Description

Features

- 650V,20A
- $R_{DS(ON)}$ = 0.35Ω (Typ.) @ V_{GS} = 10V, I_D =10A
- Fast Switching
- Improved dv/dt Capability
- 100% Avalanche Tested

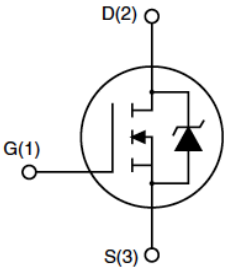
Application

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction (PFC)


TO-220F


TO-247


TO-3P



Schematic Diagram

Absolute Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Parameter		Max.		Units
			TO-220F	TO-247/TO-3P	
V_{DSS}	Drain-Source Voltage		650		V
V_{GSS}	Gate-Source Voltage		±30		V
I_D	Continuous Drain Current	T_C = 25℃	20		A
		T_C = 100℃	13		A
I_{DM}	Pulsed Drain Current note1		80		A
E_{AS}	Single Pulsed Avalanche Energy note2		1350		mJ
P_D	Power Dissipation	T_C = 25℃	167	416	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case		0.75	0.3	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		60	60	℃/W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		℃

Electrical Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V,I_D=250μA	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650V, V_{GS} = 0V, T_J= 25℃	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	V_{DS} =0V, V_{GS} = ±30V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}= V_{GS}, I_D=250μA	2	3	4	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS} =10V, I_D =10A	-	0.35	0.45	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	-	2978	-	pF
C_{oss}	Output Capacitance		-	291	-	pF
C_{rss}	Reverse Transfer Capacitance		-	40	-	pF
Q_g	Total Gate Charge	V_{DD} = 520V, I_D = 20A, V_{GS} = 10V	-	80	-	nC
Q_{gs}	Gate-Source Charge		-	12	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	34	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 325V, I_D =20A, R_G = 25Ω	-	37	-	ns
t_r	Turn-on Rise Time		-	66	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	175	-	ns
t_f	Turn-off Fall Time		-	84	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	20	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	80	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 20A	-	-	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} =0V, I_S=20A, di/dt=100A/μs	-	450	-	ns
Q_{rr}	Reverse Recovery Charge		-	7.1	-	μC

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. I_{AS} =16A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

3. Pulse Test: Pulse Width≤350μs, Duty Cycle≤1%

Typical Performance Characteristics

Figure1: Output Characteristics

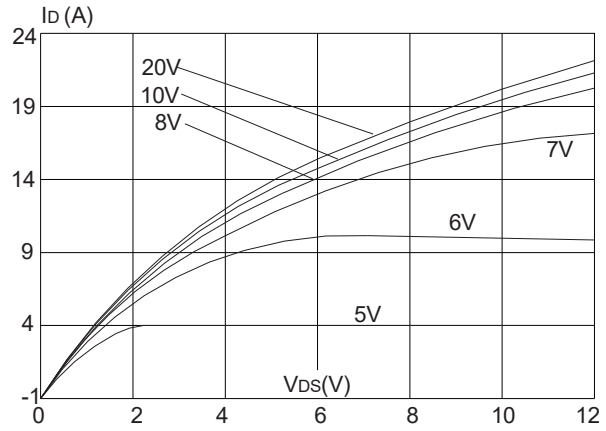


Figure 2: Typical Transfer Characteristics

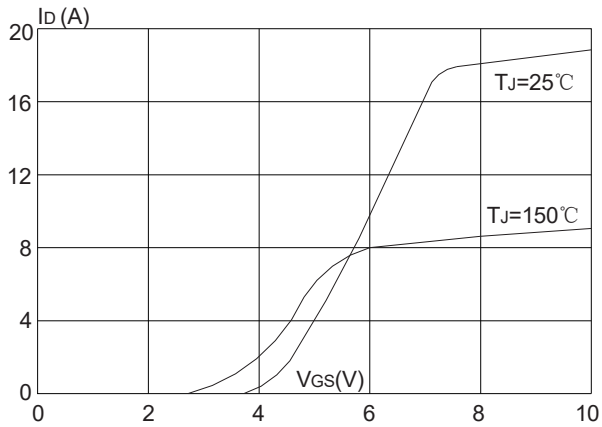


Figure 3: On-resistance vs. Drain Current

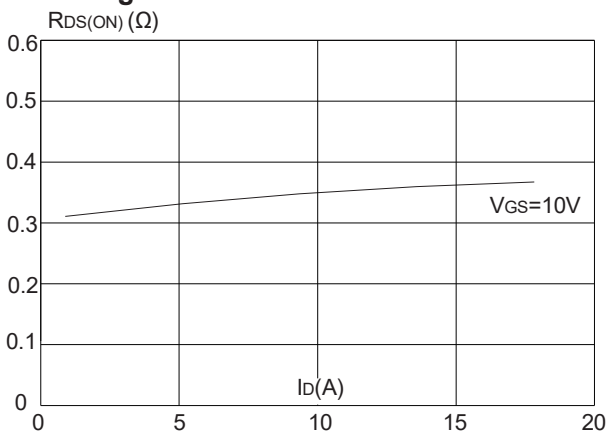


Figure 4: Body Diode Characteristics

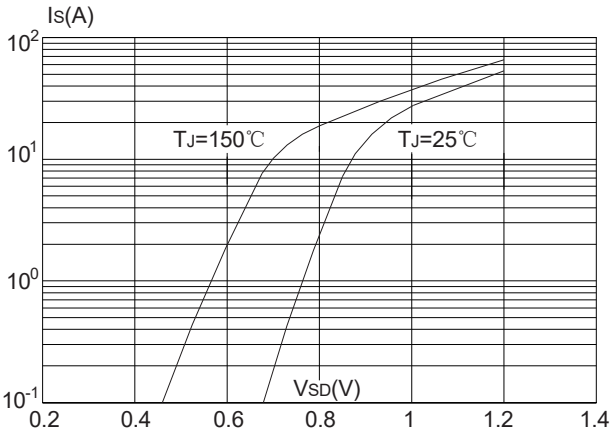


Figure 5: Gate Charge Characteristics

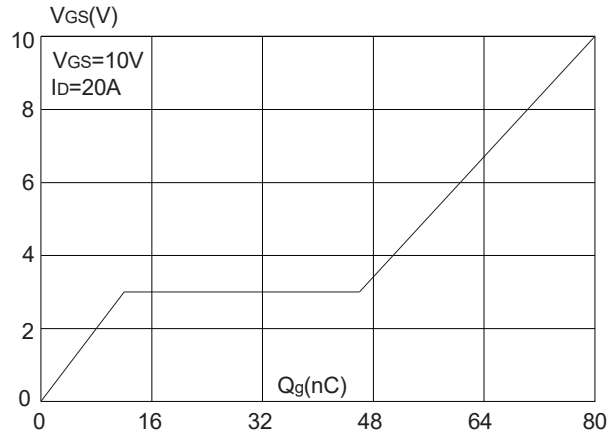


Figure 6: Capacitance Characteristics

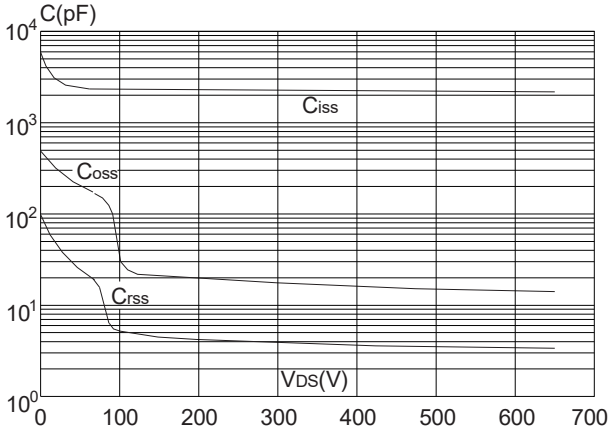


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

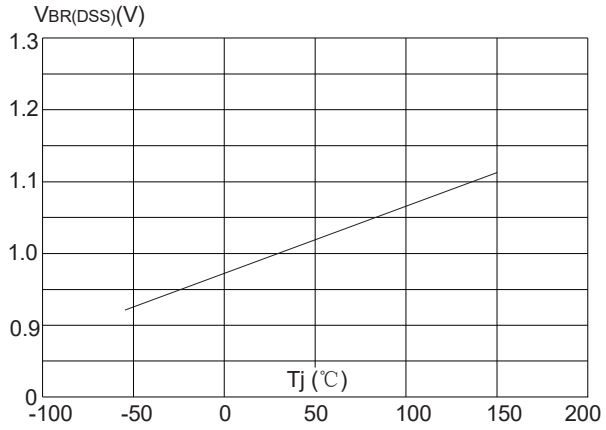


Figure 8: Normalized on Resistance vs. Junction Temperature

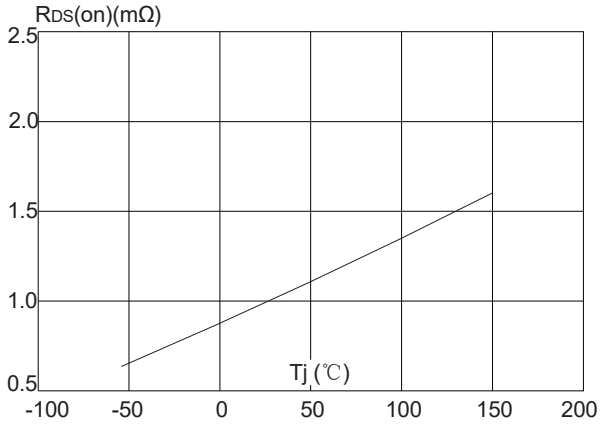


Figure 9: Maximum Safe Operating Area

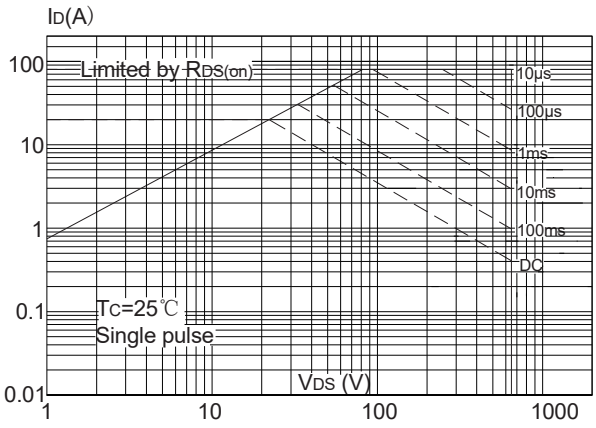


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

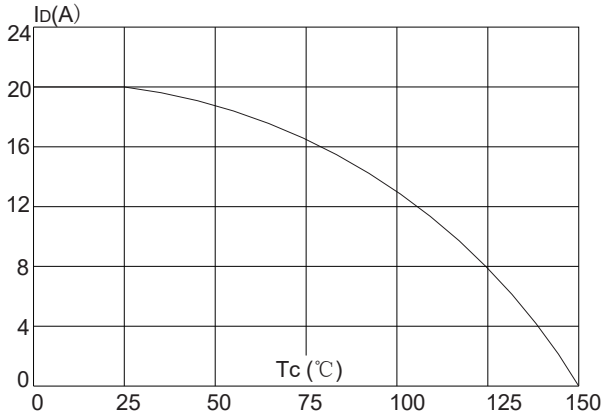


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220F)

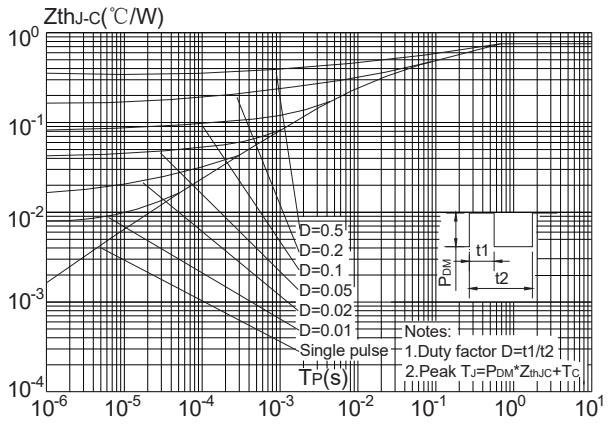
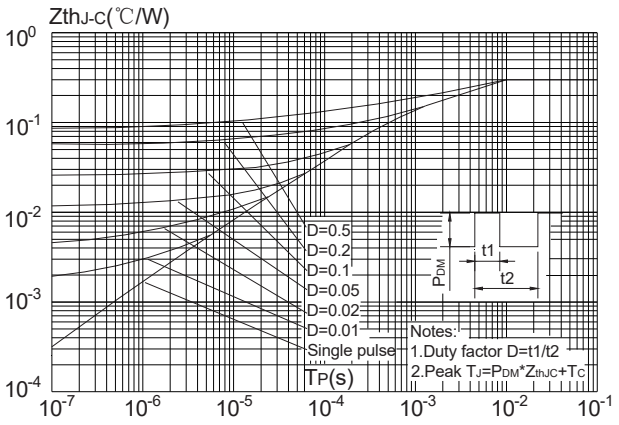


Figure.12: Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-247,TO-3P)



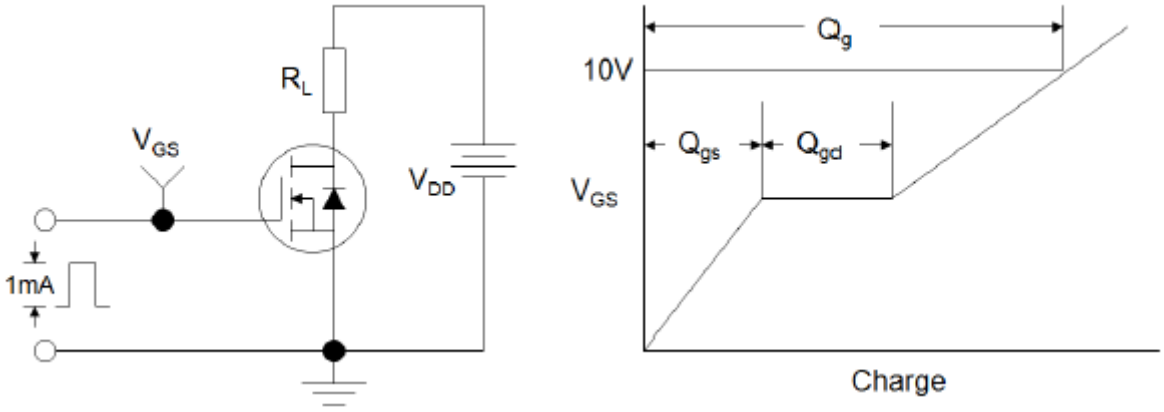


Figure1:Gate Charge Test Circuit & Waveform

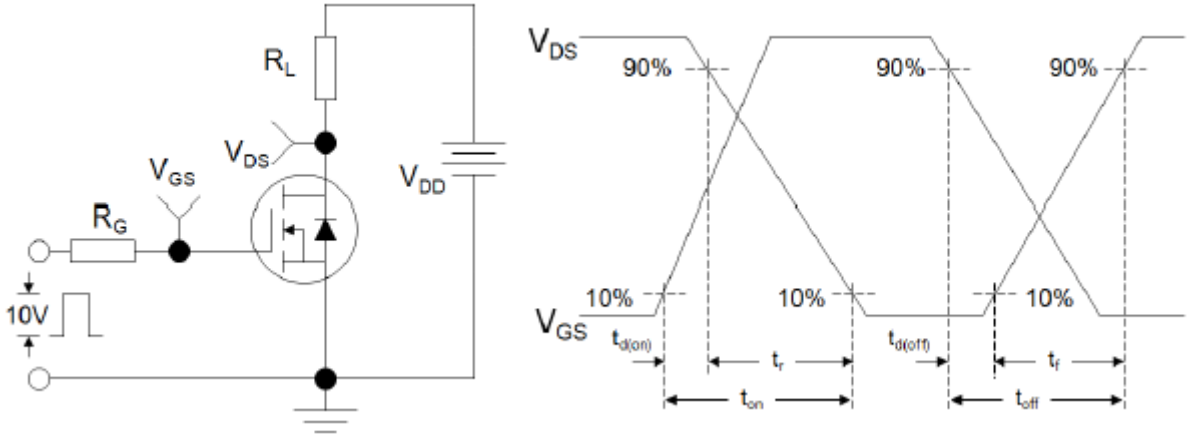


Figure 2: Resistive Switching Test Circuit & Waveforms

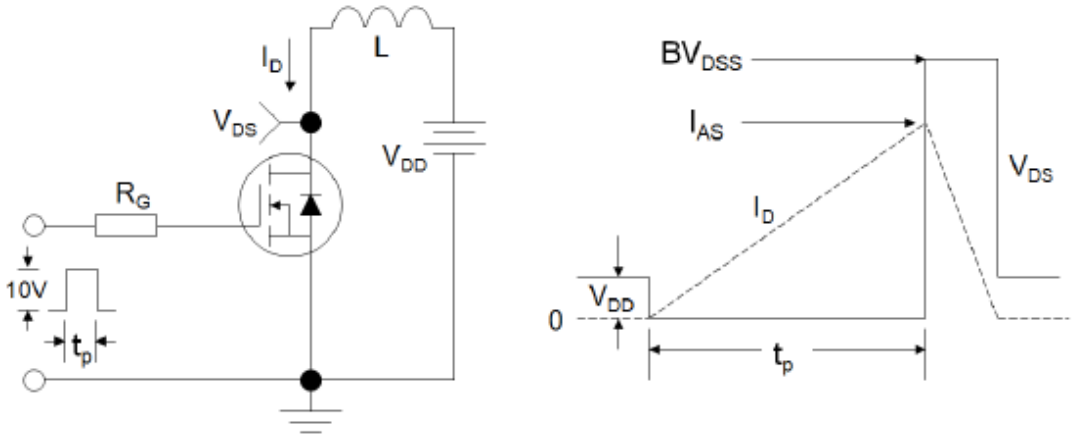


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

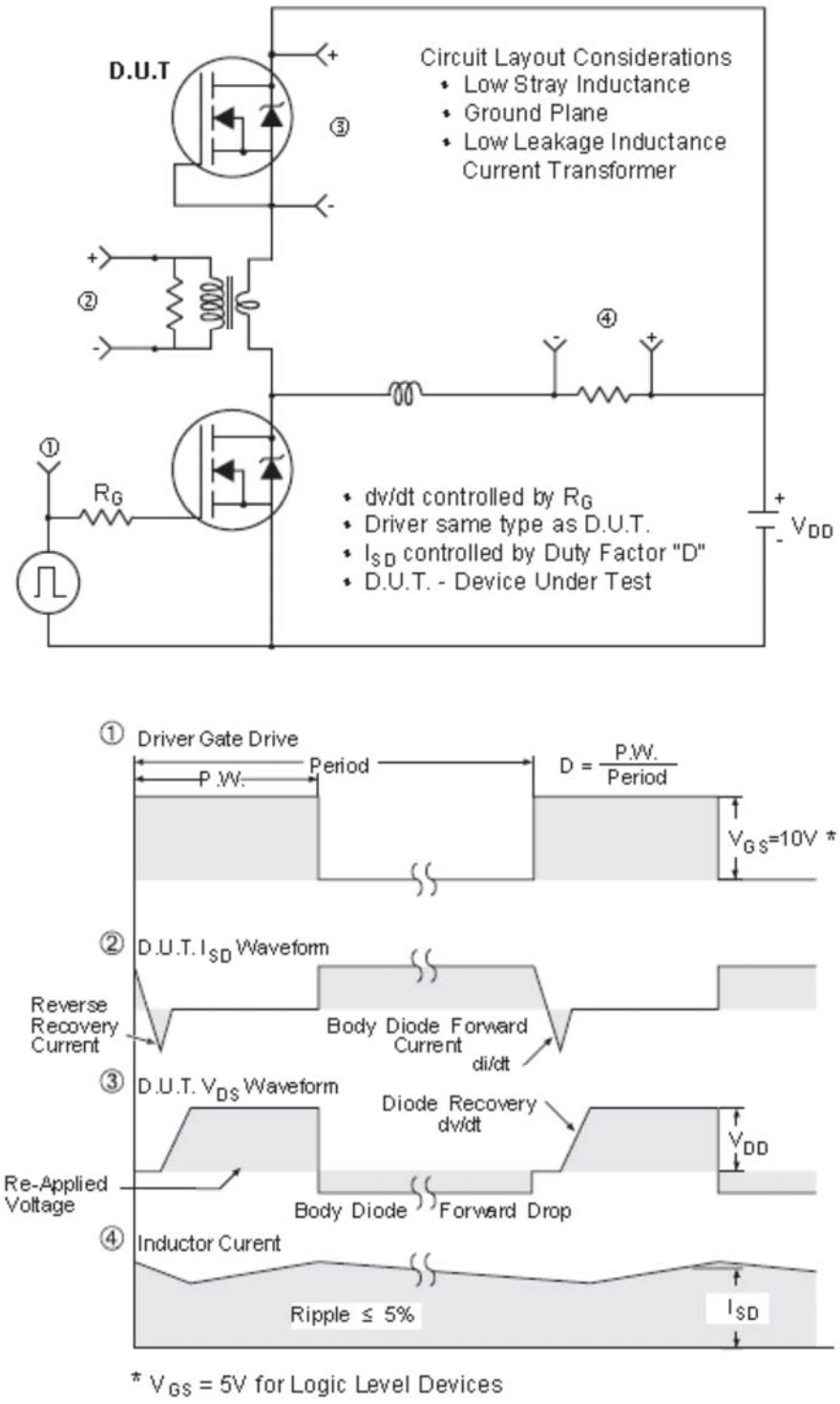


Figure 4:Peak Diode Recovery dv/dt Test Circuit & Waveforms (For N-channel)