JJMICROELECTRONICS

650V, 12A, 148mΩ N-channel Power Super Junction MOSFET

JMH65R190PFFD

Features

- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS Tested
- 100% ΔVds Tested
- Halogen-free; RoHS-compliant

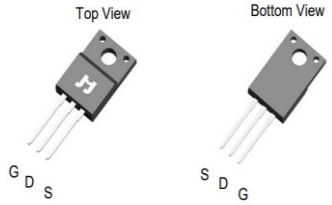
Applications

- SMPS with PFC
- Flyback and LLC topologies
- Silver ATX,adapter,TV,lighting,Telecom

Product Summary

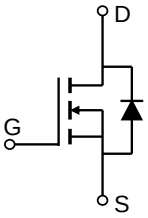
Parameters	Value	Unit
V_{DSS}	650	V
$V_{GS(th)\_Typ}$	3.6	V
I_D(@V_{GS}=10V)	12	A
$R_{DS(ON)\_Typ}$(@V_{GS}=10V	148	mΩ

RoHS



TO-220FP

Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Tube(pcs)	Per Carton (pcs)
JMH65R190PFFD-U	H65R190PF	N/A	Tube	TO-220FP	50	5000

Absolute Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Symbol	Parameter		Value	Unit
V_{DS}	Drain-to-Source Voltage		650	V
V_{GS}	Gate-to-Source Voltage		±30	V
I_D	Continuous Drain Current	T_C = 25°C	12	A
		T_C = 100°C	7.6	
I_{DM}	Pulsed Drain Current (1)		Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy (2)		65	mJ
P_D	Power Dissipation	T_C = 25°C	71	W
		T_C = 100°C	28	
T_J, T_{STG}	Junction & Storage Temperature Range		-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient(3)	58	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.8	

Electrical Characteristics (T_J = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650V, V_{GS} = 0V	-	-	10.0	μA
I_{GSS}	Gate-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	2.5	3.6	4.6	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance(4)	V_{GS} = 10V, I_D = 10A	-	148	190	mΩ
Dynamic Characteristics						
R_g	Gate Resistance	f = 1MHz	-	4.9	-	Ω
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 325V, f = 1MHz	1084	1517	2049	pF
C_{oss}	Output Capacitance		28	39	52	pF
C_{rss}	Reverse Transfer Capacitance		-	5.9	-	pF
Q_g	Total Gate Charge	V_{GS} = 0 to 10V V_{DS} = 325V, I_D = 10A	23	32	43	nC
Q_{gs}	Gate Source Charge		-	10	-	nC
Q_{gd}	Gate Drain("Miller") Charge		-	11	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	V_{GS} = 10V, V_{DD} = 310V I_D= 10A, R_{GEN} = 24Ω	-	36	-	ns
t_r	Turn-On Rise Time		-	38	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	100	-	ns
t_f	Turn-Off Fall Time		-	30	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	12	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	48	A
V_{SD}	Body Diode Forward Voltage	V_{GS} = 0V, I_S = 10A	-		1.2	V
trr	Body Diode Reverse Recovery Time	I_F = 10A, di/dt = 100A/us	94	131	177	ns
Qrr	Body Diode Reverse Recovery Charge		-	851	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E_{AS} condition: Starting T_J=25C, V_{DD}=50V, V_{GS}=10V, R_G=25ohm, L=10mH, I_{AS}=3.6A, V_{DD}=0V during time in avalanche.
3. $R_{\theta JA}$ is measured with the device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

Typical Performance Characteristics

Figure 1: Power De-rating

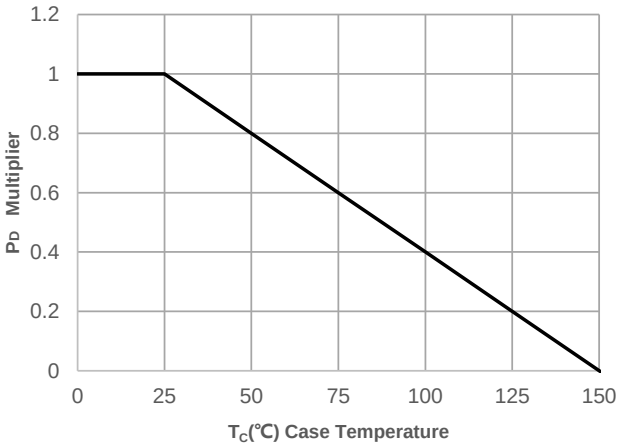


Figure 2: Current De-rating

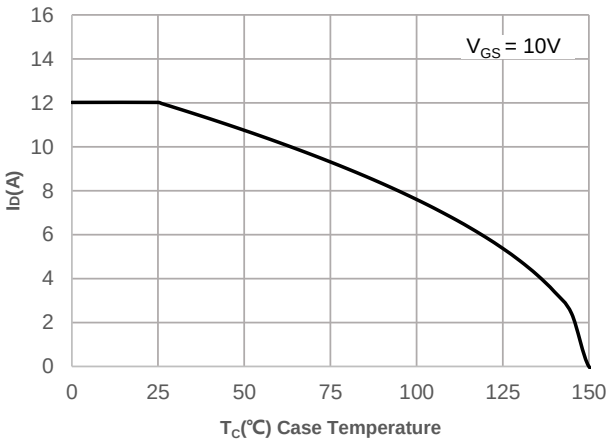


Figure 3: Normalized Maximum Transient Thermal Impedance

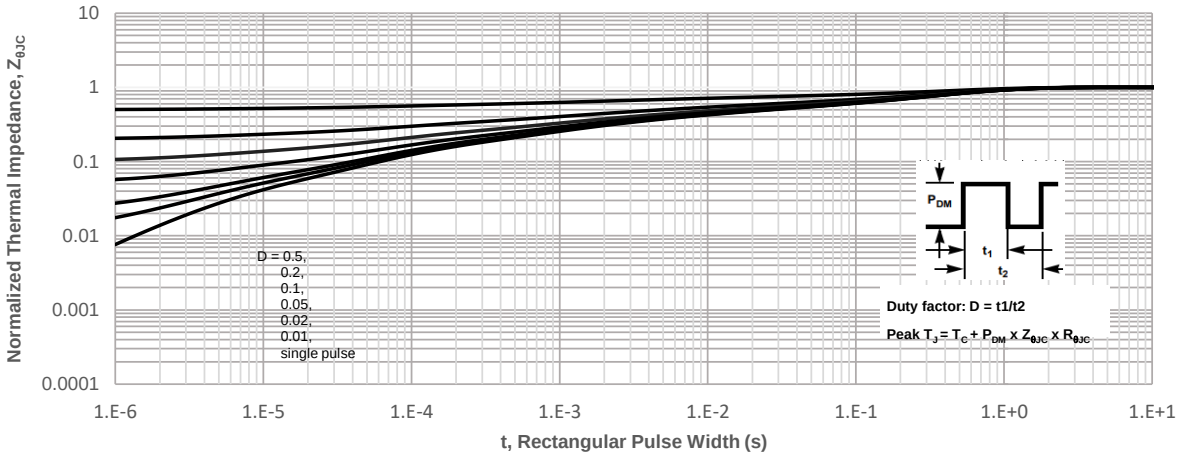
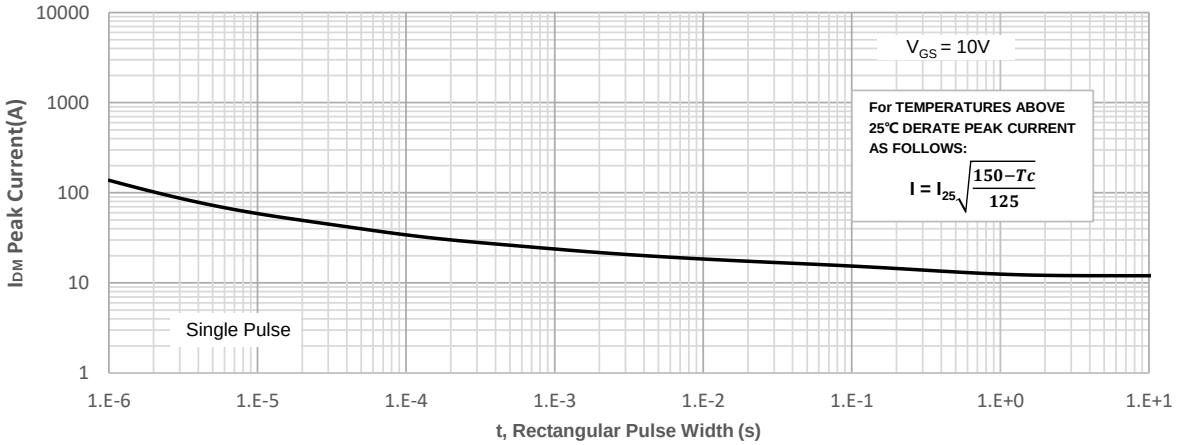


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

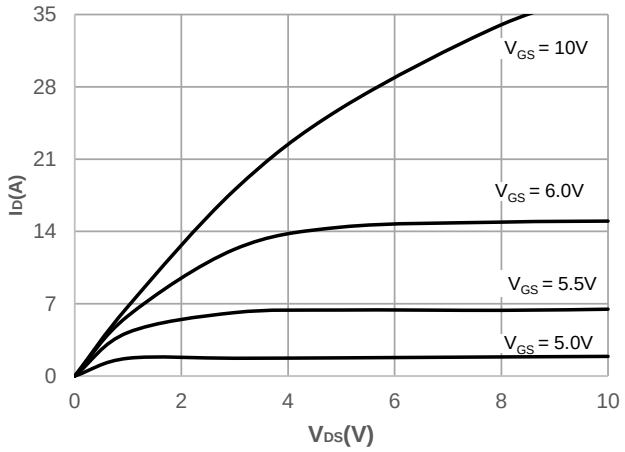


Figure 6: Typical Transfer Characteristics

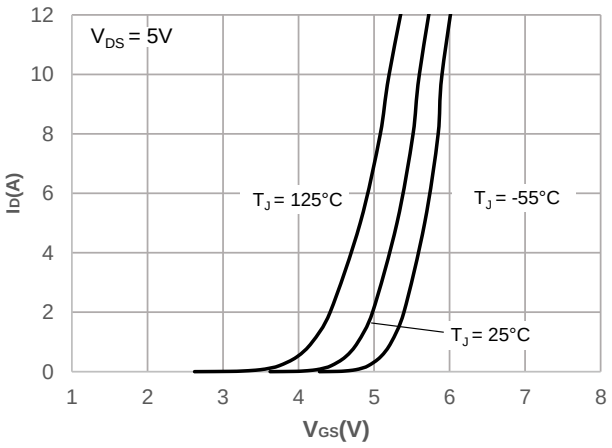


Figure 7: On-resistance vs. Drain Current

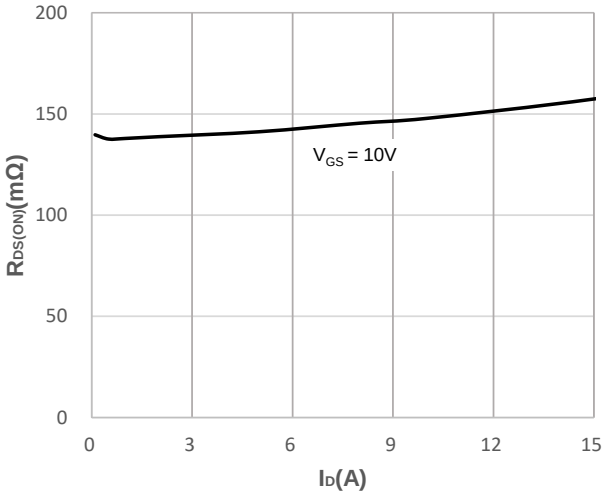


Figure 8: Body Diode Characteristics

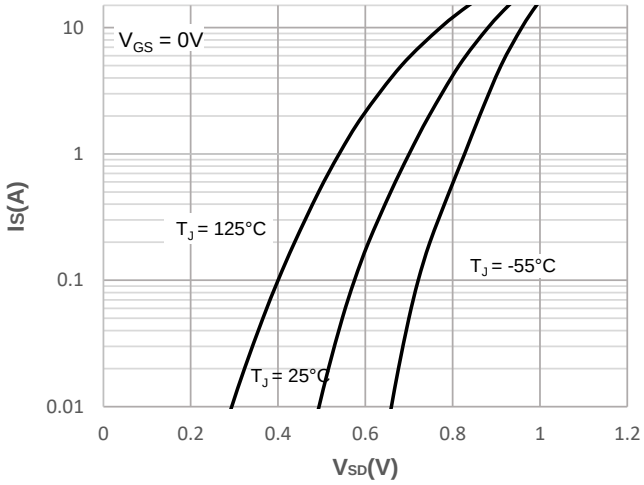


Figure 9: Gate Charge Characteristics

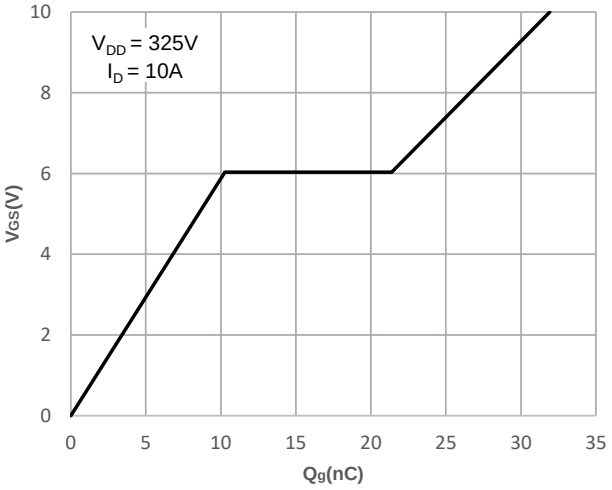
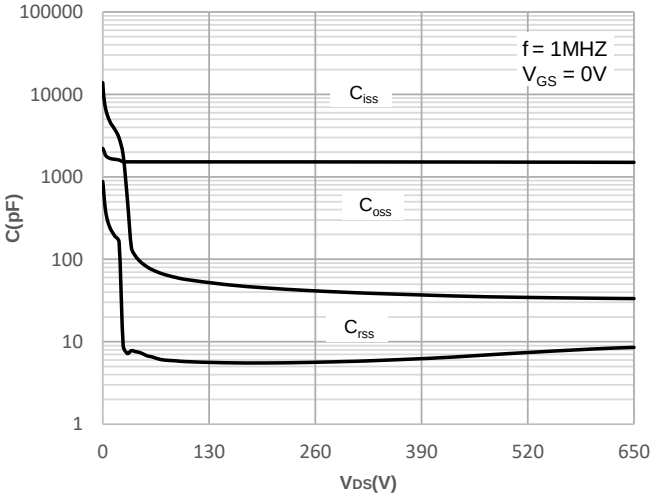


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

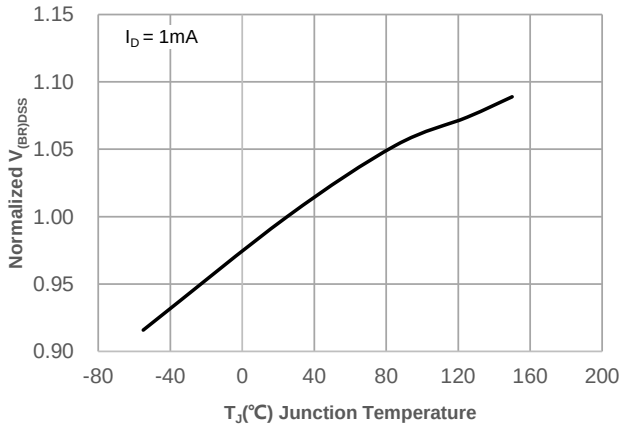


Figure 12: Normalized on Resistance vs. Junction Temperature

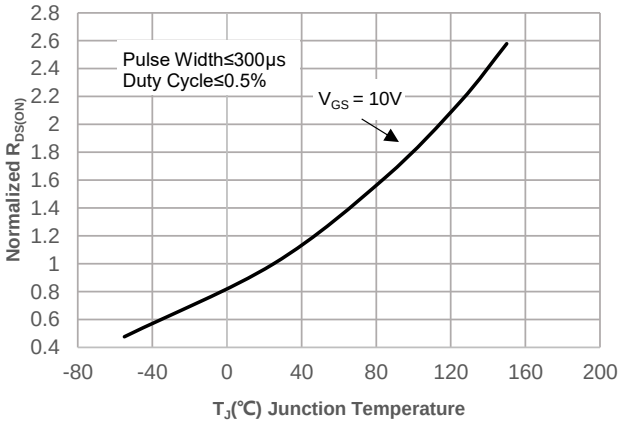


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

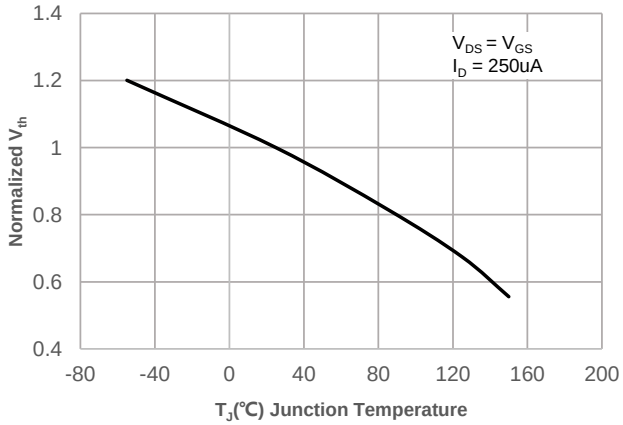


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

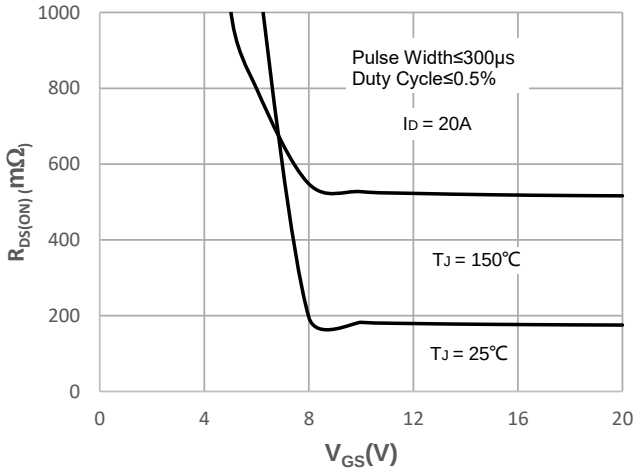
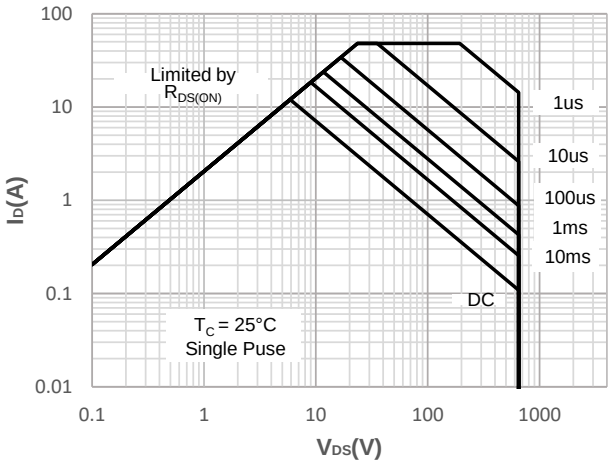


Figure 15: Maximum Safe Operating Area



Test Circuit

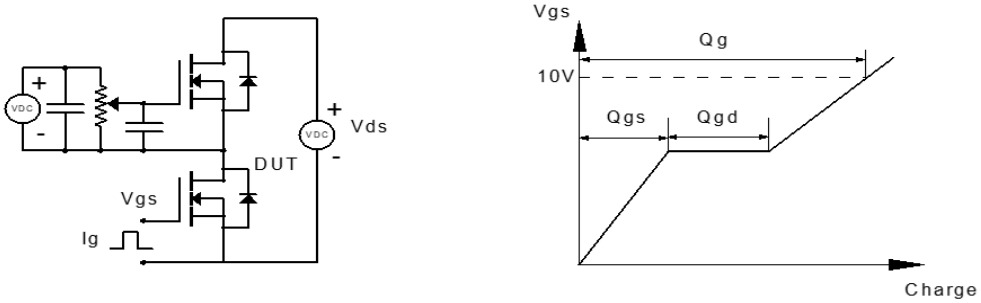


Figure 1: Gate Charge Test Circuit & Waveform

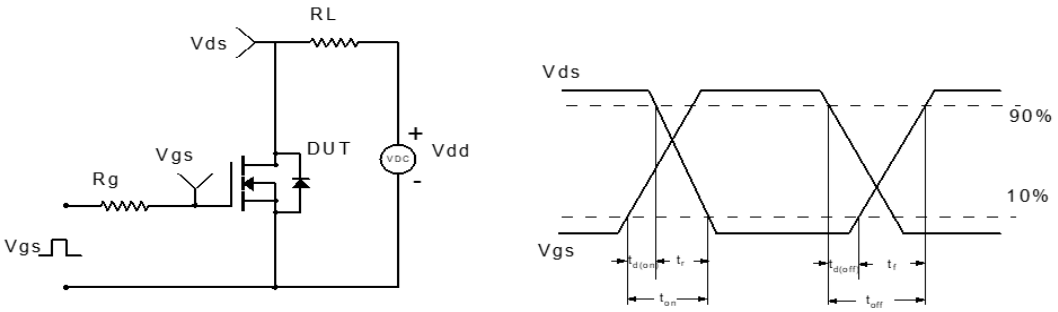


Figure 2: Resistive Switching Test Circuit & Waveform

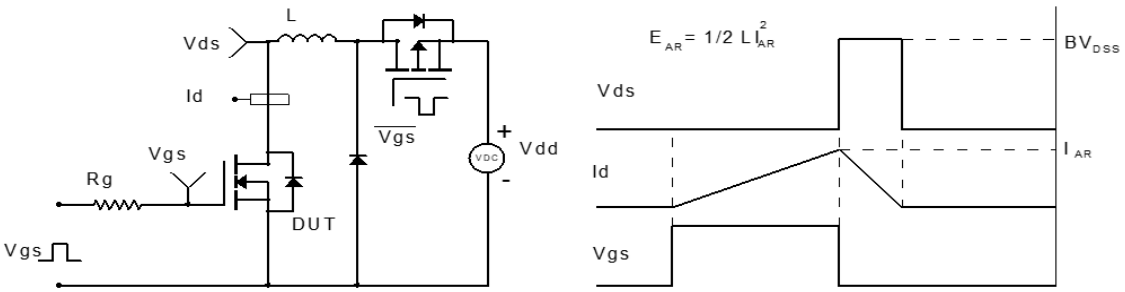


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

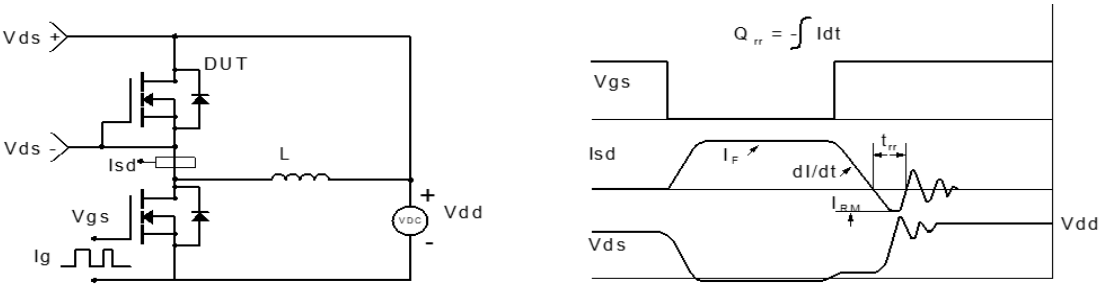
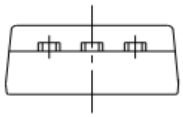


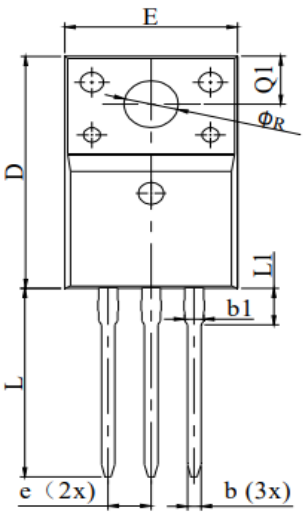
Figure 4: Diode Recovery Test Circuit & Waveform

Package Mechanical Data(TO-220F-3L)

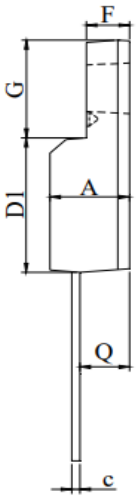
Package Outline



Front View



Top View



Side View

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.50	4.70	4.90
D	15.20	15.87	16.10
D1	8.80	--	9.50
E	9.70	10.10	10.40
F	2.44	--	2.75
b	0.70	0.80	0.91
b1	1.10	1.35	1.55
c	0.45	0.50	0.65
e	2.54 BSC		
G	6.40	6.70	6.90
L	12.00	13.10	14.50
L1	3.13	--	3.57
Q	2.60	2.75	2.85
Q1	3.20	3.30	3.40
R	3.05	--	3.28