

Description

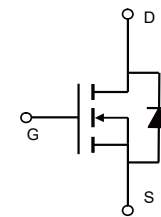
The VSM210N08 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in automotive applications and a wide variety of other applications.

General Features

- $V_{DSS}=85V, I_D=210A$
 $R_{DS(ON)} < 4.95m\Omega @ V_{GS}=10V$
- Good stability and uniformity with high E_{AS}
- Special process technology for high ESD capability
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

- Automotive applications
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM210N08	VSM210N08-TC	TO-220	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DSS}	85	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	210 (Note5)	A
Drain Current-Continuous($T_C=100^{\circ}C$)	$I_D(100^{\circ}C)$	148	A
Pulsed Drain Current	I_{DM}	850	A
Maximum Power Dissipation	P_D	300	W
Derating factor		2.0	W/ $^{\circ}C$
Single pulse avalanche energy (Note 3)	E_{AS}	1800	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	5	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^{\circ}C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 1)	$R_{\theta JC}$	0.5	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient ^(Note 1)	$R_{\theta JA}$	60	$^{\circ}\text{C/W}$

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

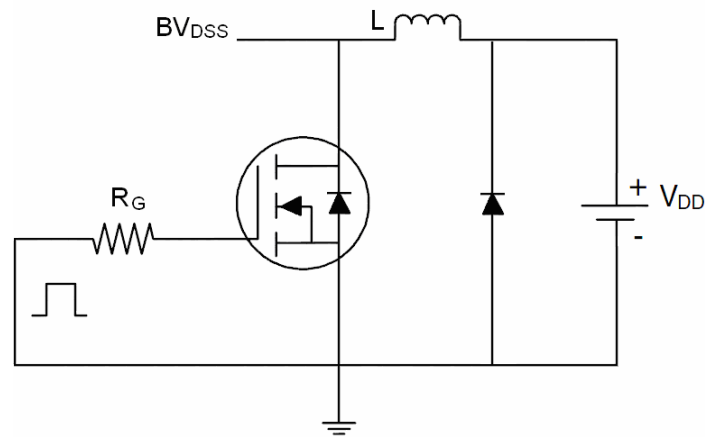
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	85	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =85V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±200	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	3.2	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =40A	-	4.1	4.95	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =20A	35	-	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz	-	7600	-	PF
Output Capacitance	C _{oss}		-	720	-	PF
Reverse Transfer Capacitance	C _{rss}		-	346	-	PF
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} =40V, I _D =40A V _{GS} =10V, R _{GEN} =1.2Ω (Note2)	-	23	-	nS
Turn-on Rise Time	t _r		-	124	-	nS
Turn-Off Delay Time	t _{d(off)}		-	84	-	nS
Turn-Off Fall Time	t _f		-	78	-	nS
Total Gate Charge	Q _g	V _{DS} =40V, I _D =40A, V _{GS} =10V(Note2)	-	140	-	nC
Gate-Source Charge	Q _{gs}		-	40	-	nC
Gate-Drain Charge	Q _{gd}		-	57	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =40A	-	-	1.2	V
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 40A di/dt = 100A/μs(Note2)	-	110	-	nS
Reverse Recovery Charge	Q _{rr}		-	300	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

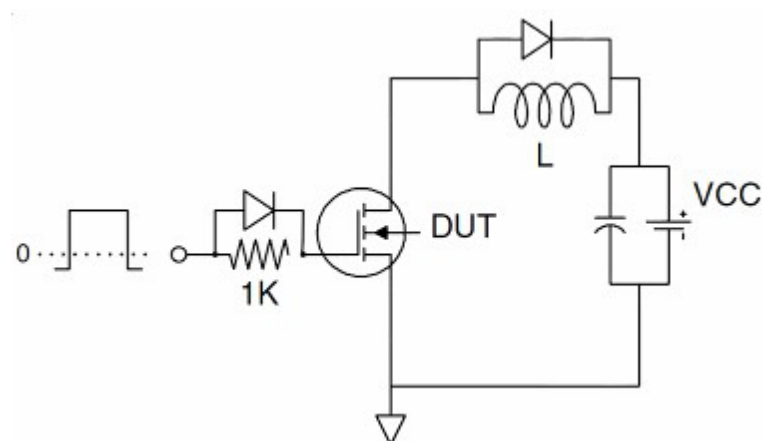
- The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The Power dissipation PDSM is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.
- Pulse Test: Pulse Width $\leq 400\mu s$, Duty Cycle $\leq 2\%$.
- EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=42.5V, V_G=10V, L=0.5mH, R_g=25\Omega$
- $I_{SD}\leq 125A, di/dt\leq 260A/\mu s, V_{DD}\leq V_{(BR)DSS}, T_J\leq 175^{\circ}\text{C}$

Test Circuit

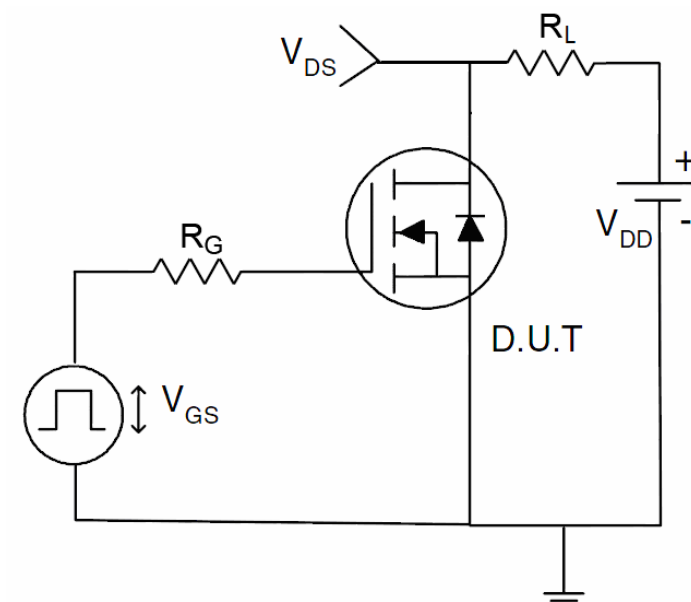
1) E_{AS} test circuit



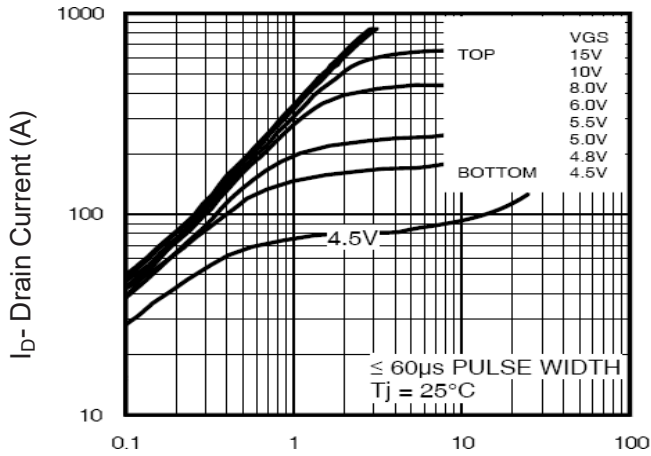
2) Gate charge test circuit



3) Switch time test circuit

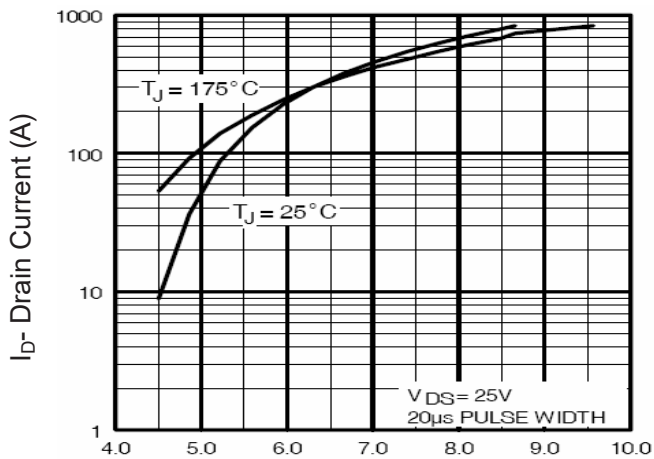


Typical Electrical and Thermal Characteristics



V_{DS} Drain-Source Voltage (V)

Figure 1 Output Characteristics



V_{GS} Gate-Source Voltage (V)

Figure 2 Transfer Characteristics

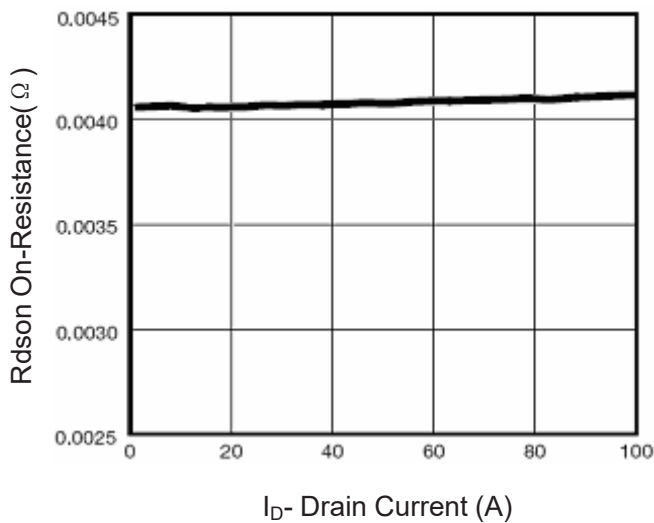
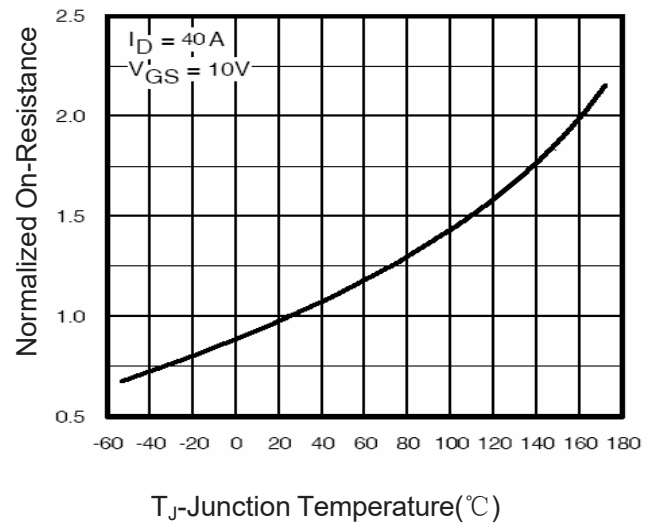


Figure 3 $R_{DS(on)}$ - Drain Current



T_J -Junction Temperature($^\circ C$)

Figure 4 $R_{DS(on)}$ -Junction Temperature

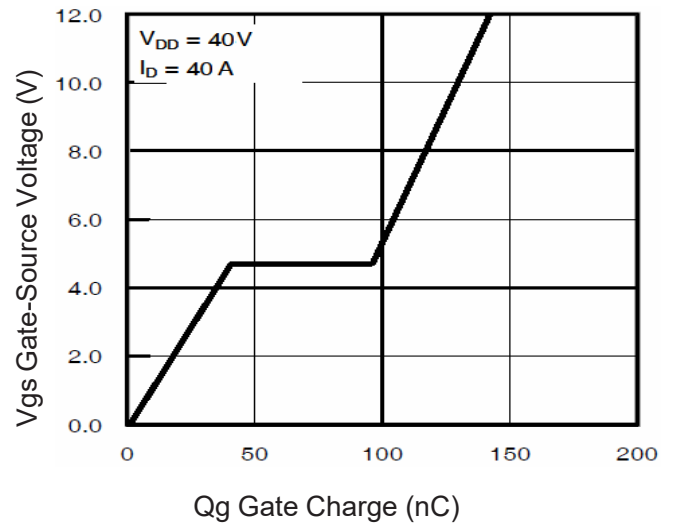


Figure 5 Gate Charge

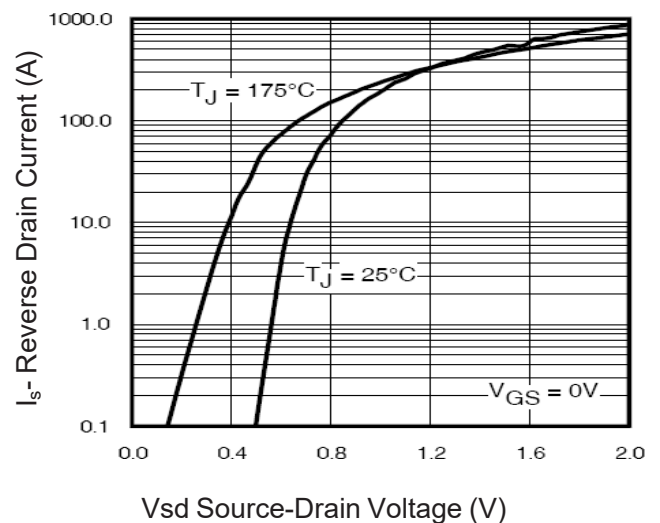
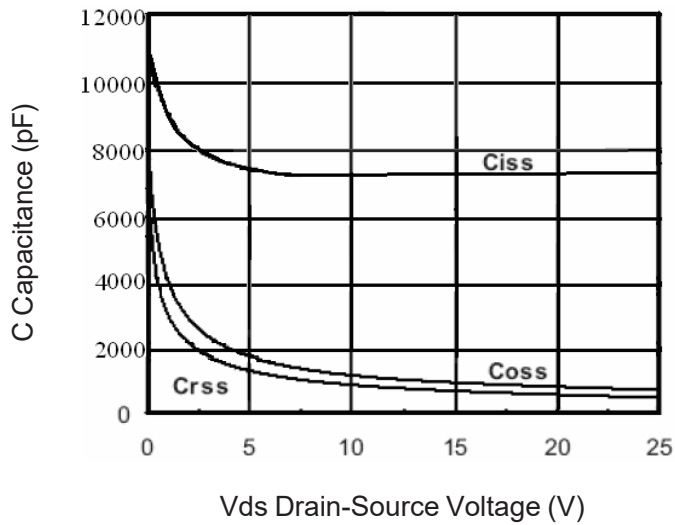
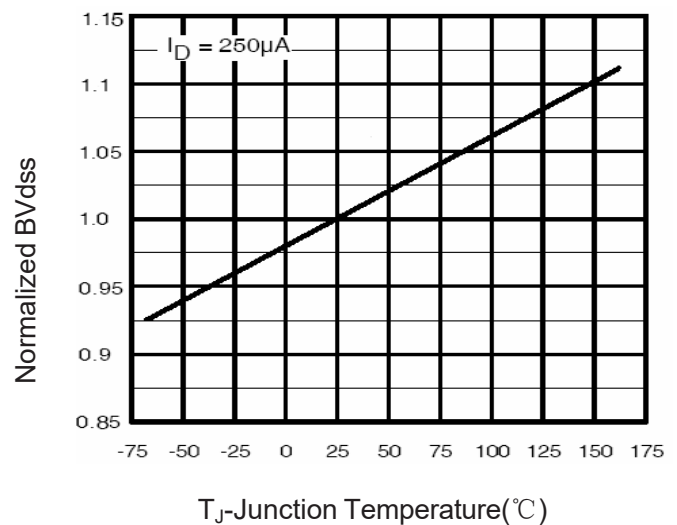
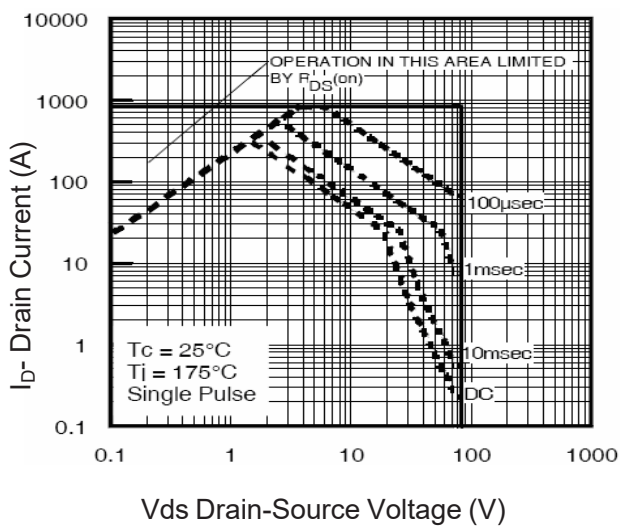
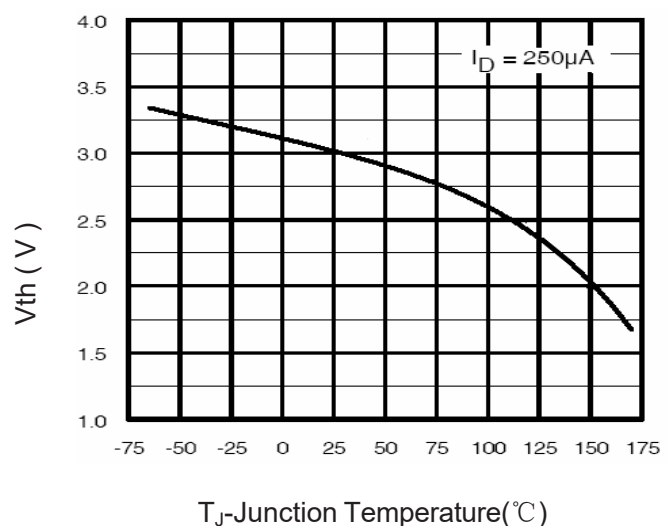
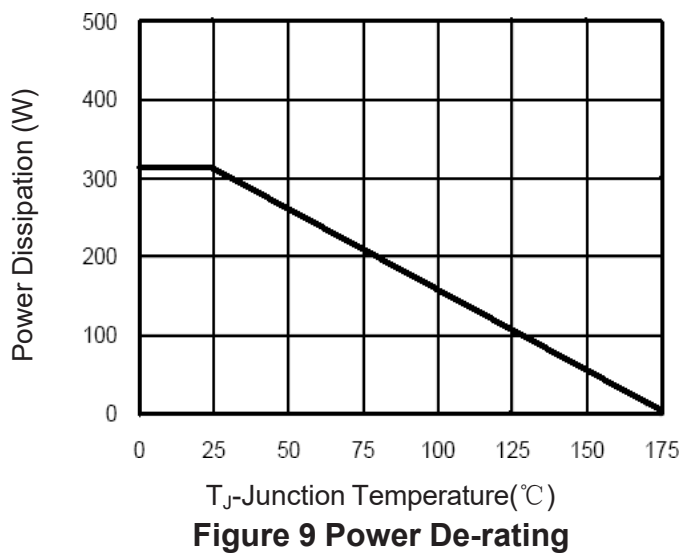
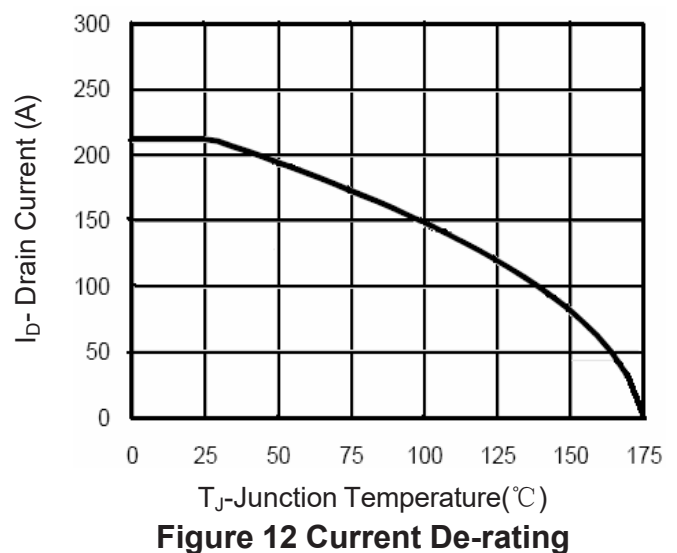


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 10 BV_{DSS} vs Junction Temperature

Figure 8 Safe Operation Area

Figure 11 V_{GS(th)} vs Junction Temperature

Figure 9 Power De-rating

Figure 12 Current De-rating

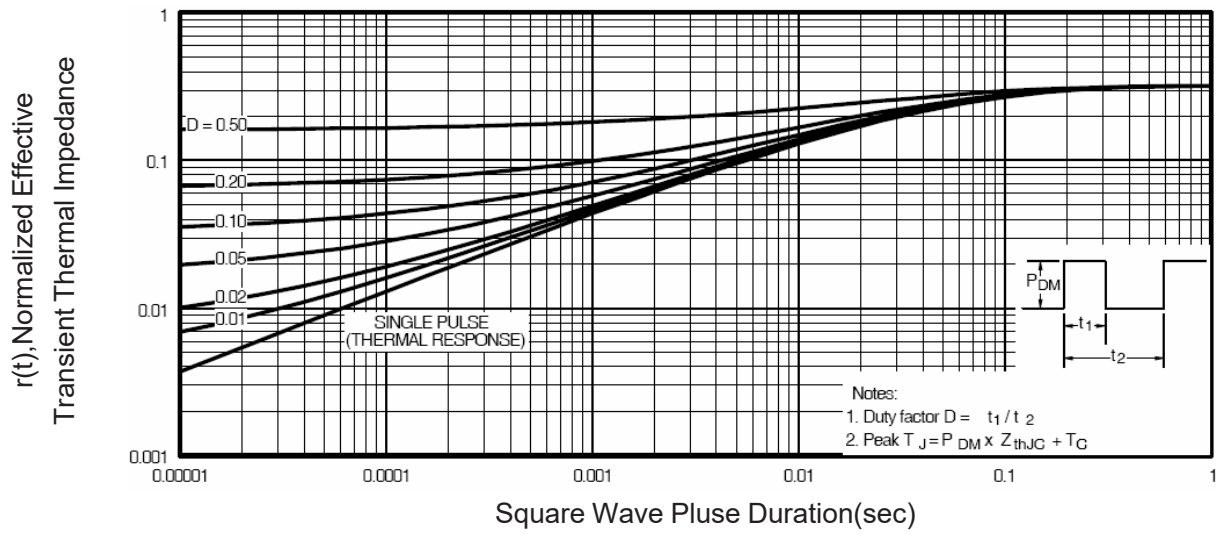


Figure 11 Normalized Maximum Transient Thermal Impedance