Description

The Power MOSFET is fabricated using the advanced planer VDMOS technology. The resulting device has low conduction resistance, superior switching performance and high avalanche energy.

Features

- Low $R_{DS(on)}$
- Low gate charge (typ. Q_g = 58.3 nC)
- 100% UIS tested
- RoHS compliant

Applications

- Power factor correction.
- Switched mode power supplies.
- LED driver.

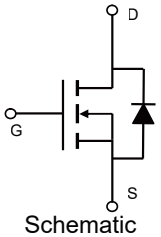
Product Summary

V_{DSS}	650V
I_D	20A
$R_{DS(on),max}$	0.5Ω
$Q_{g,typ}$	58.3 nC


TO-220C


TO-220F


TO-247



Schematic

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current (T_C = 25°C)	I_D	20	A
(T_C = 100°C)		12.5	A
Pulsed drain current [1]	I_{DM}	80	A
Gate-Source voltage	V_{GSS}	±30	V
Avalanche energy, single pulse [2]	E_{AS}	720	mJ
Peak diode recovery dv/dt [3]	dv/dt	5	V/ns
Power Dissipation (TO-220F, T_C = 25°C)	P_D	45	W
Derate above 25°C		0.36	W/°C
Power Dissipation (TO-247/TO-220, T_C = 25°C)		250	W
Derate above 25°C		2	W/°C
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	°C
Continuous diode forward current	I_S	20	A
Diode pulse current	$I_{S,pulse}$	80	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-247/TO-220	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	2.78	0.5	°C/W
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	40	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Reel
VSM20N65-TC	TO-220C	VSM20N65-TC	30	
VSM20N65-TF	TO-220F	VSM20N65-TF	50	
VSM20N65-T7	TO-247	VSM20N65-T7	50	

Electrical Characteristics

T_c = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=0.25 mA	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=0.25 mA	2	-	4	V
Drain cut-off current	I_{DSS}	V_{DS}=650 V, V_{GS}=0 V, T_j = 25°C T_j = 125°C	 - -	 -	 1 100	 μA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=30 V, V_{DS}=0 V	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-30 V, V_{DS}=0 V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=10A	-	0.42	0.5	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V,	-	2962	-	
Output capacitance	C_{oss}	f = 1 MHz	-	266	-	pF
Reverse transfer capacitance	C_{rss}		-	18	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 325 V, I_D = 20A	-	18.8	-	
Rise time	t_r	R_G = 10 Ω, V_{GS}=15 V	-	43.4	-	ns
Turn-off delay time	$t_{d(off)}$		-	98.2	-	
Fall time	t_f		-	16.9	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=520 V, I_D=20 A,	-	16.7	-	
Gate to drain charge	Q_{gd}	V_{GS}=0 to 10 V	-	19.3	-	nC
Gate charge total	Q_g		-	58.3	-	
Gate plateau voltage	$V_{plateau}$		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=20A	-	-	1.5	V
Reverse recovery time	t_{rr}	V_R=325 V, I_F=20A	-	492.8	-	ns
Reverse recovery charge	Q_{rr}	dI_F/dt=100 A/μs	-	7.46	-	μC
Peak reverse recovery current	I_{rrm}		-	30.3	-	A

Notes:

1. Pulse width limited by maximum junction temperature.
2. L=10mH, I_{AS} = 12A, Starting T_j= 25°C.
3. I_{SD} = 20A, di/dt≤100A/us, V_{DD}≤BV_{DS}, Starting T_j= 25°C.

Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

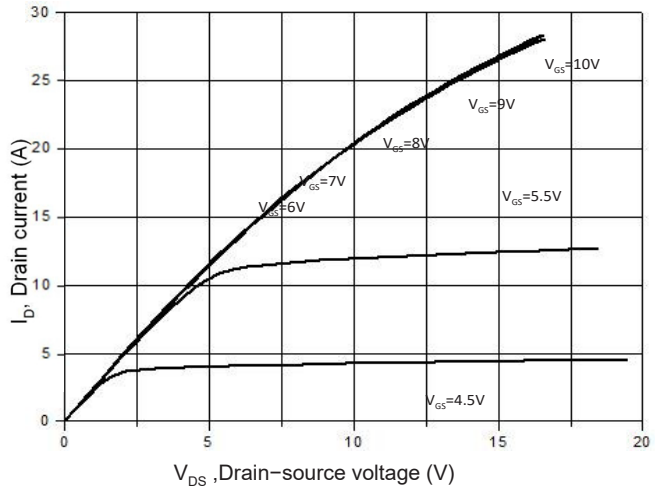


Figure 2. Transfer Characteristics

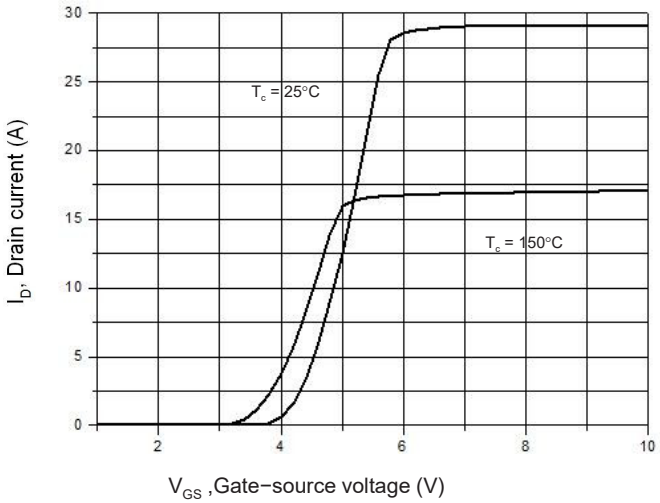


Figure 3. On-Resistance Variation vs. Drain Current

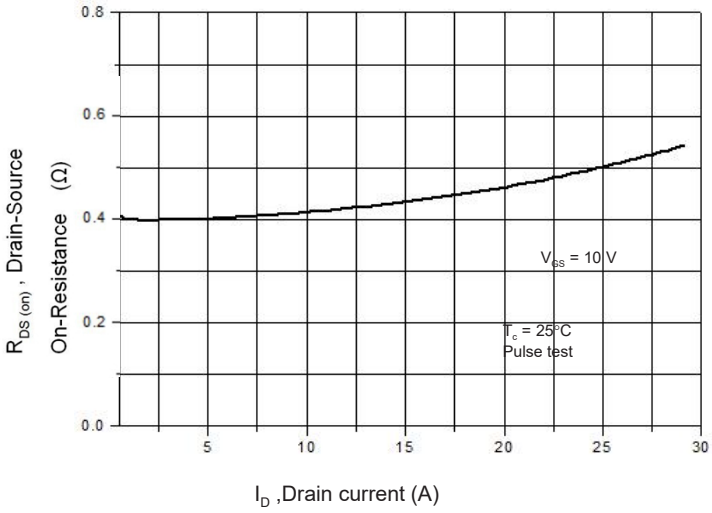


Figure 4. Threshold Voltage vs. Temperature

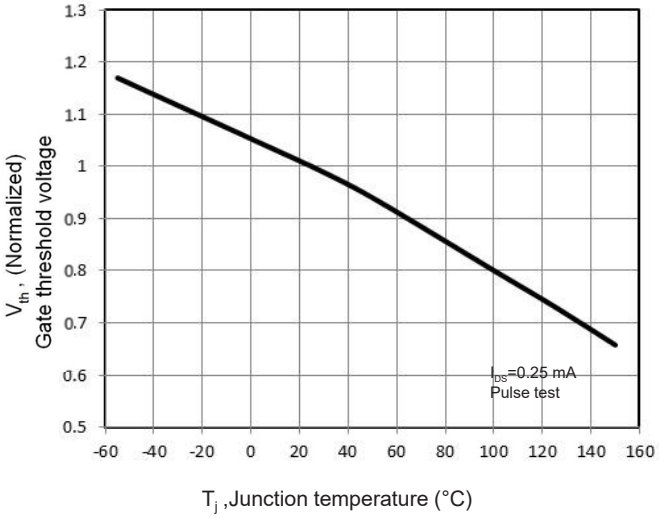


Figure 5. Breakdown Voltage vs. Temperature

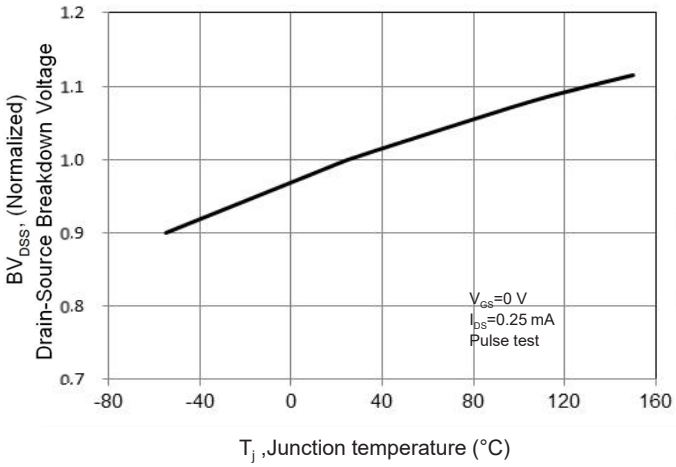


Figure 6. On-Resistance vs. Temperature

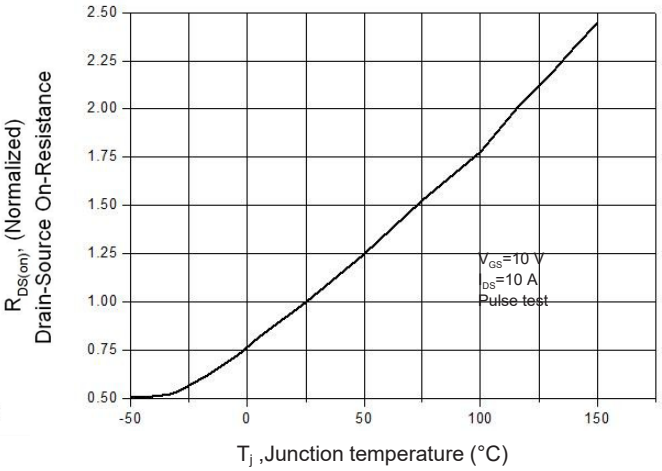


Figure 7. Capacitance Characteristics

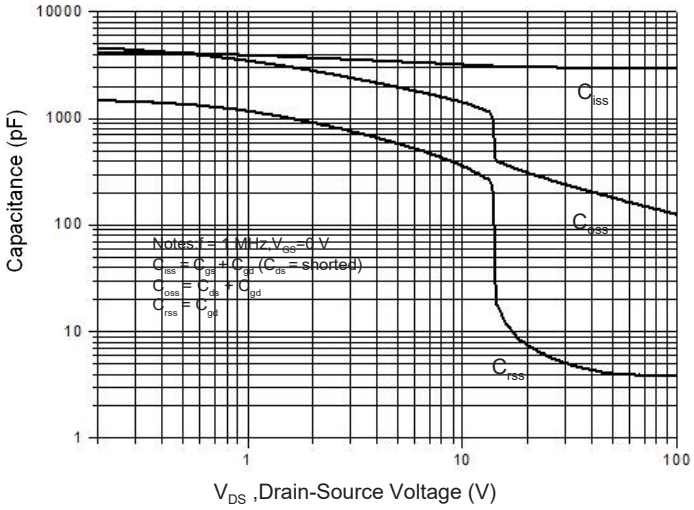


Figure 8. Gate Charge Characteristics

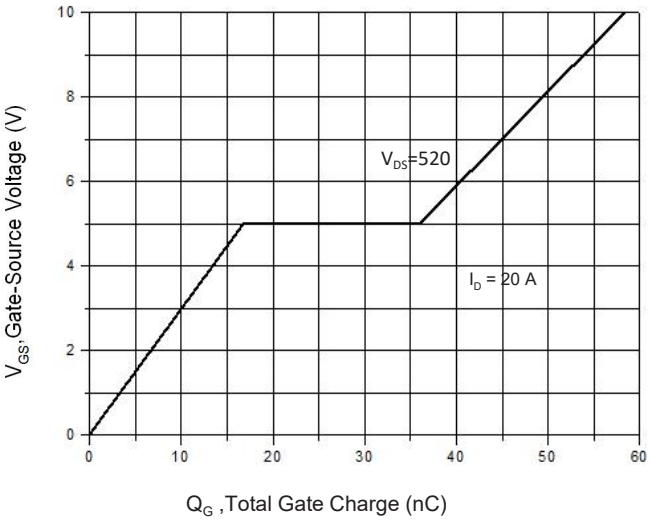


Figure 9. Maximum Safe Operating Area
C C TO-220F

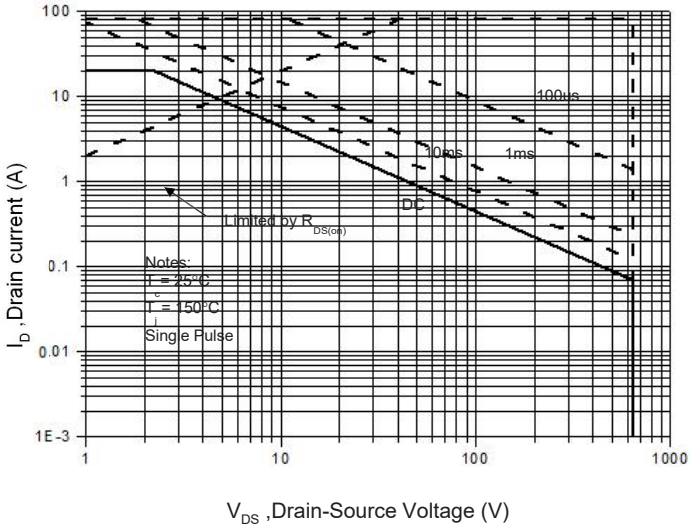


Figure 10. Maximum Safe Operating Area
TO-247/C C TO-220

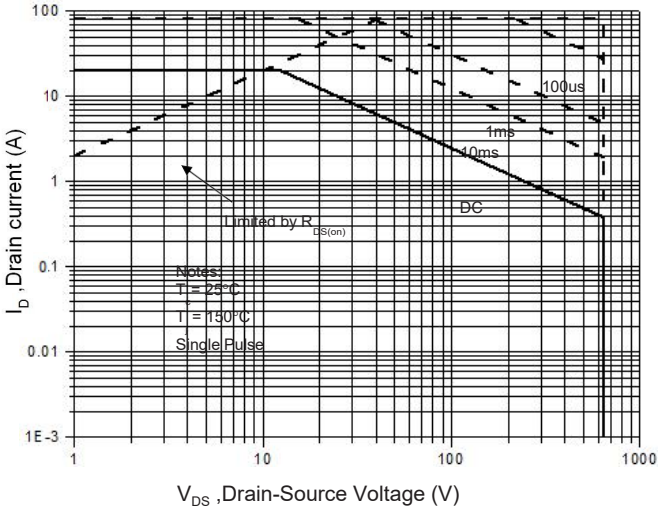


Figure 11. Power Dissipation vs. Temperature
C C TO-220F

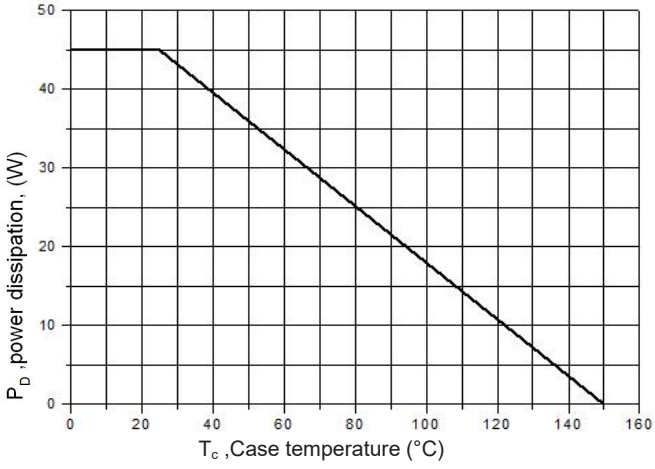


Figure 12. Power Dissipation vs. Temperature
TO-247/C C TO-220

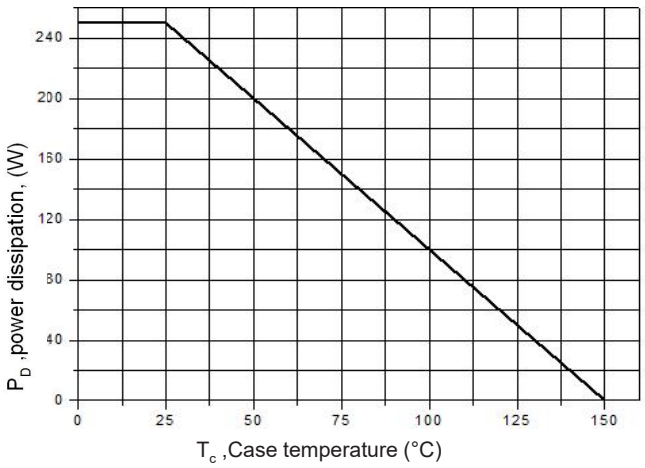


Figure 13. Continuous Drain Current vs. Temperature

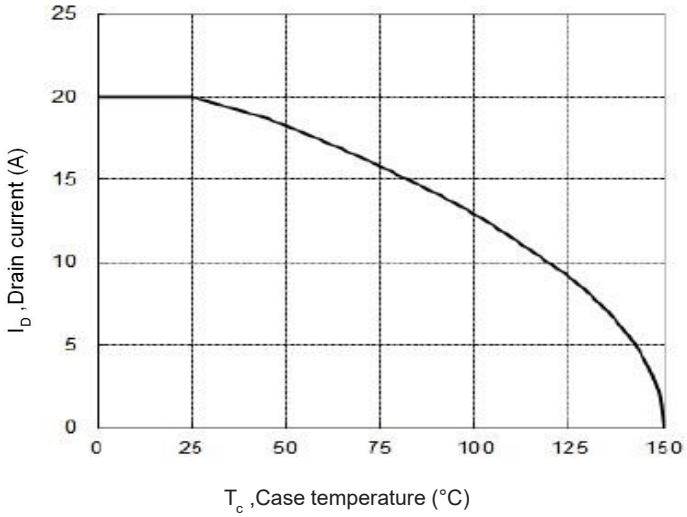


Figure 14. Body Diode Transfer Characteristics

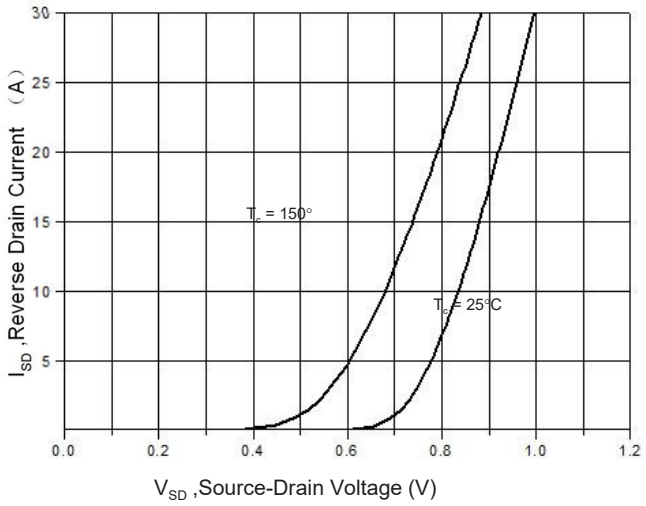


Figure 15 Transient Thermal Impedance , Junction to Case，C TO-220F

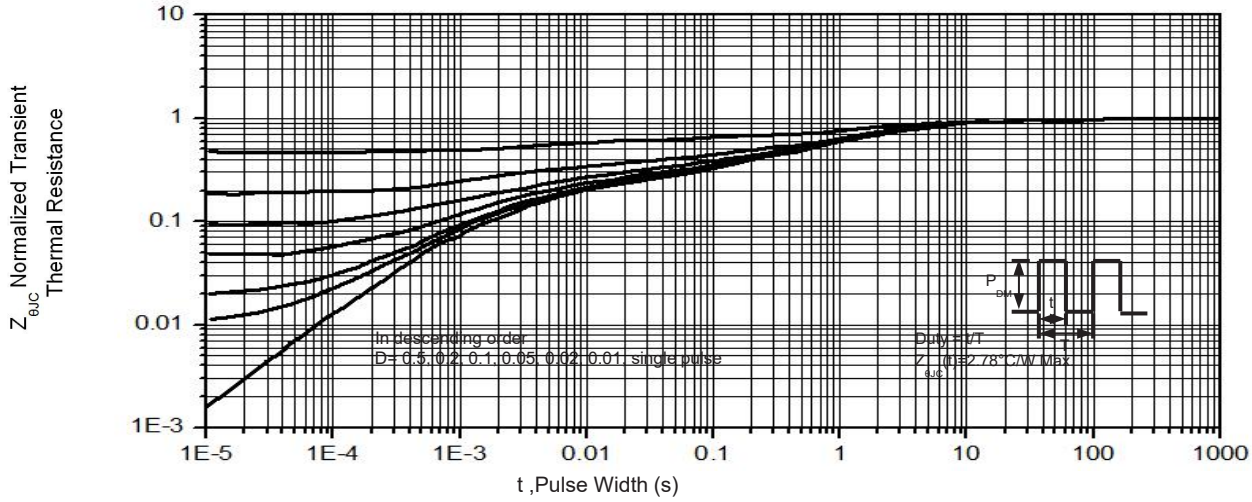
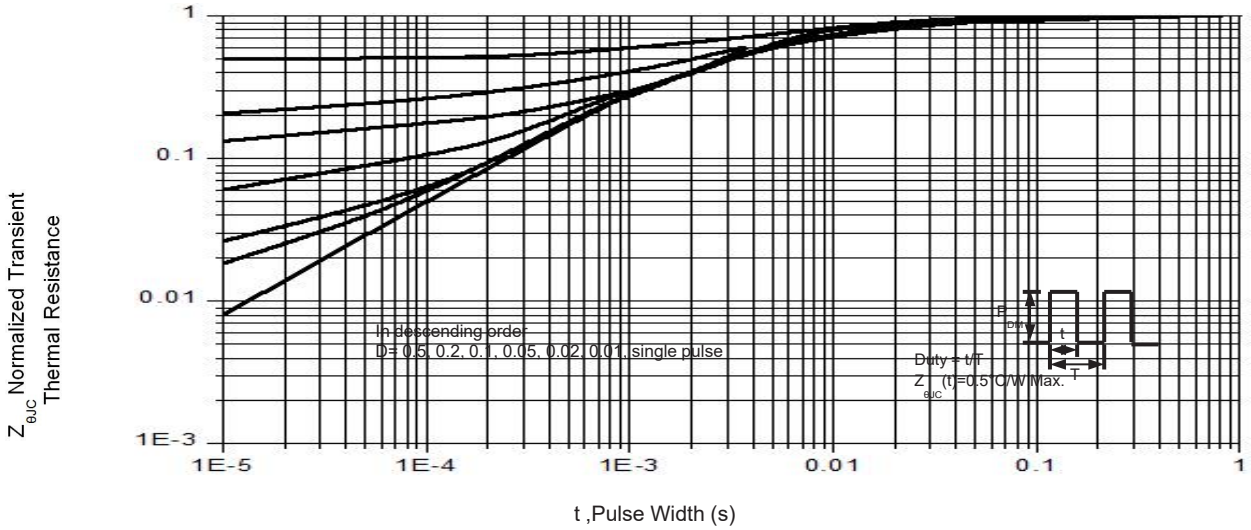
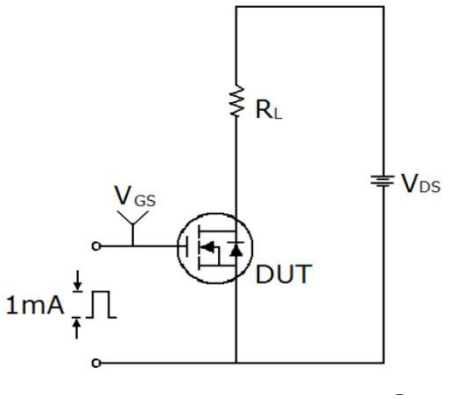
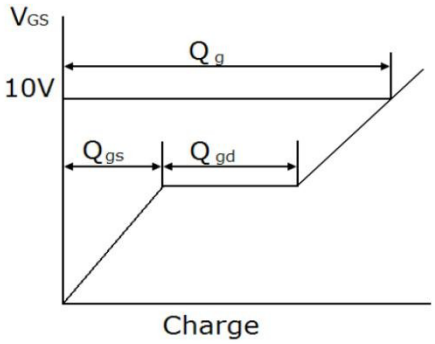


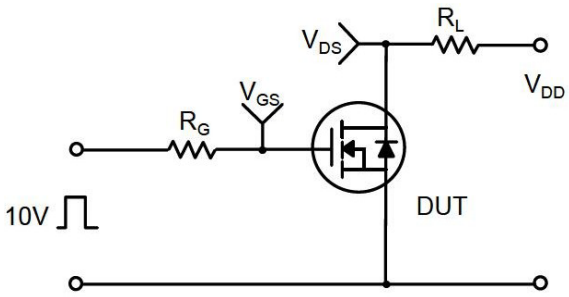
Figure 16. Transient Thermal Impedance, Junction to Case，TO-247/C TO-220

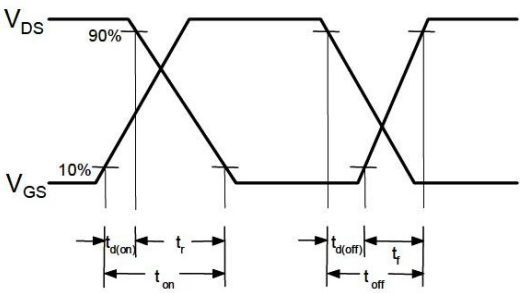


Gate Charge Test Circuit & Waveform









Unclamped Inductive Switching Test Circuit & Waveforms