

Features

- Ultra-low $R_{DS(ON)}$
- Low $R_{DS(ON)}$
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- 100% UIS Tested, 100% $R_{DS(ON)}$ Tested
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- Pb-free
- Halogen-free and RoHS-compliant

Applications

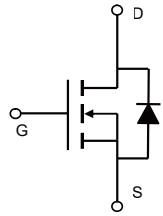
- Motor Power Driving, Management, Power Electronics, etc.
- Current Switching, Switching, Power Electronics, etc.
- Power Load Switching, Management, Quick/Wireless in Telecom., Charging, Industrial Motor Automation, Driving CE

Product Summary

Parameter	Value	Unit
V_{DS}	100	V
$V_{GS(th)}$ Typ	3.2	V
I_D (@ $V_{GS} = 10V$) ⁽¹⁾	223	A
$R_{DS(ON)}$ Typ (@ $V_{GS} = 10V$)	3	mΩ



TO-263



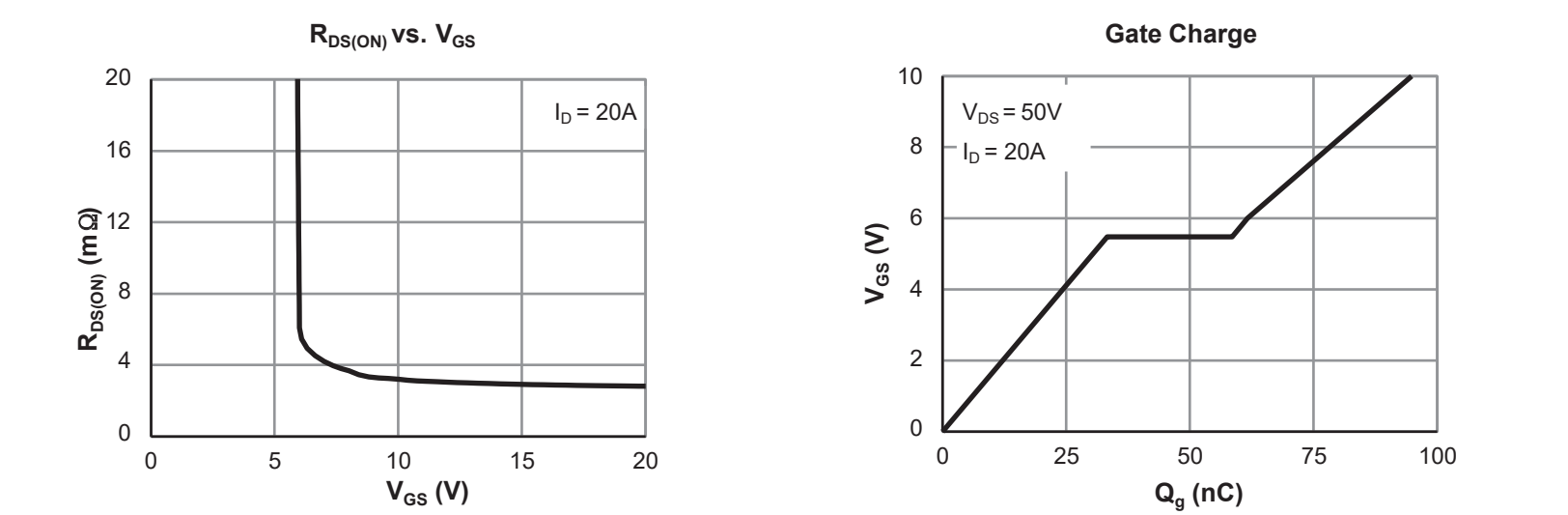
Schematic

Ordering Information

Device	Package	# of Pins	Marking	MSL	T _J (°C)	Media	Quantity (pcs)
VSM223N10-T3	TO-263	3	VSM223N10	NA	-55 to 150	Tube	50

Absolute Maximum Ratings (@ T_A = 25°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⁾	I_D	223	A
		103	
Pulsed Drain Current ⁽²⁾	I_{DM}	892	A
Avalanche Energy ⁽³⁾	E_{AS}	794	mJ
Power Dissipation ⁽⁴⁾	P_D	277	W
		83	
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}	$V_{DS} = 80\text{V}$, $V_{GS} = 0\text{V}$			1.0	μA
		$T_J = 55^{\circ}\text{C}$			5.0	
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	3.2	4.0	V
Static Drain-Source ON-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$	TO-263-3L	3	4.2	$\text{m}\Omega$
			TO-220-3L	3.2	4.2	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{V}$, $I_D = 20\text{A}$		35.9		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	$T_C = 25^{\circ}\text{C}$			223	A

DYNAMIC PARAMETERS ⁽⁵⁾

Input Capacitance	C_{iss}	$V_{GS} = 0\text{V}$, $V_{DS} = 50\text{V}$, $f = 1\text{MHz}$		5972		pF
Output Capacitance	C_{oss}			1181		pF
Reverse Transfer Capacitance	C_{rss}			43		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 $V_{DS} = 50\text{V}$, $I_D = 20\text{A}$		95		nC
Total Gate Charge (@ $V_{GS} = 6\text{V}$)	Q_g			62		nC
Gate Source Charge	Q_{gs}			33		nC
Gate Drain Charge	Q_{gd}			25		nC
Turn-On DelayTime	$t_{D(on)}$	$V_{GS} = 10\text{V}$, $V_{DS} = 50\text{V}$ $R_L = 2.5\ \Omega$, $R_{GEN} = 3\ \Omega$		22		ns
Turn-On Rise Time	t_r			31		ns
Turn-Off DelayTime	$t_{D(off)}$			48		ns
Turn-Off Fall Time	t_f			30		ns
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 15\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$		74		ns
Body Diode Reverse Recovery Charge	Q_{rr}	$I_F = 15\text{A}$, $dI_F/dt = 100\text{A}/\mu\text{s}$		169		nC

Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	49	57	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.45	0.60	$^{\circ}\text{C/W}$

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 794 mJ is based on starting $T_J = 25^{\circ}\text{C}$, $L = 3.0\text{mH}$, $I_{AS} = 23\text{A}$, $V_{GS} = 10\text{V}$, $V_{DD} = 50\text{V}$; 100% test at $L = 0.3\text{mH}$, $I_{AS} = 53.1\text{A}$.
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

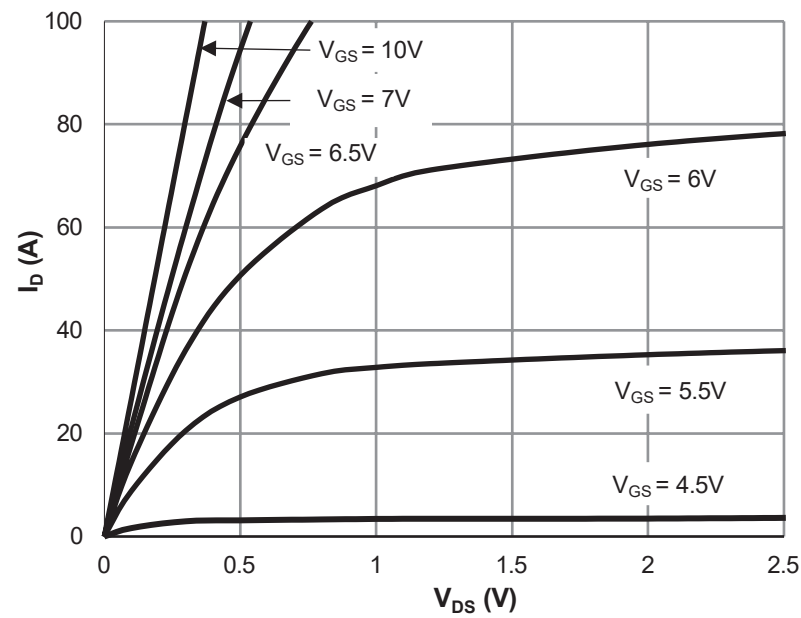


Figure 1: Saturation Characteristics

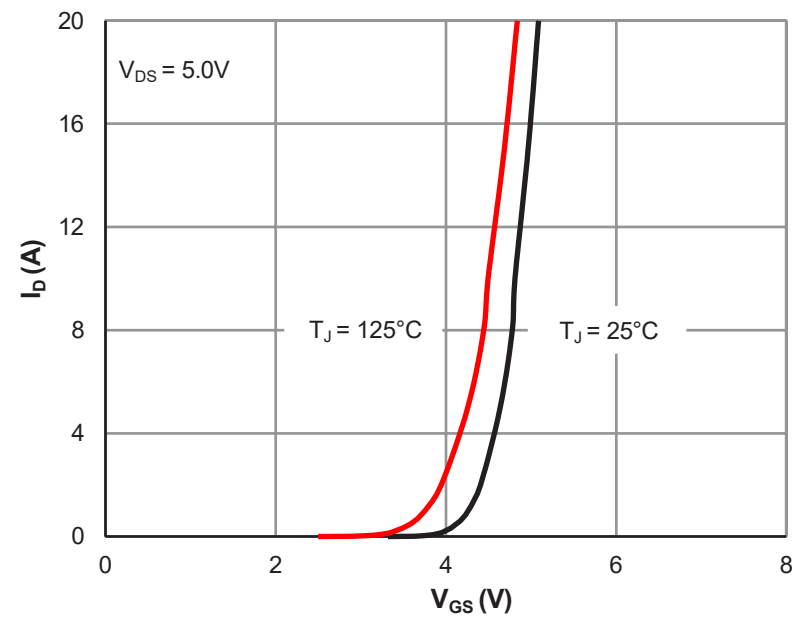


Figure 2: Transfer Characteristics

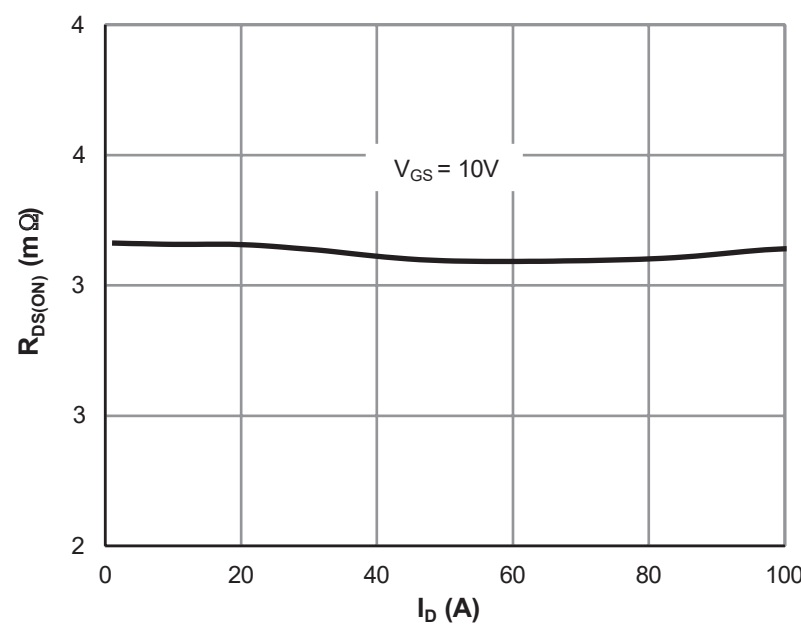


Figure 3: $R_{DS(ON)}$ vs. Drain Current

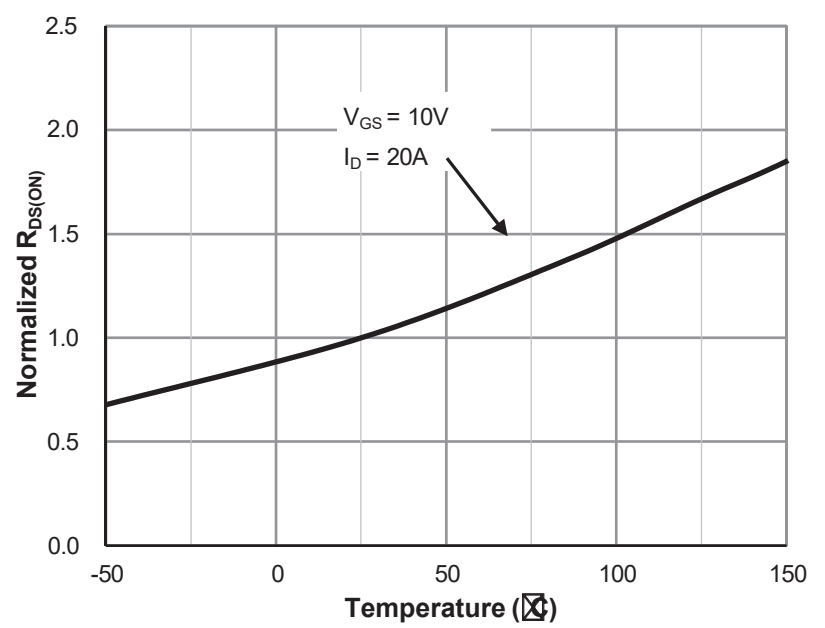


Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

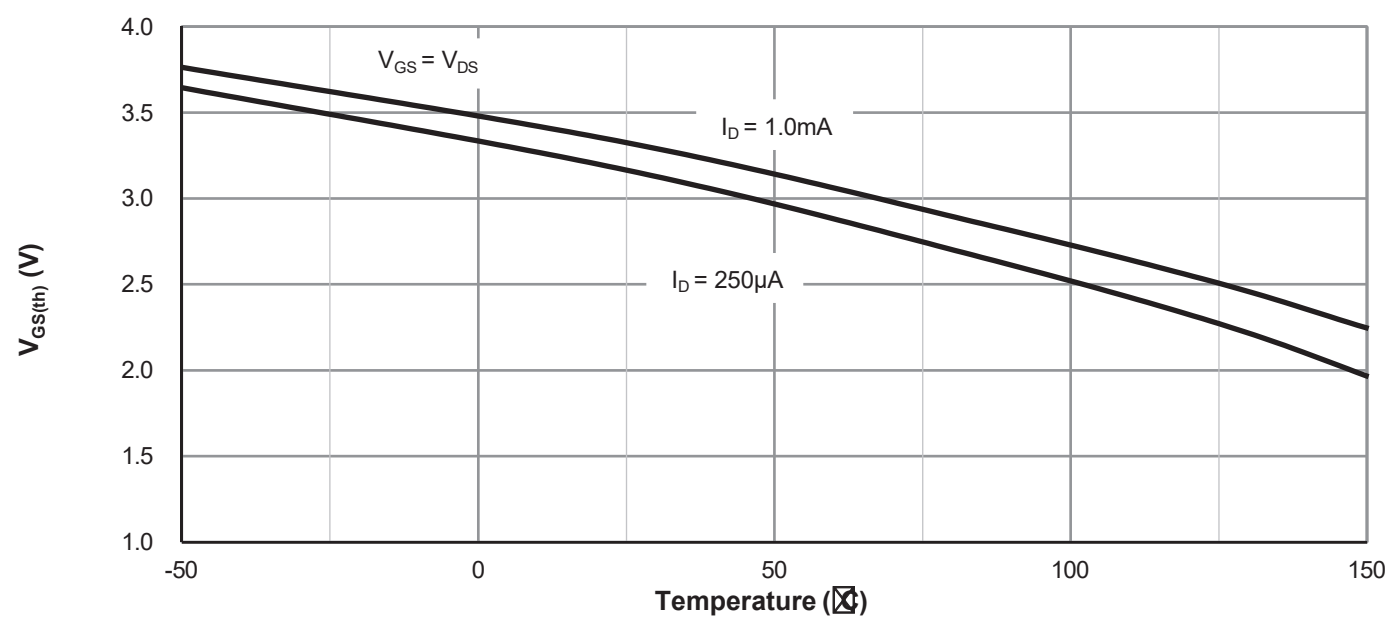


Figure 5: $V_{GS(th)}$ vs. Junction Temperature

Typical Electrical & Thermal Characteristics

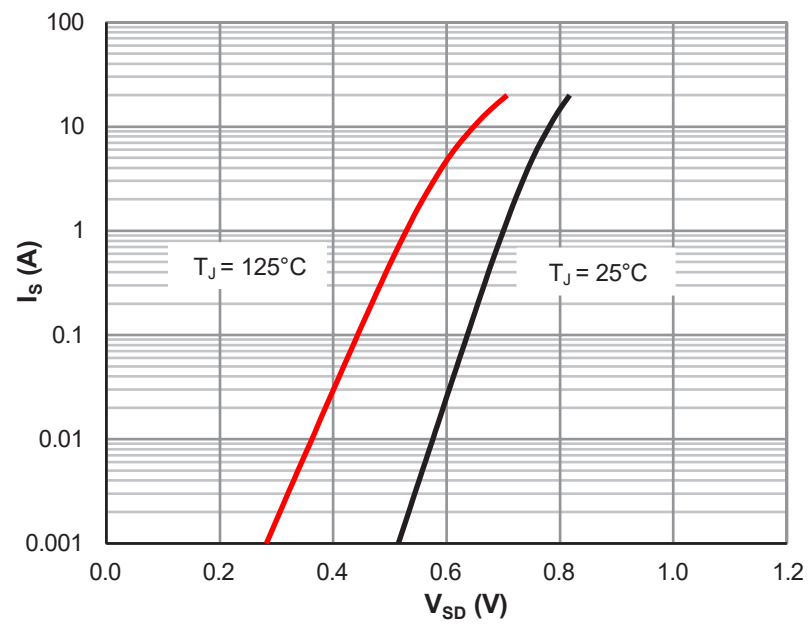


Figure 7: Body-Diode Characteristics

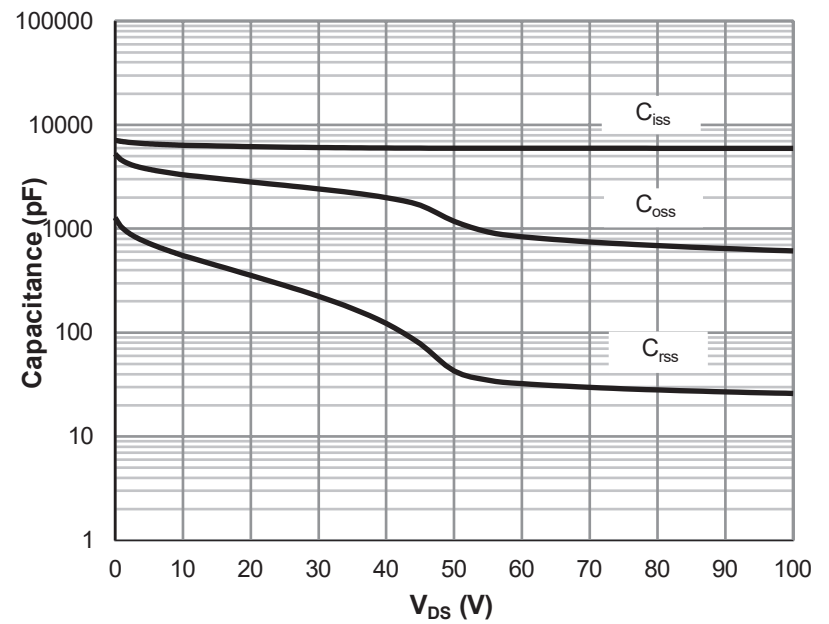


Figure 8: Capacitance Characteristics

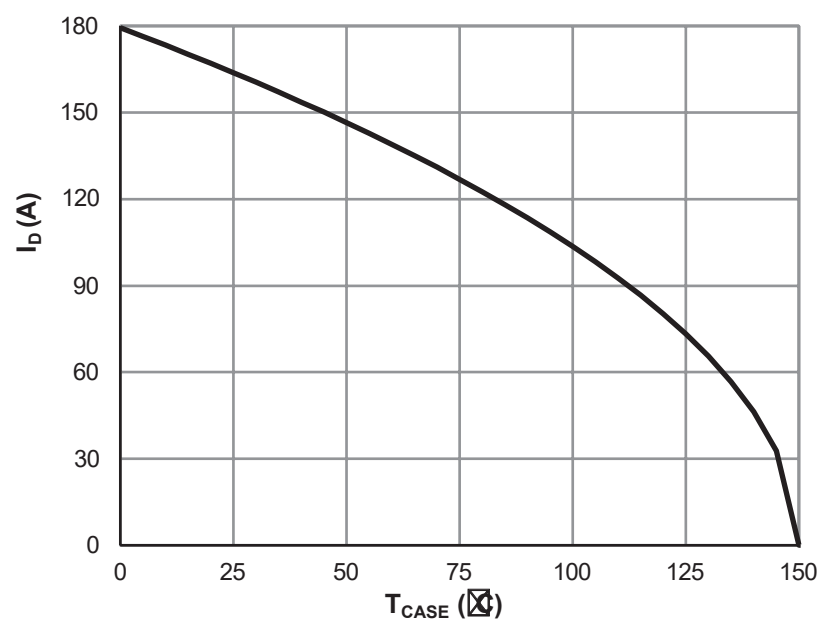


Figure 9: Current De-rating

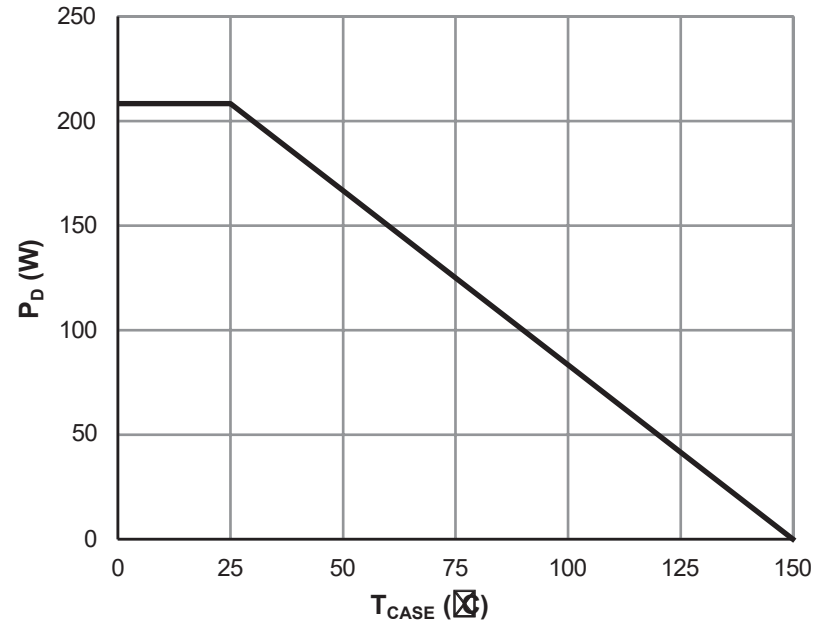


Figure 10: Power De-rating

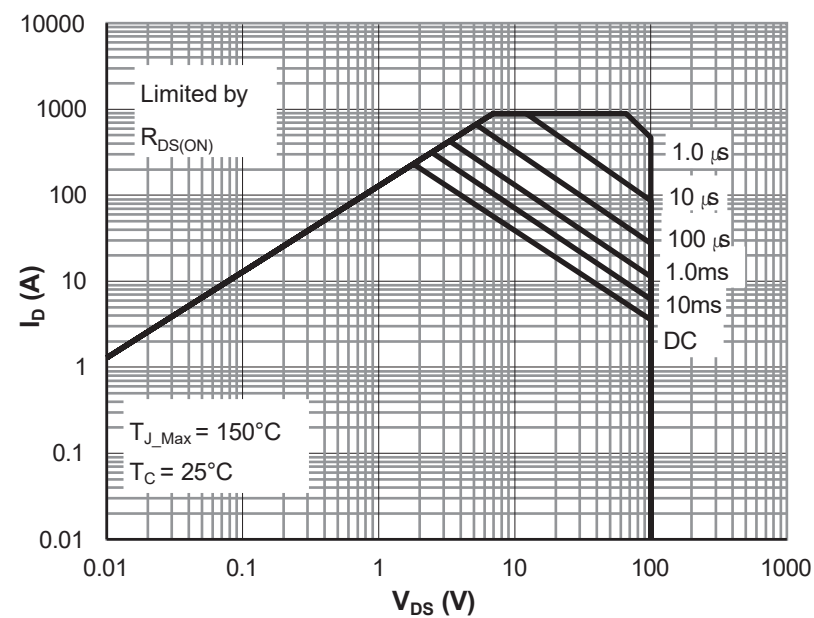


Figure 11: Maximum Safe Operating Area

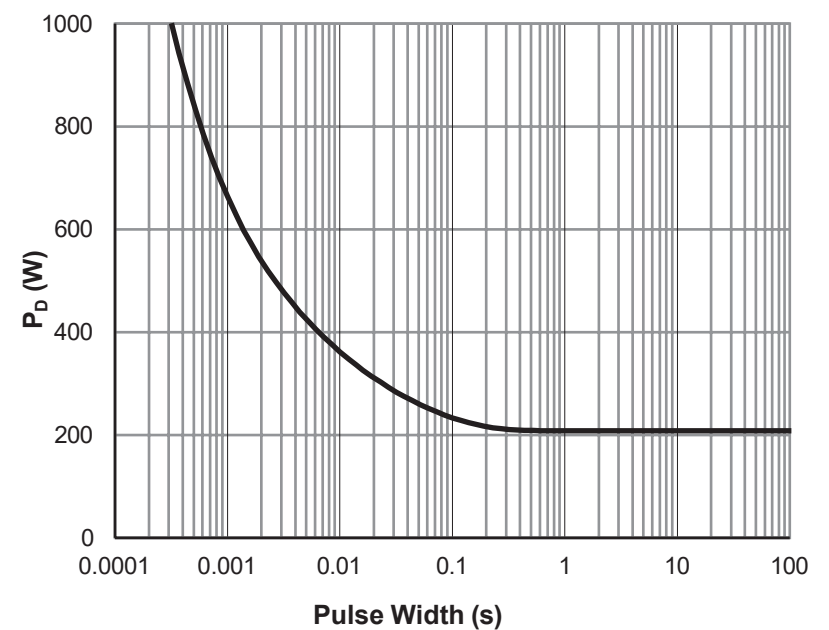
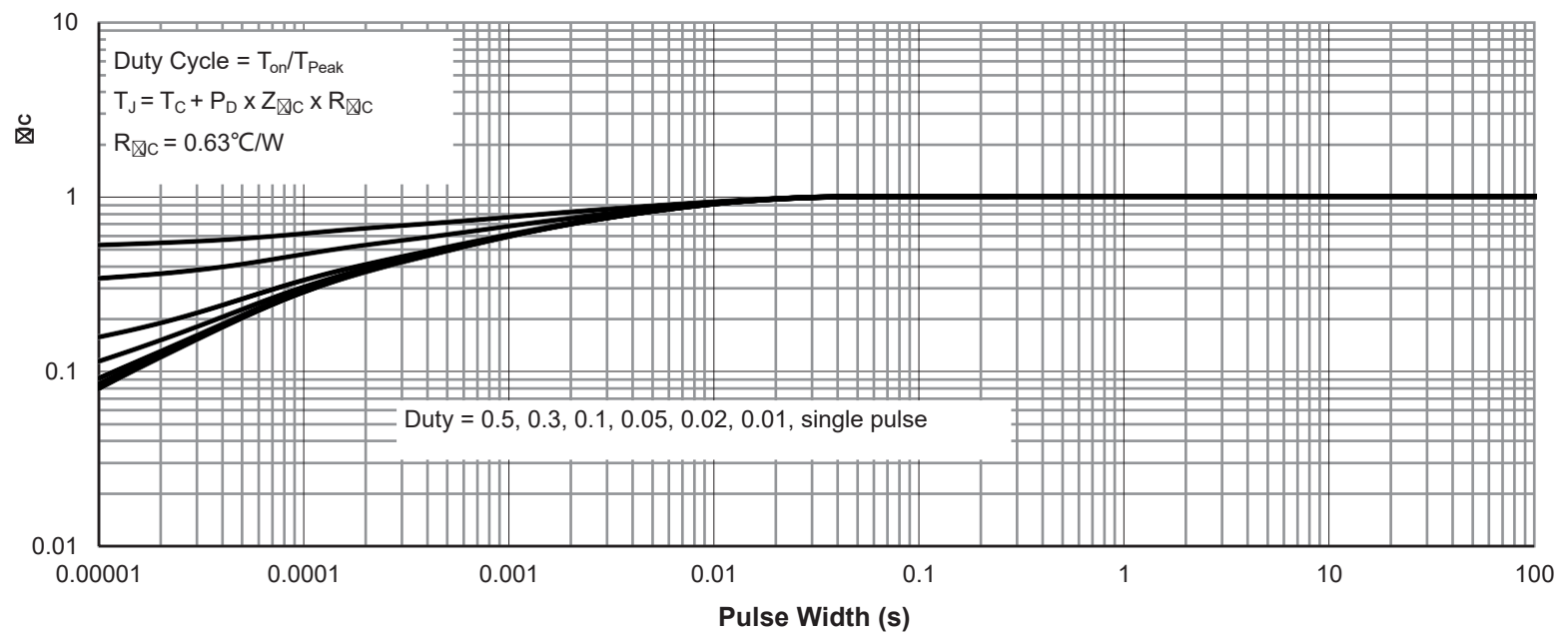


Figure 12: Single Pulse Power Rating, Junction-to-Case

Typical Electrical & Thermal Characteristics**Figure 13: Normalized Maximum Transient Thermal Impedance**