

Description

The Power MOSFET is fabricated using the advanced planar 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. $Q_g = 12.8 \text{ nC}$)
- ◆ 100% UIS tested
- ◆ RoHS compliant

Applications

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

Product Summary

V_{DSS}	600V
I_D	4A
$R_{DS(on),max}$	2.4Ω
$Q_{g,typ}$	12.8 nC



TO-262



TO-251



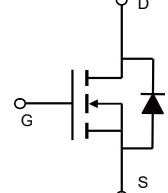
TO-252



TO-220F



TO-220C



Schematic

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	600	V
Continuous drain current ($T_C = 25^\circ\text{C}$)	I_D	4	A
($T_C = 100^\circ\text{C}$)		2.5	A
Pulsed drain current ¹⁾	I_{DM}	16	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	245	mJ
Peak diode recovery dv/dt ³⁾	dv/dt	5	V/ns
Power Dissipation C TO-220F ($T_C = 25^\circ\text{C}$)	P_D	32	W
Derate above 25°C		0.26	W/ $^\circ\text{C}$
Power Dissipation C TO-220\TO-251\TO-252\TO-262 ($T_C = 25^\circ\text{C}$)		77	W
Derate above 25°C		0.61	W/ $^\circ\text{C}$
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Continuous diode forward current	I_S	4	A
Diode pulse current	$I_{S,pulse}$	16	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		C TO-220F	C TO-220\TO-251\TO-252\TO-262	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.8	1.62	$^\circ\text{C/W}$
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	110	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Reel
VSM4N60-T62	TO-262	VSM4N60-T62	50	
VSM4N60-T1	TO-251	VSM4N60-T1	50	
VSM4N60-T2	TO-252	VSM4N60-T2		2500
VSM4N60-TF	TO-220F	VSM4N60-TF	80	
VSM4N60-TC	TO-220C	VSM4N60-TC	50	

Electrical Characteristics

 $T_c = 25^{\circ}\text{C}$ 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	600	-	-	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} =600 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 =2 A	-	2.0	2.4	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	580	-	pF
Output capacitance	C _{oss}		-	50	-	
Reverse transfer capacitance	C _{rss}		-	3	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 300 V, I _D = 4 A R _G = 10 Ω, V _{GS} =15 V	-	13	-	ns
Rise time	t _r		-	31	-	
Turn-off delay time	t _{d(off)}		-	38	-	
Fall time	t _f		-	17	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480 V, I _D =4 A, V _{GS} =0 to 10 V	-	3.1	-	nC
Gate to drain charge	Q _{gd}		-	5.5	-	
Gate charge total	Q _g		-	12.8	-	
Gate plateau voltage	V _{plateau}		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =4 A	-	-	1.5	V
Reverse recovery time	t _{rr}	V _R =400 V, I _F =4 A, dI _F /dt=100 A/μs	-	275	-	ns
Reverse recovery charge	Q _{rr}		-	1.43	-	μC
Peak reverse recovery current	I _{rrm}		-	10.4	-	A

Notes:

- Pulse width limited by maximum junction temperature.
- $L=10\text{mH}$, $I_{AS} = 7\text{ A}$, Starting $T_j = 25^{\circ}\text{C}$.
- $I_{SD} = 4\text{ A}$, $dI/dt \leq 100\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DS}$, Starting $T_j = 25^{\circ}\text{C}$.

Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

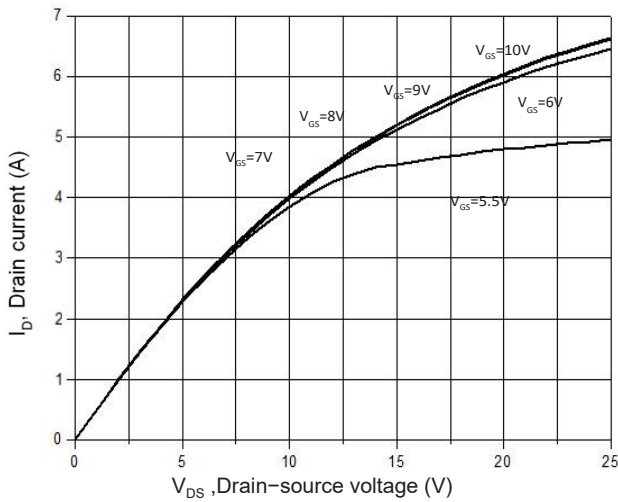


Figure 2. Transfer Characteristics

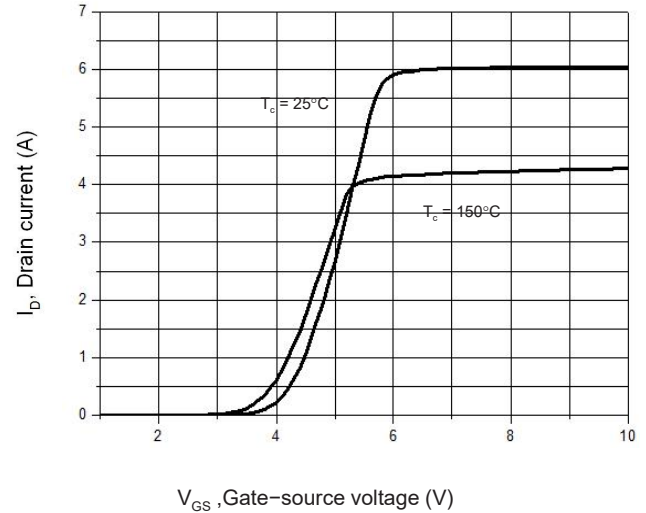


Figure 3. On-Resistance Variation vs. Drain Current

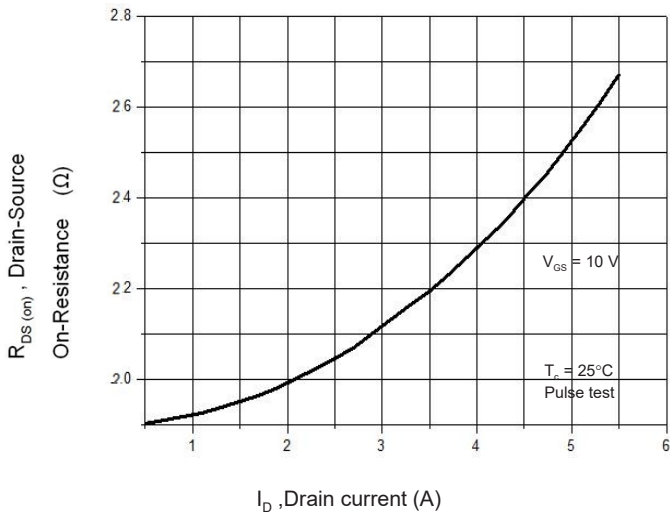


Figure 4. Threshold Voltage vs. Temperature

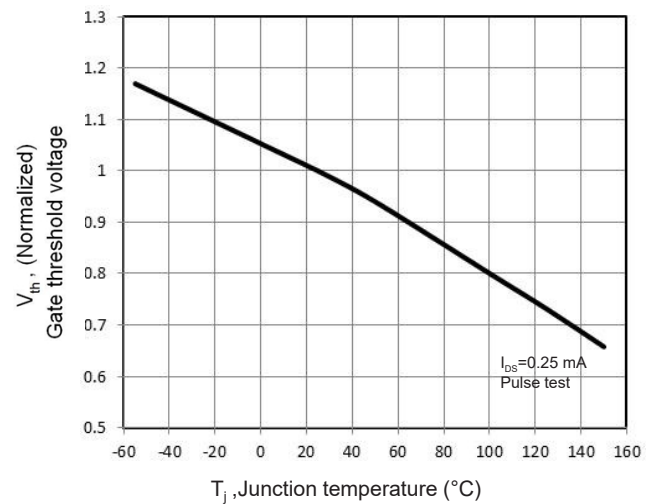


Figure 5. Breakdown Voltage vs. Temperature

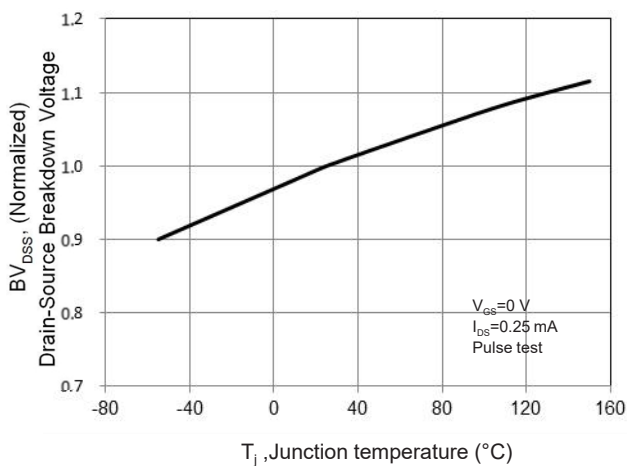


Figure 6. On-Resistance vs. Temperature

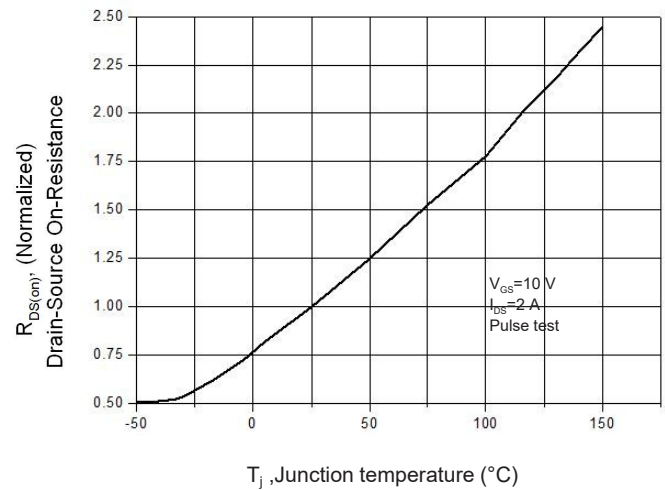


Figure 7. Capacitance Characteristics

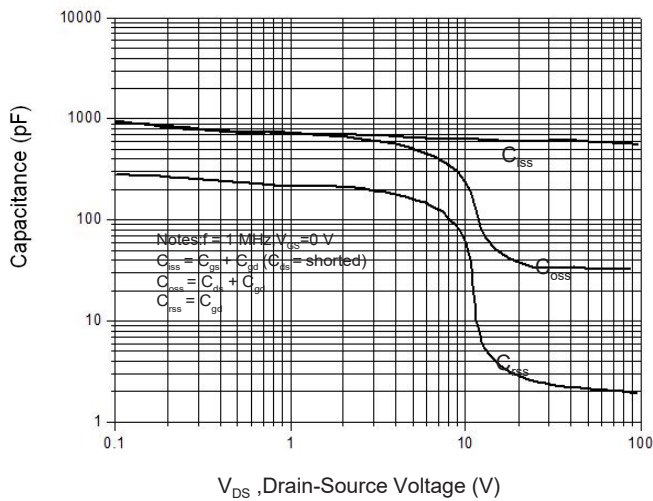


Figure 8. Gate Charge Characterist

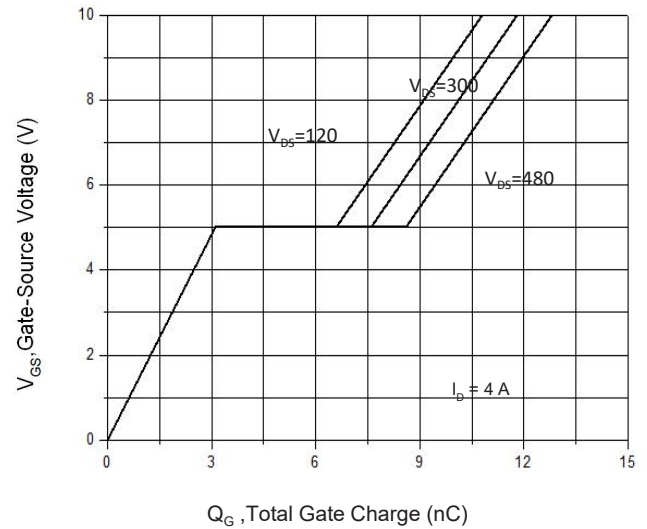
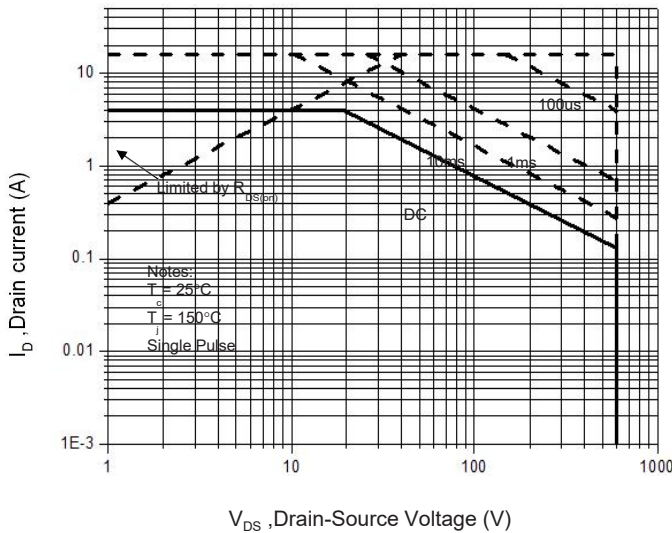
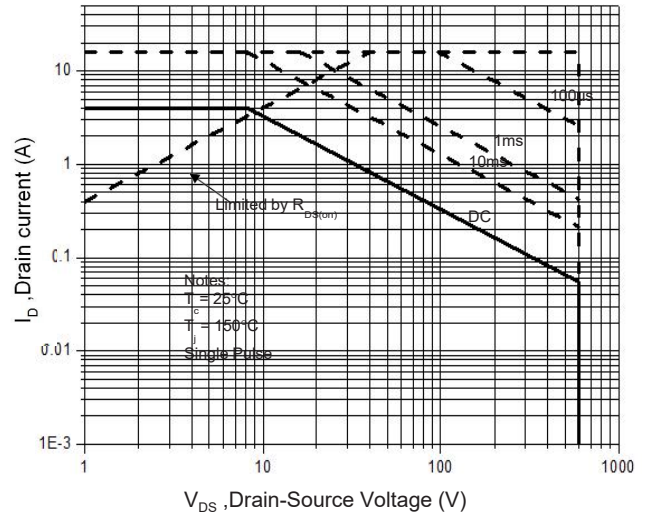
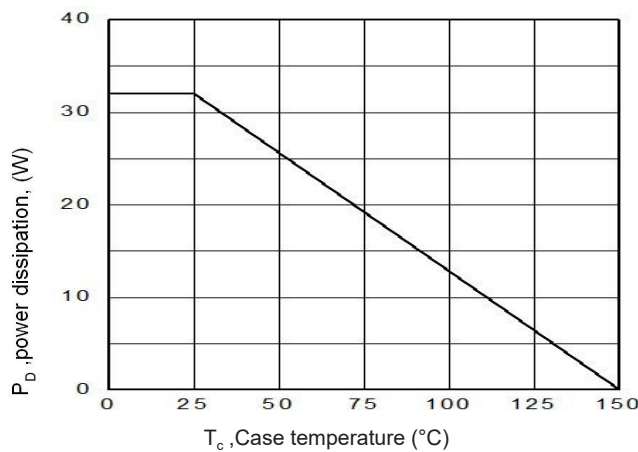
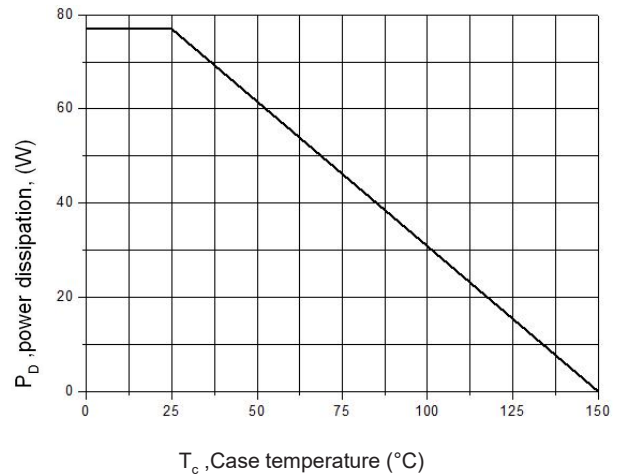

Figure 9. Maximum Safe Operating Area
C C TO-220F

Figure 10. Maximum Safe Operating Area
C C TO-220/TO-251/TO-252/TO-262

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

Figure 12. Power Dissipation vs. Temperature
C C TO-220/TO-251/TO-252/TO-262


Figure 13. Continuous Drain Current vs. Temperature

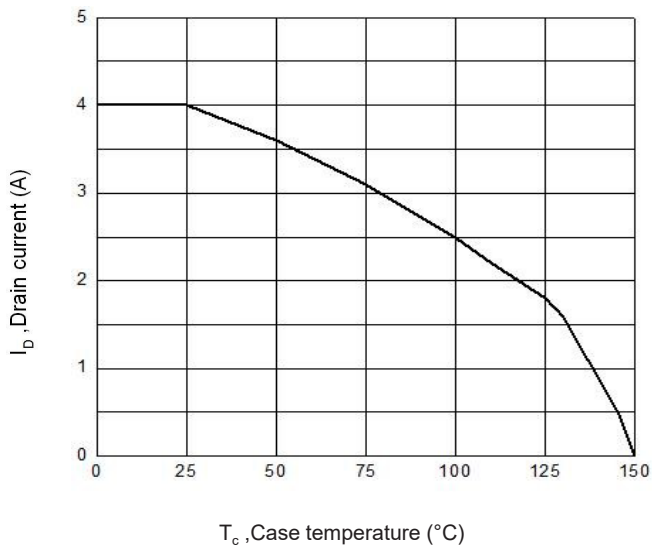
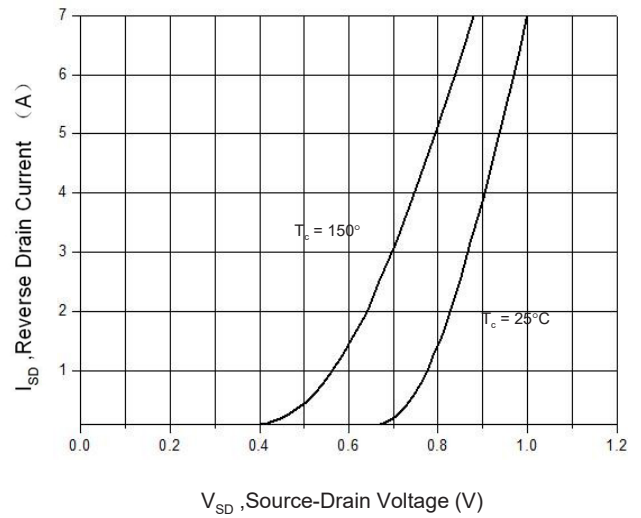
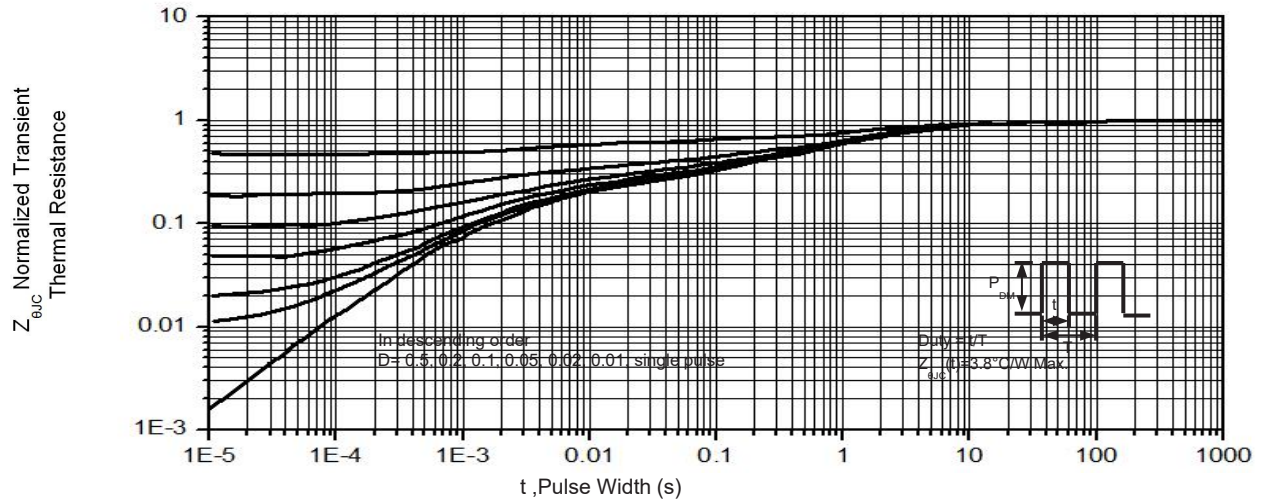
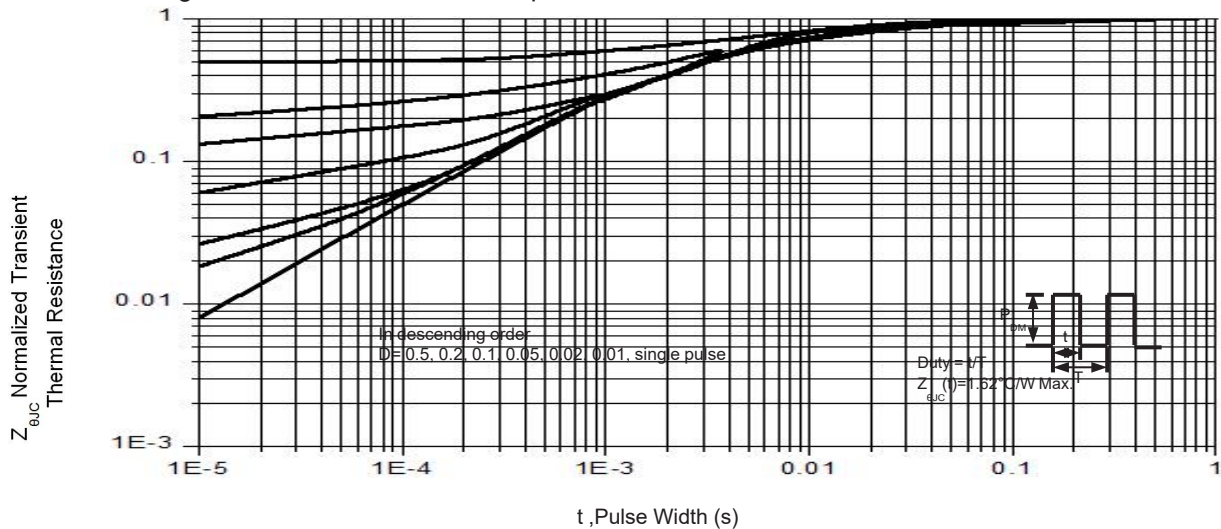
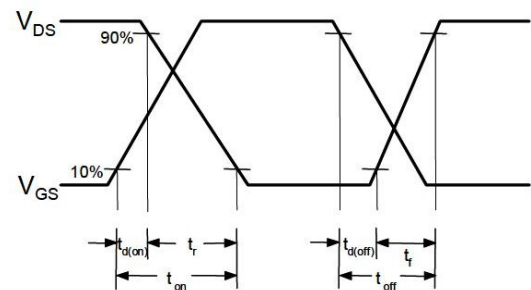
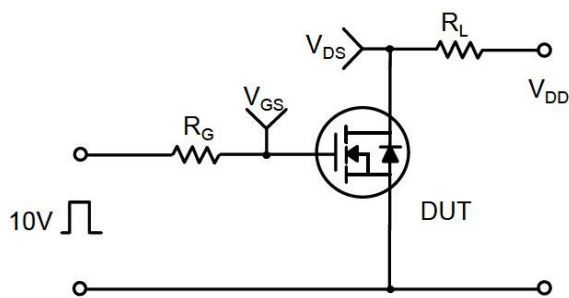
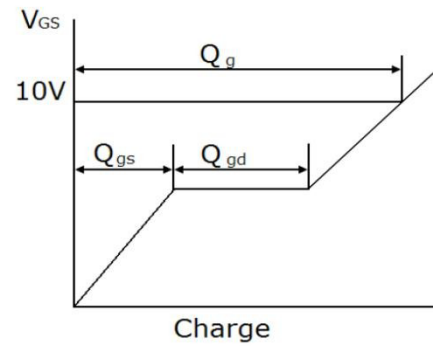
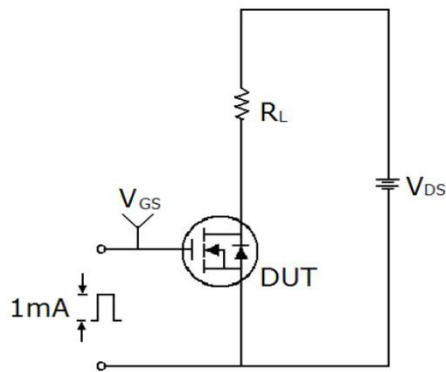


Figure 14. Body Diode Transfer Characteristics


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

 Figure 16. Transient Thermal Impedance, Junction to Case ζ TO-220/TO-251/TO-252/TO-262


Gate Charge Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveforms

