



SWF4N65

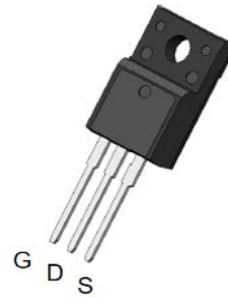
N-channel Power MOSFET

Applications

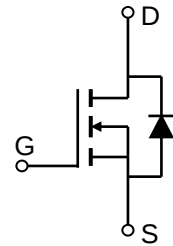
- Load Switch
- PWM Application
- Power Management

Features

- 650V, 4A
 $R_{DS(ON)} < 2.64\Omega @ V_{GS} = 10V$
- Fast Switching
- Improved dv/dt Capability



TO-220F Top View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Package	TUBE (pcs)	Inner Box (pcs)	Per Carton (pcs)
4N65	SWF4N65	TO-220F	50	1000	5000

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

Symbol	Parameter	Value	Units
V_{DS}	Drain-to-Source Voltage	650	V
V_{GS}	Gate-to-Source Voltage	± 30	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	4
		$T_C = 100^\circ\text{C}$	3
I_{DM}	Pulsed Drain Current ⁽¹⁾	16	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	125	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	27
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽³⁾	62.5	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.7	
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 150	$^\circ\text{C}$



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Electrical Characteristics ($T_J = 25^\circ\text{C}$ 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	-	-	1.0	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	3	4	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽⁴⁾	V _{GS} = 10V, I _D = 2A	-	2.22	2.64	Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 25V, f = 1MHz	-	587	-	pF
C _{oss}	Output Capacitance		-	59	-	pF
C _{rss}	Reverse Transfer Capacitance		-	10	-	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 10V V _{DS} = 520V, I _D = 4A	-	15	-	nC
Q _{gs}	Gate Source Charge		-	3.5	-	nC
Q _{gd}	Gate Drain("Miller") Charge		-	6	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 320V I _D = 4A, R _{GEN} = 24Ω	-	13	-	ns
t _r	Turn-On Rise Time		-	22	-	ns
t _{d(off)}	Turn-Off DelayTime		-	43	-	ns
t _f	Turn-Off Fall Time		-	27	-	ns
Drain-Source Diode Characteristics and Max Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	4	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	16	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _S = 4A	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	I _F = 4A, di/dt = 100A/us	-	280	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	2	-	μC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E_{AS} condition: Starting $T_J=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $V_G=10\text{V}$, $R_G=25\text{ohm}$, $L=10\text{mH}$, $I_{AS}=5\text{A}$
3. $R_{\theta JA}$ is measured with the device mounted on a minimum recommended pad of 2oz copper FR4 PCB
4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.



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Typical Performance Characteristics

Figure 1: Output Characteristics

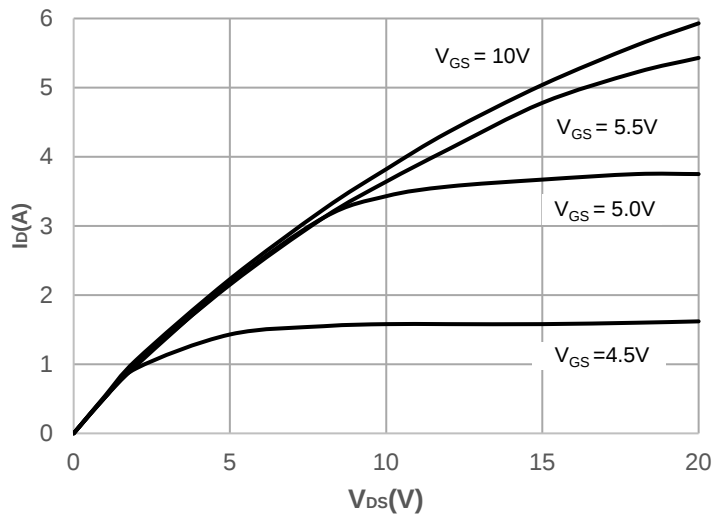


Figure 2: Typical Transfer Characteristics

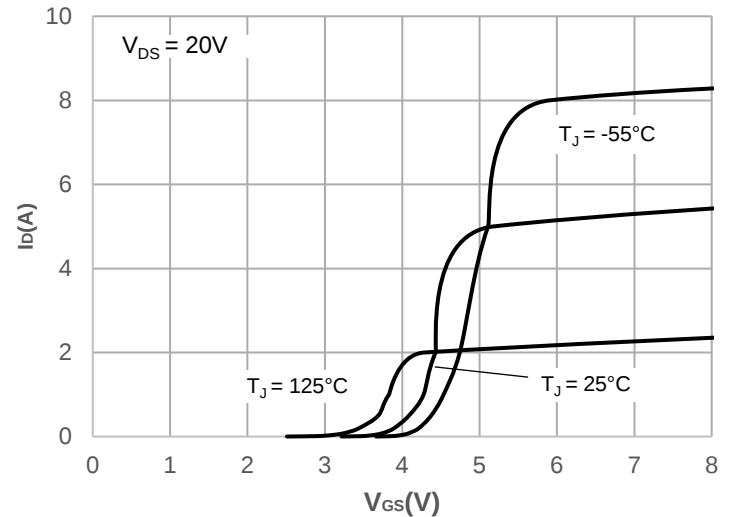


Figure 3: On-resistance vs. Drain Current

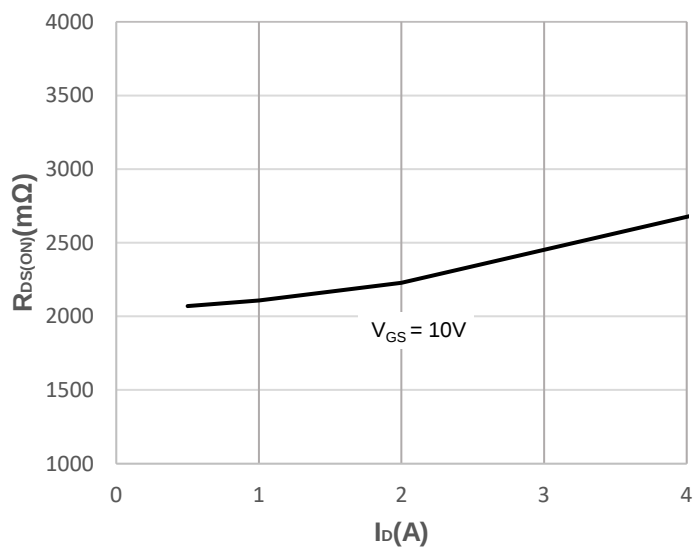


Figure 4: Body Diode Characteristics

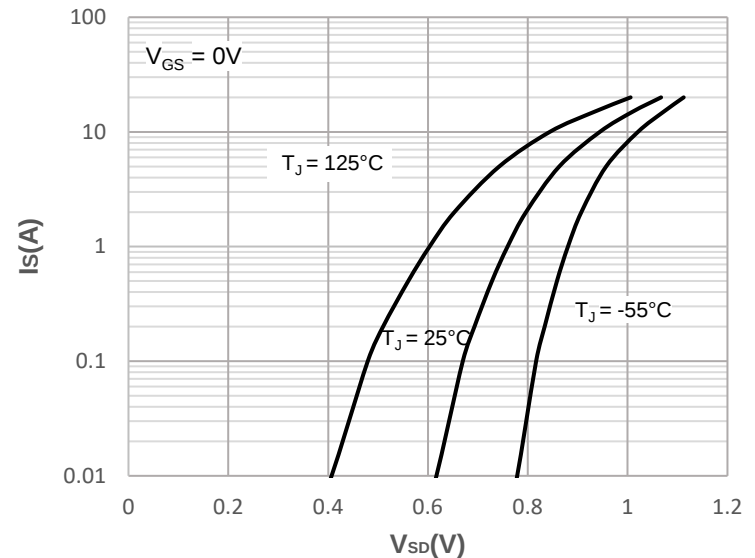


Figure 5: Gate Charge Characteristics

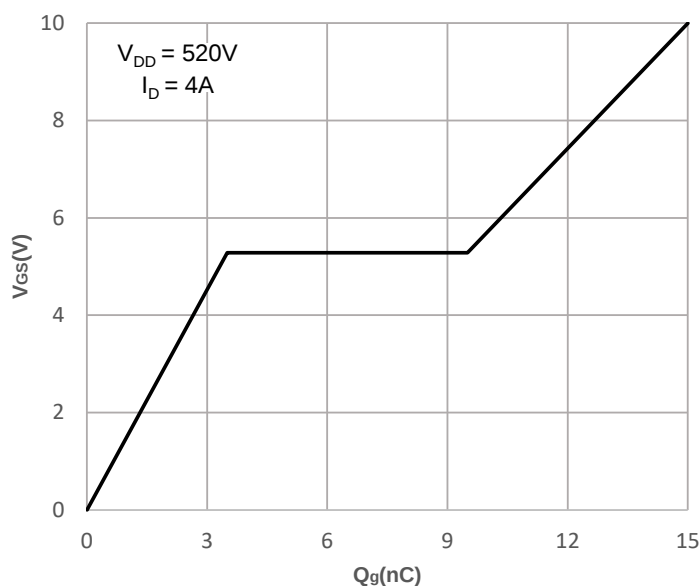
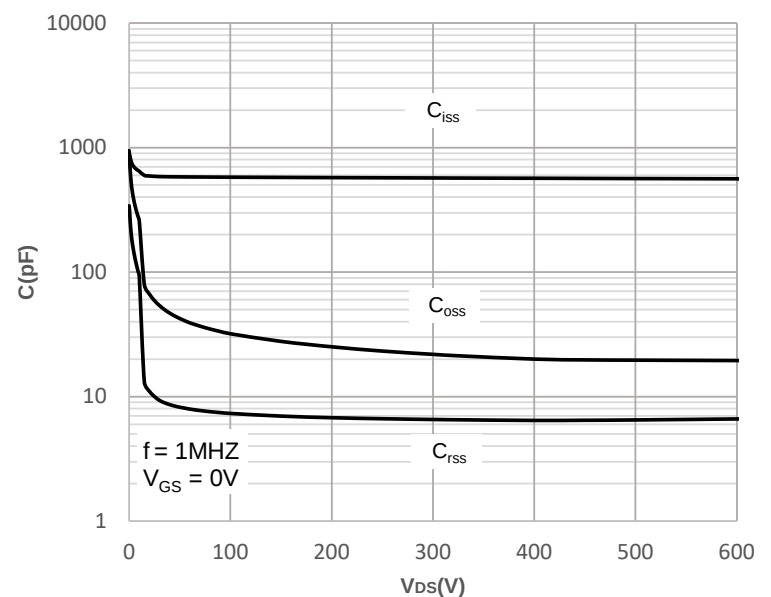


Figure 6: Capacitance Characteristics





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Typical Performance Characteristics

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

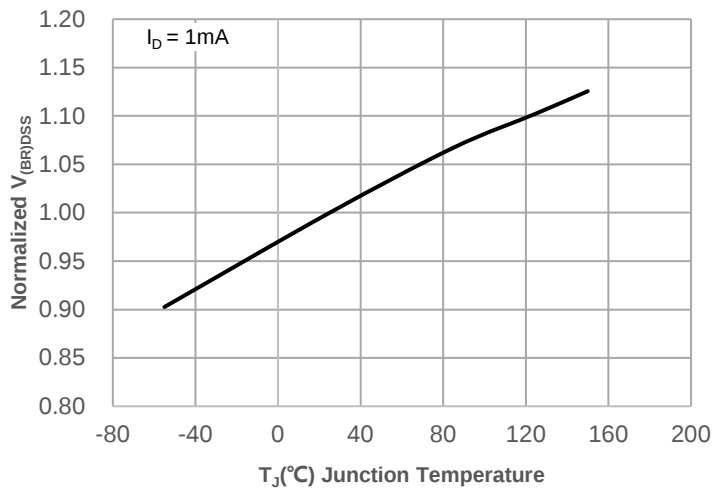


Figure 8: Normalized on Resistance vs. Junction Temperature

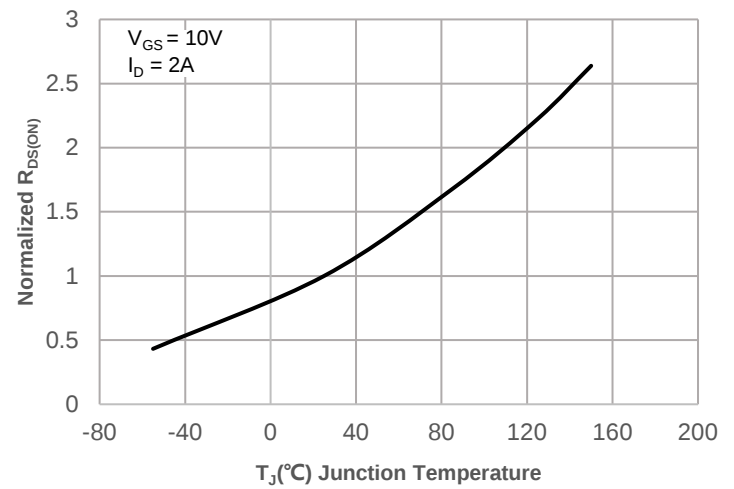


Figure 9: Maximum Safe Operating Area

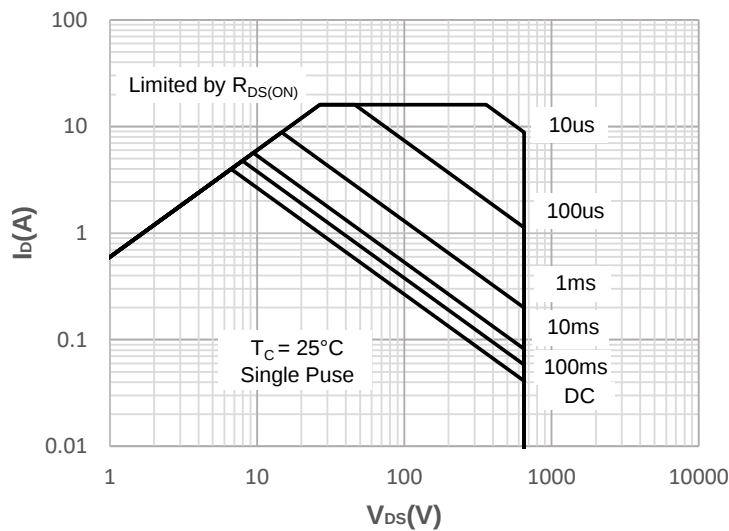


Figure 10: Maximum Continuous Driain Current vs. Case Temperature

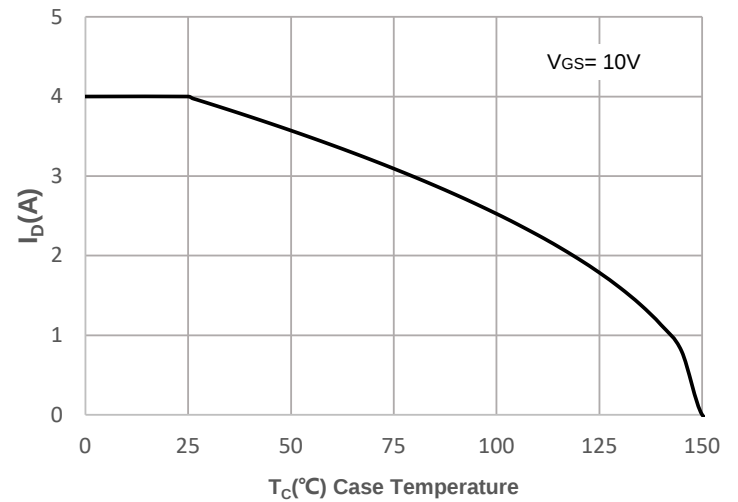


Figure 11: Normalized Maximum Transient Thermal Impedance

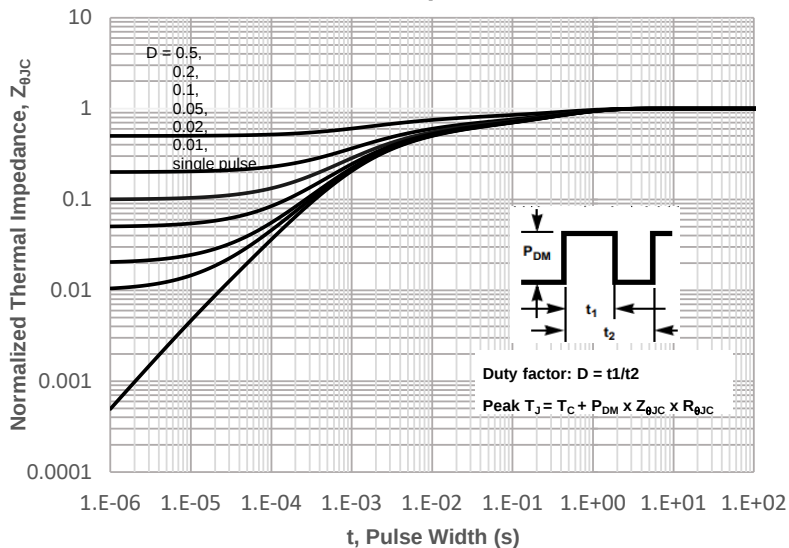
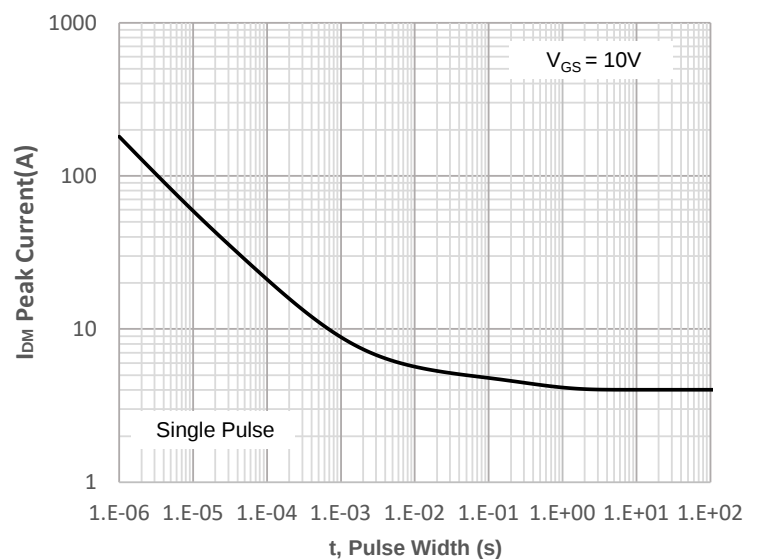


Figure 12: Peak Current Capacity



Test Circuit

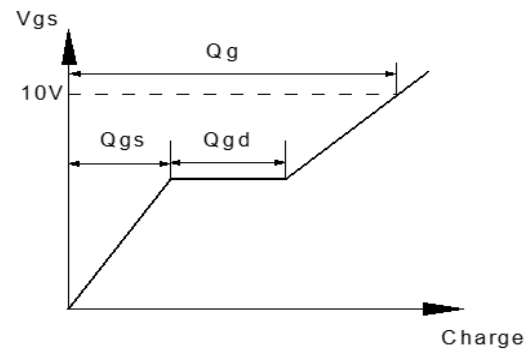
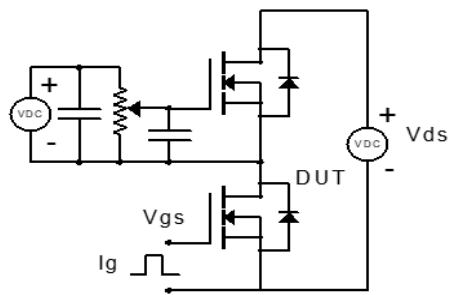


Figure 1: Gate Charge Test Circuit & Waveform

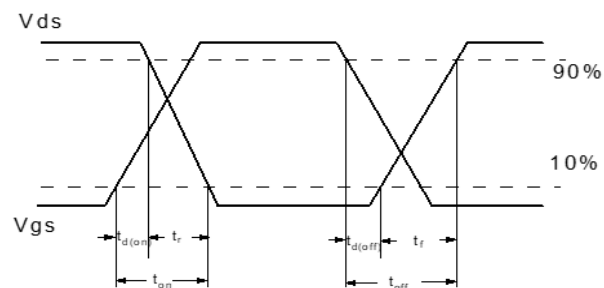
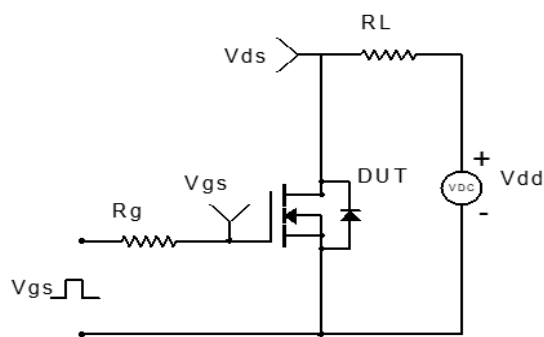


Figure 2: Resistive Switching Test Circuit & Waveform

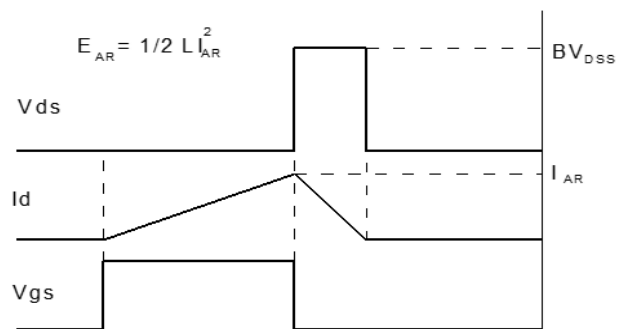
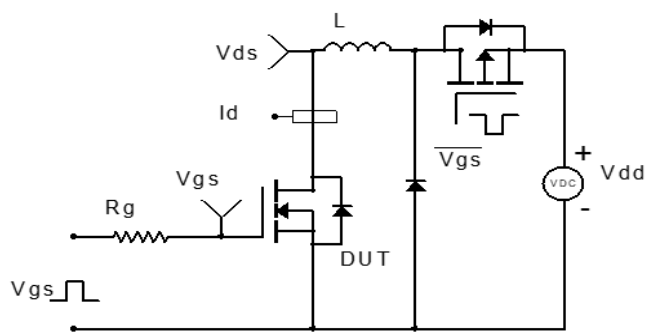


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

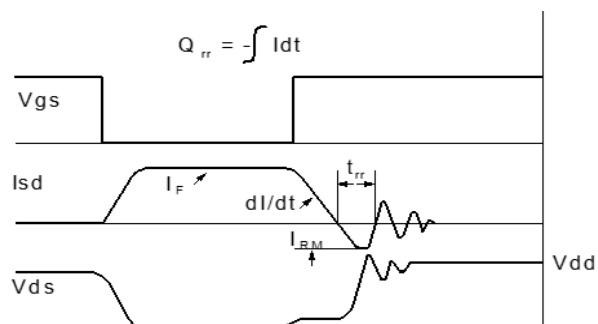
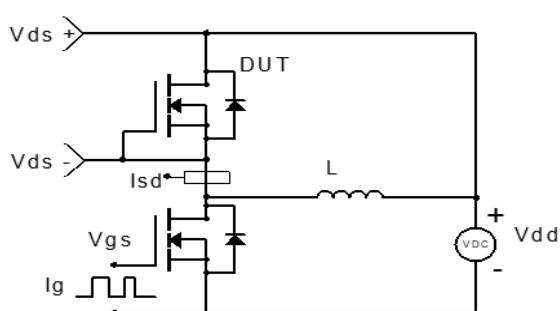


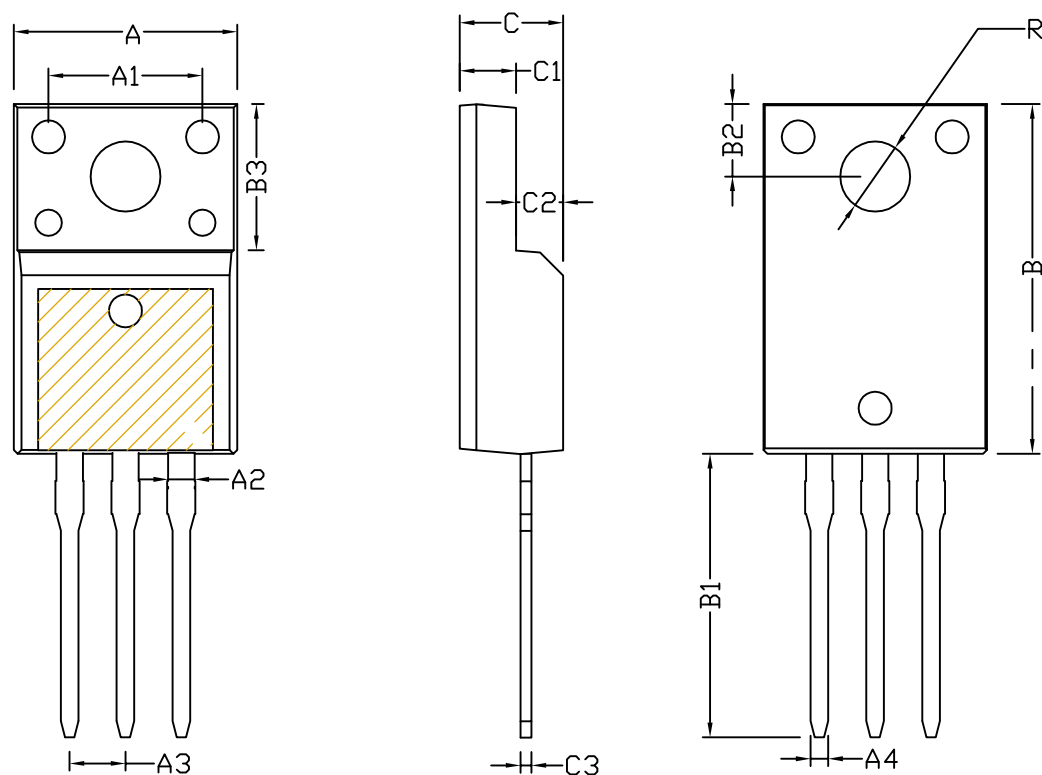
Figure 4: Diode Recovery Test Circuit & Waveform



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Package Mechanical Data(TO-220F)



标注	最小	标准	最大	标注	最小	标准	最大	标注	最小	标准	最大
A	10.03	10.13	10.23	B	15.81	15.91	16.01	C	4.62	4.7	4.78
A1	6.5	7.0	7.5	B1	12.79	12.89	12.99	C1	2.5	2.55	2.6
A2	1.20	1.28	1.36	B2	3.0	3.3	3.6	C2	2.1	2.15	2.2
A3		2.54		B3	6.6	6.65	6.7	C3		0.5	
A4	0.7	0.8	0.9	R		3.18					