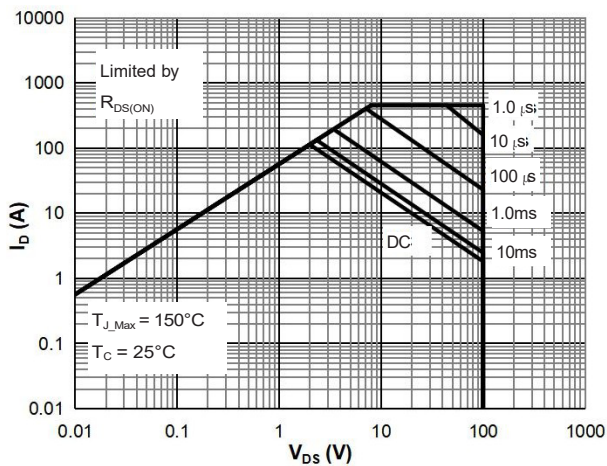


Figure 11: Maximum Safe Operating Area

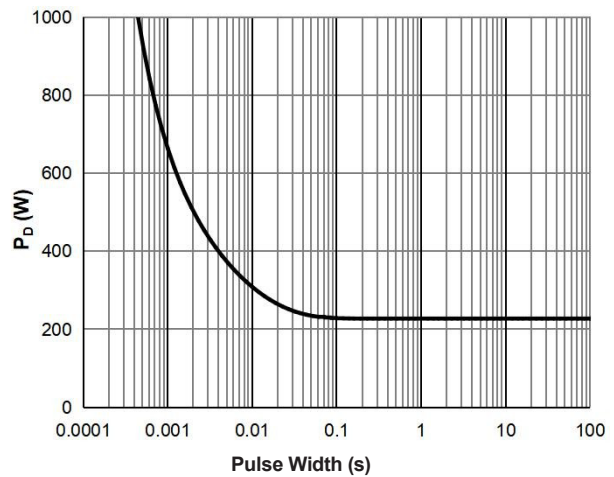


Figure 12: Single Pulse Power Rating, Junction-to-Case

Typical Electrical & Thermal Characteristics

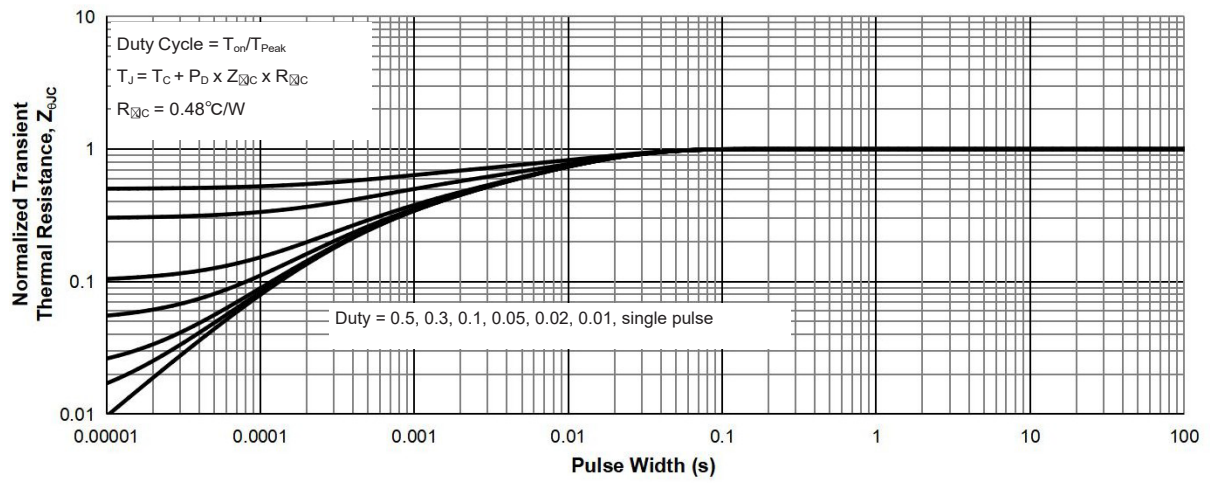


Figure 13: Normalized Maximum Transient Thermal Impedance