



SK04N90B-TF

900V N-Channel MOSFET

General Features

- Proprietary New Planar Technology
- $R_{DS(ON),typ.}=3.6\ \Omega @ V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

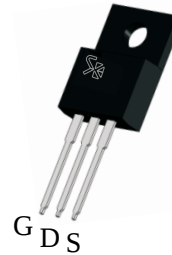
Applications

- CRT,TV/Monitor
- Other Applications

Ordering Information

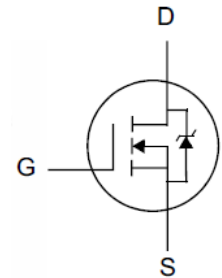
Part Number	Package
SK04N90B	TO-220F

BV_{DSS}	$R_{DS(ON),typ.}$	I_D
900V	$3.6\ \Omega$	4A



TO-220F

Package No to Scale



Absolute Maximum Ratings

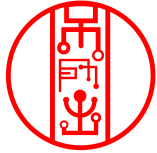
$T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	SK04N90B	Unit
V_{DSS}	Drain-to-Source Voltage ^[1]	900	V
V_{GSS}	Gate-to-Source Voltage	± 30	
I_D	Continuous Drain Current	4	A
$I_D @ T_C=100^\circ\text{C}$	Continuous Drain Current @ $T_C=100^\circ\text{C}$	Figure 3	
I_{DM}	Pulsed Drain Current at $V_{GS}=10V$ ^[2]	Figure 6	
E_{AS}	Single Pulse Avalanche Energy	650	mJ
dv/dt	Peak Diode Recovery dv/dt ^[3]	5.0	V/ns
P_D	Power Dissipation	30	W
	Derating Factor above 25°C	0.24	W/ $^\circ\text{C}$
T_L T_{PAK}	Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds	300 260	$^\circ\text{C}$
$T_J \& T_{STG}$	Operating and Storage Temperature Range	-55 to 150	

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	SK04N90B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4.17	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	100	



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Electrical Characteristics

OFF Characteristics $T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	900	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=900V, V_{GS}=0V$
		--	--	100		$V_{DS}=720V, V_{GS}=0V, T_J=125^\circ\text{C}$
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	$V_{GS}=+30V, V_{DS}=0V$
		--	--	-100		$V_{GS}=-30V, V_{DS}=0V$

ON Characteristics

$T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance ^[4]	--	3.6	4.8	Ω	$V_{GS}=10V, I_D=2.0A$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
gfs	Forward Transconductance ^[4]	--	5.5	--	S	$V_{DS}=15V, I_D=4.0A$

Dynamic Characteristics

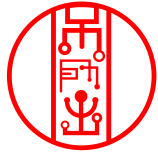
Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	490	--	pF	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance	--	25	--		
C_{oss}	Output Capacitance	--	50	--		
Q_g	Total Gate Charge	--	16	--	nC	$V_{DD}=400V, I_D=4A, V_{GS}=0 \text{ to } 10V$
Q_{gs}	Gate-to-Source Charge	--	3.0	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	6.0	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	10	--	nS	$V_{DD}=400V, I_D=4A, V_{GS}=10V, R_G=12\Omega$
t_{rise}	Rise Time	--	10	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	30	--		
t_{fall}	Fall Time	--	15	--		



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Source-Drain Body Diode Characteristics

$T_J=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current ^[4]	--	--	4.0	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current ^[4]	--	--	16		
V_{SD}	Diode Forward Voltage	--	--	1.5	V	$I_S=4.0\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse recovery time	--	135	--	ns	$V_{GS}=0\text{V}$, $I_F=4.0\text{A}$, $di_F/dt=100\text{A}/\mu\text{s}$
Q_{rr}	Reverse recovery charge	--	446	--	nC	

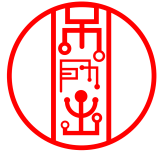
Note:

[1] $T_J=+25^{\circ}\text{C}$ to $+150^{\circ}\text{C}$

[2] Repetitive rating; pulse width limited by maximum junction temperature.

[3] $I_{SD}=4\text{A}$ $di/dt < 100\text{A}/\mu\text{s}$, $V_{DD} < BV_{DSS}$, $T_J=+150^{\circ}\text{C}$.

[4] Pulse width $\leq 380\mu\text{s}$; duty cycle $\leq 2\%$.



Typical Characteristics

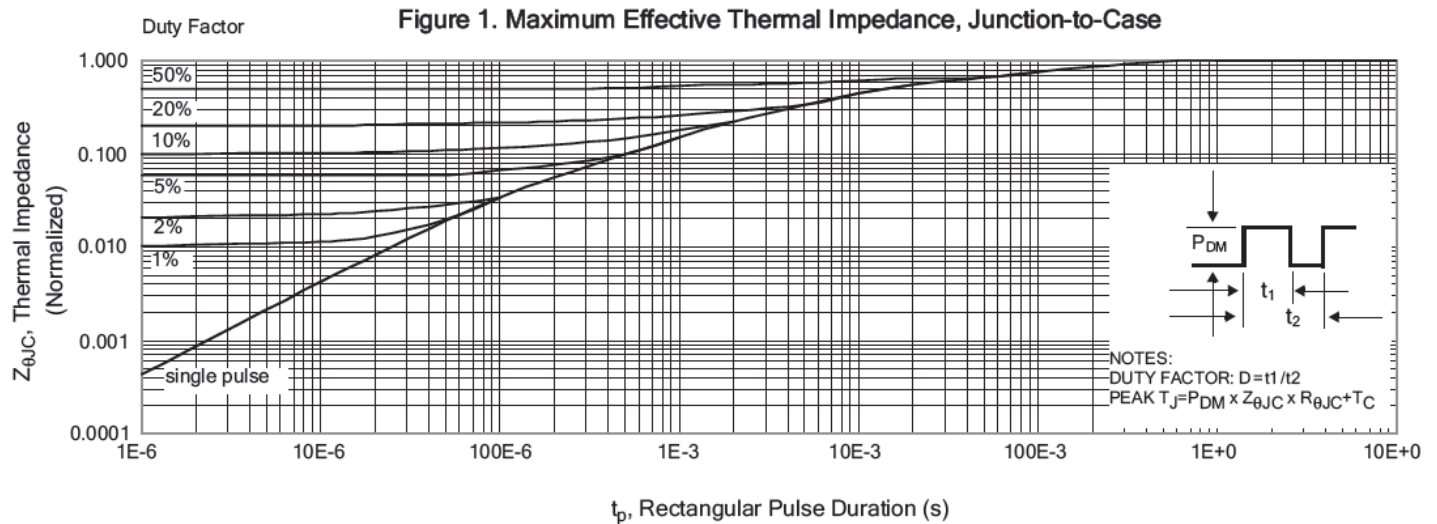


Figure 2. Maximum Power Dissipation vs Case Temperature

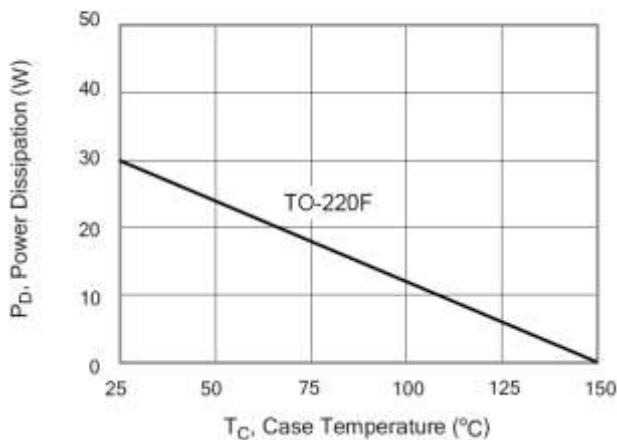


Figure 3. Maximum Continuous Drain Current vs Case Temperature

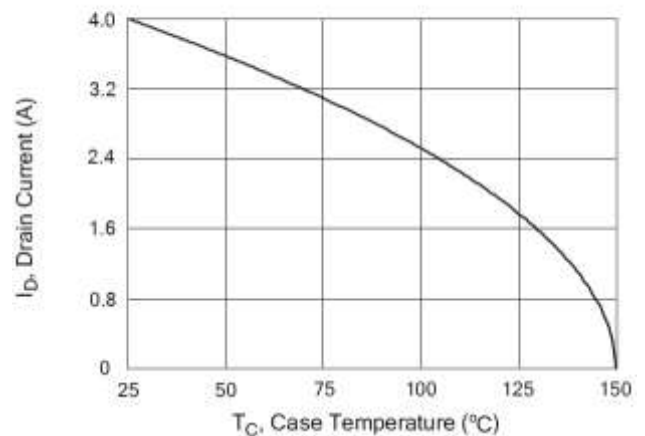


Figure 4. Typical Output Characteristics

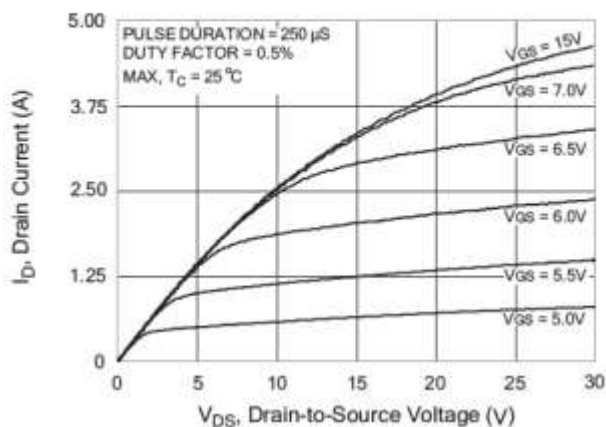
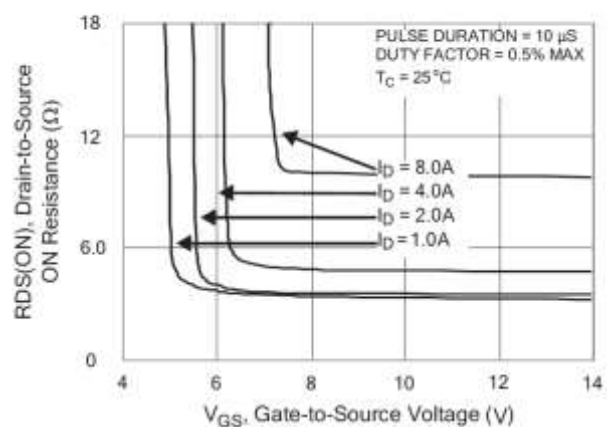
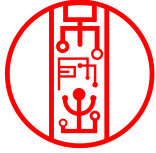


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current





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Typical Characteristics(Cont.)

Figure 6. Maximum Peak Current Capability

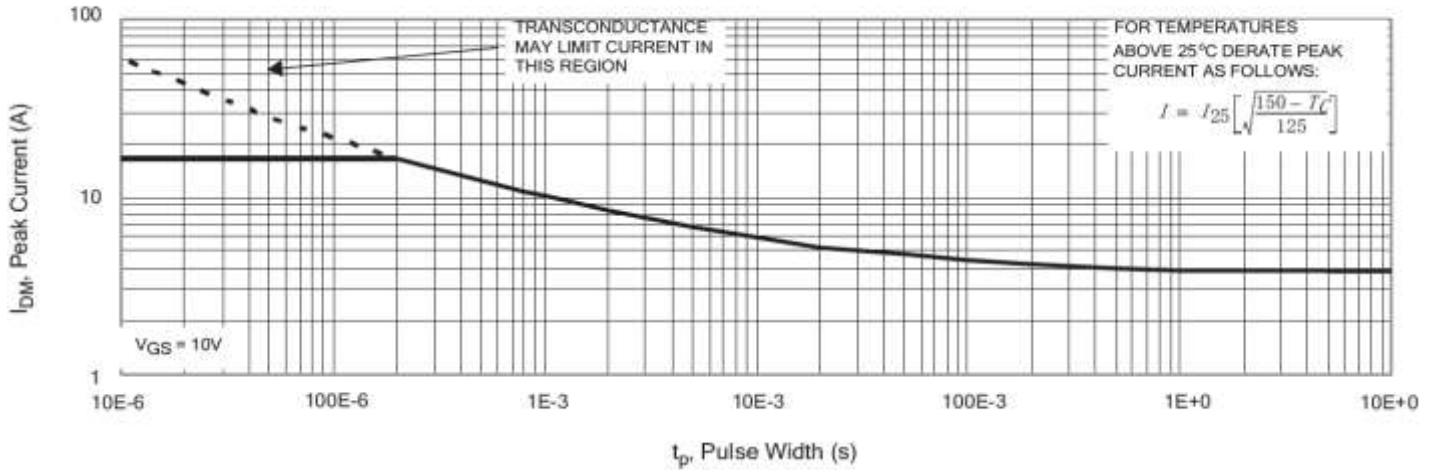


Figure 7. Typical Transfer Characteristics

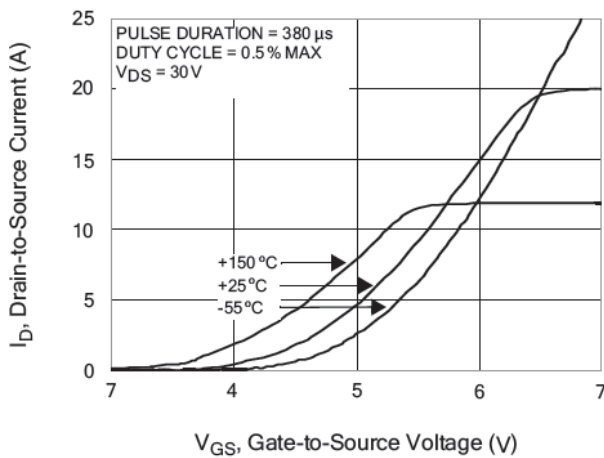


Figure 8. Unclamped Inductive Switching Capability

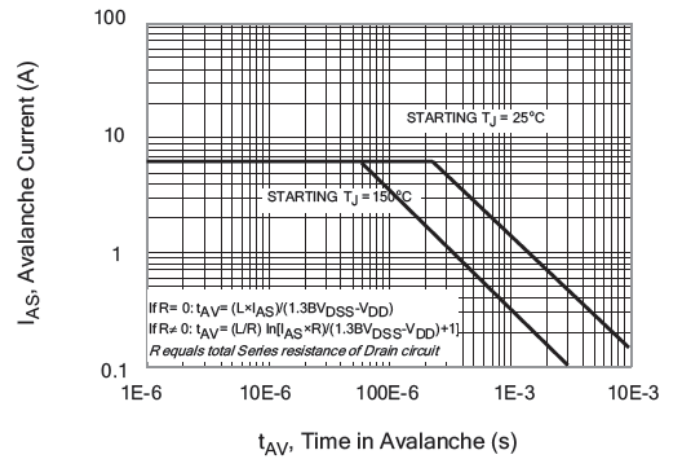


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

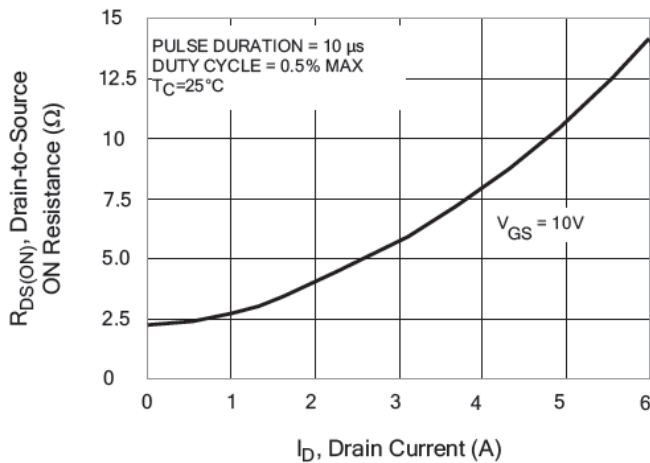
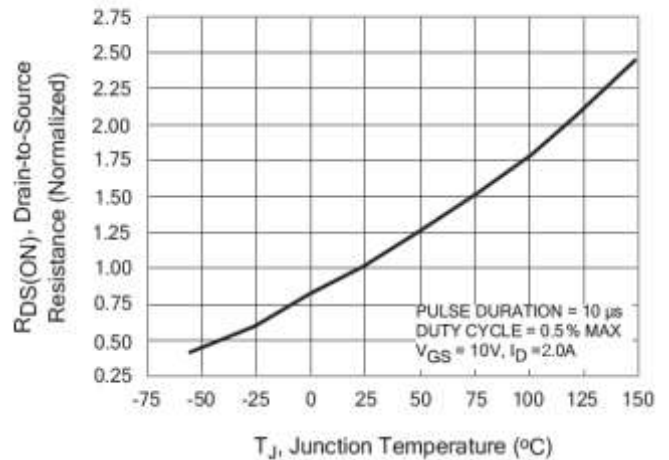
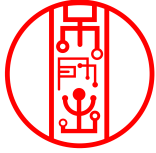


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature





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Typical Characteristics(Cont.)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

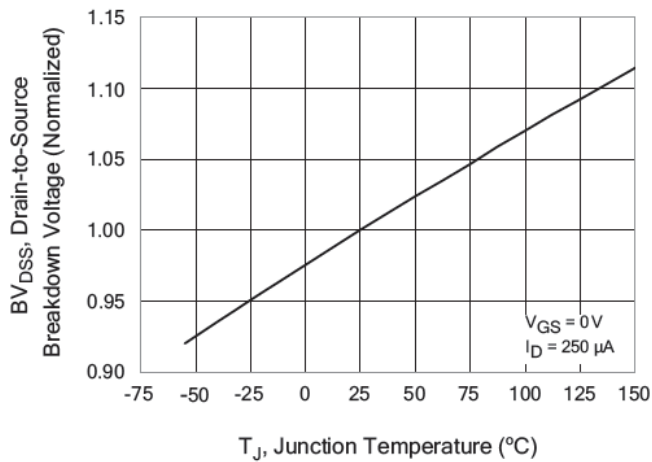


Figure 12. Typical Threshold Voltage vs Junction Temperature

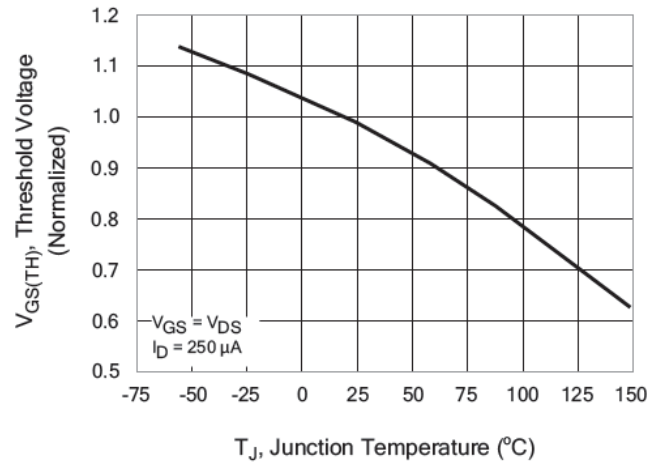


Figure 13 . Maximum Safe Operating Area

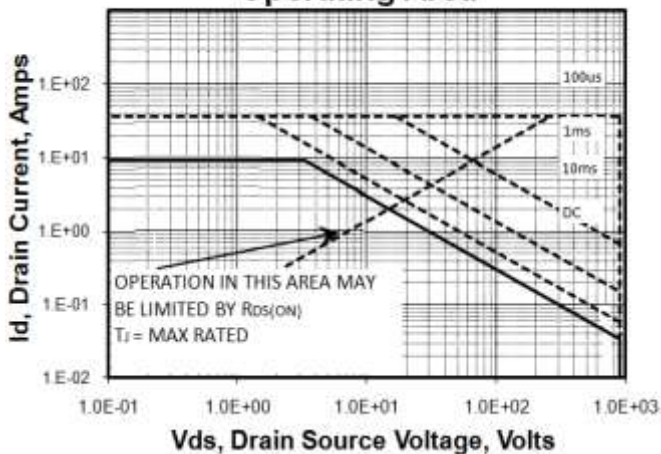


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

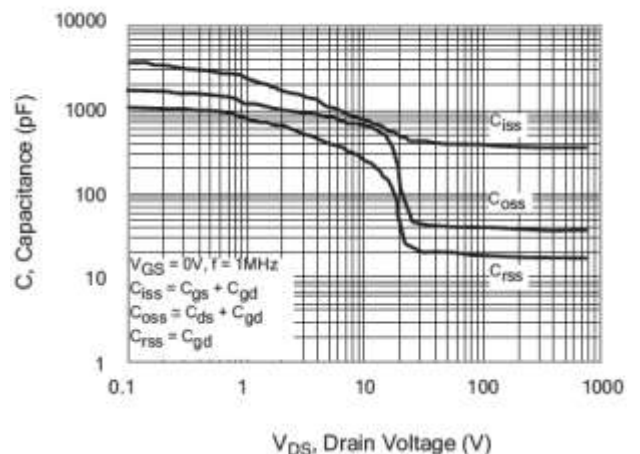


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

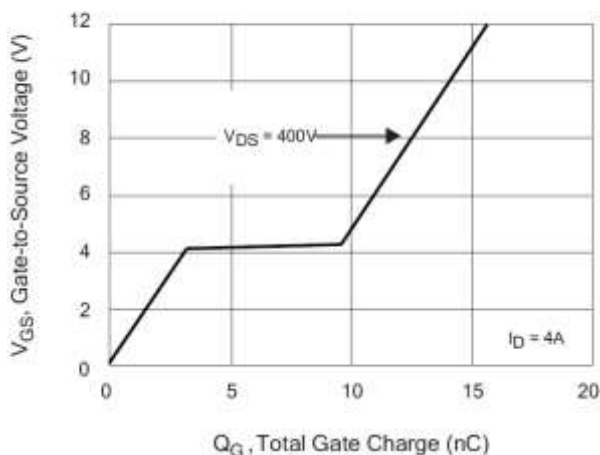
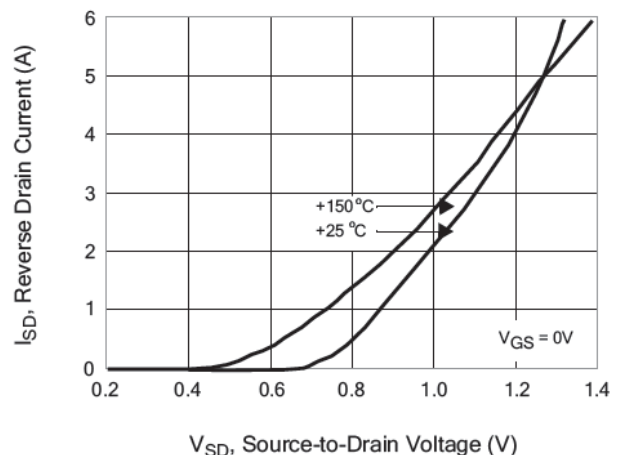
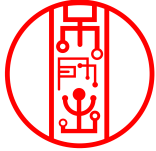


Figure 16. Typical Body Diode Transfer Characteristics





Test Circuits and Waveforms

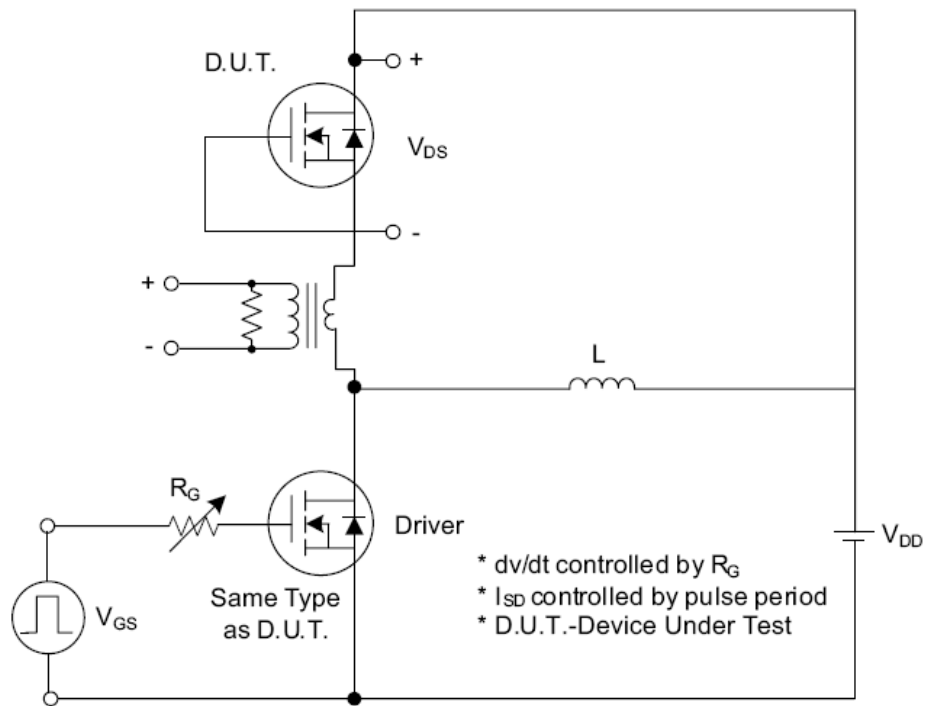


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

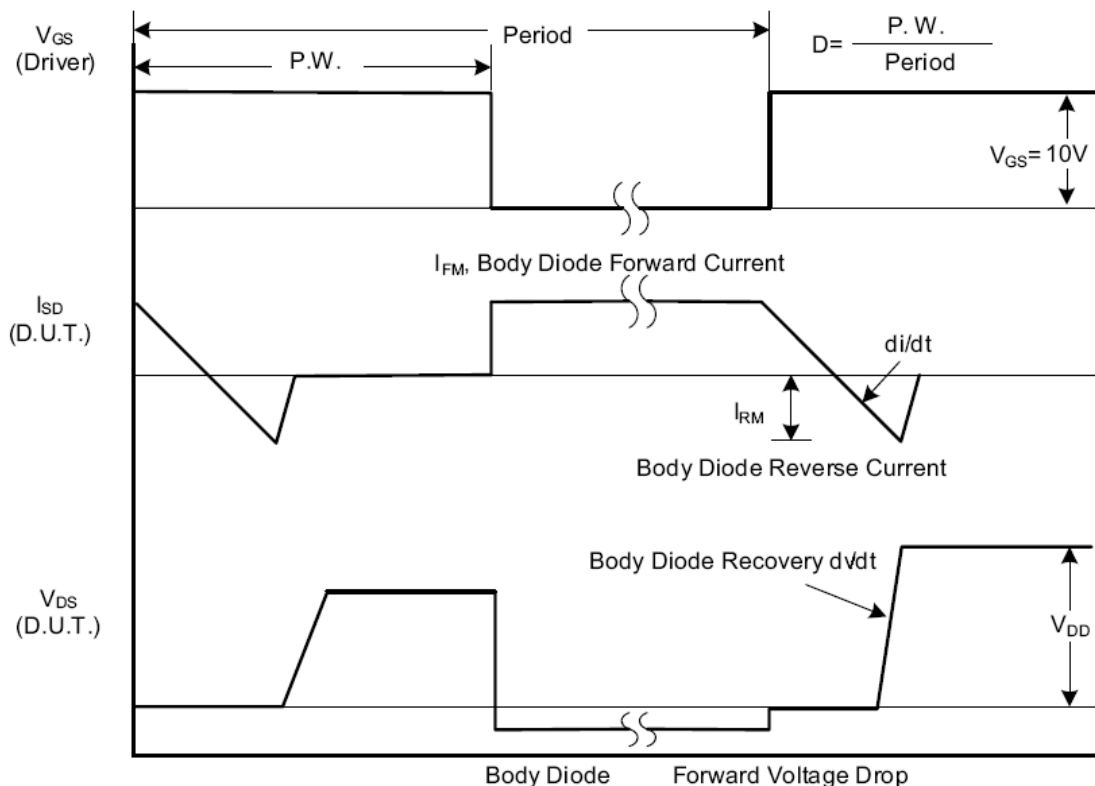
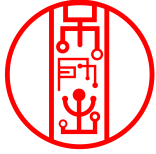


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms



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Test Circuits and Waveforms (Cont.)

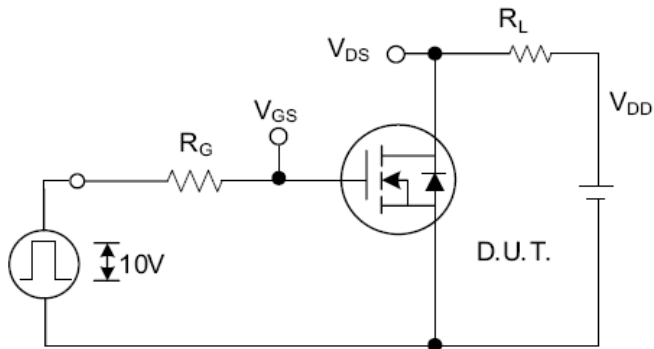


Fig. 2.1 Switching Test Circuit

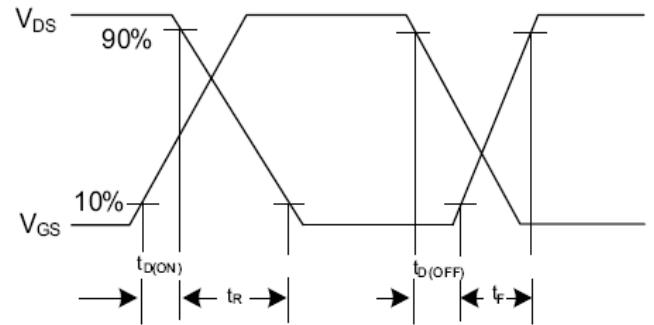


Fig. 2.2 Switching Waveforms

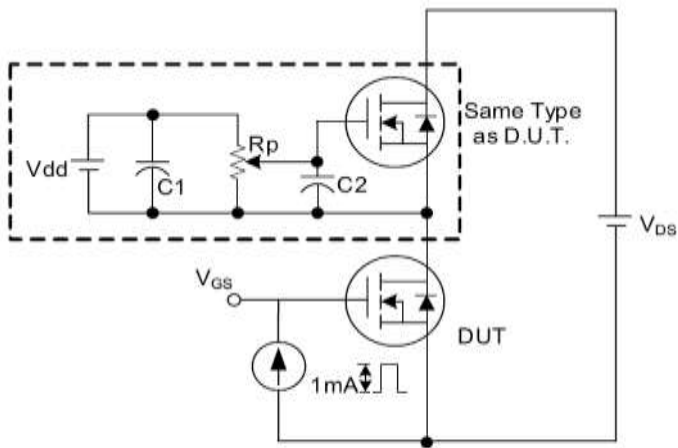


Fig. 3.1 Gate Charge Test Circuit

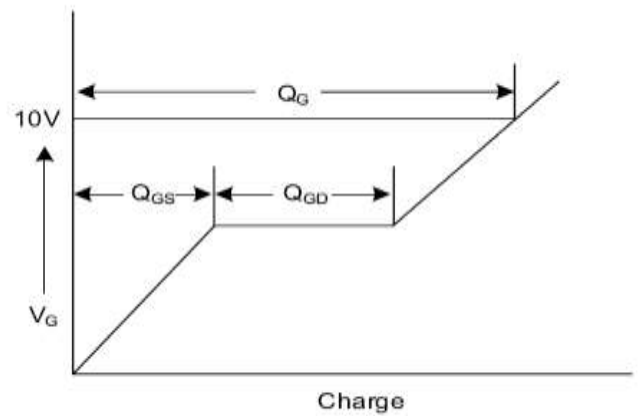


Fig. 3.2 Gate Charge Waveform

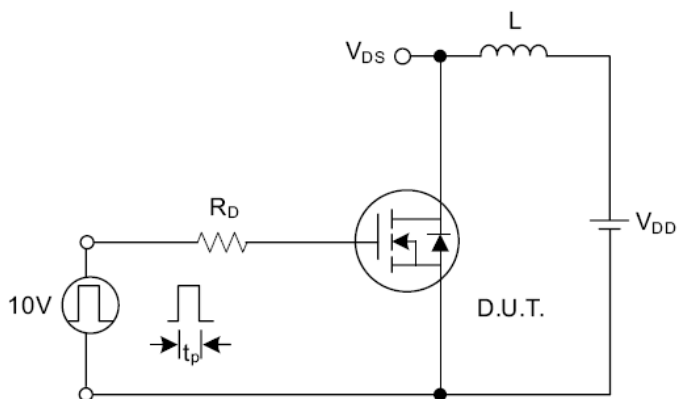


Fig. 4.1 Unclamped Inductive Switching Test Circuit

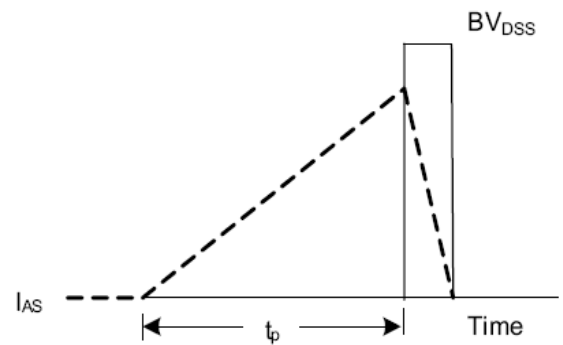
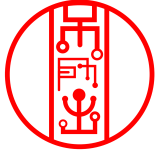


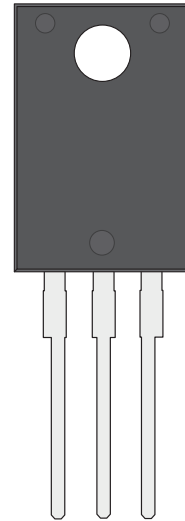
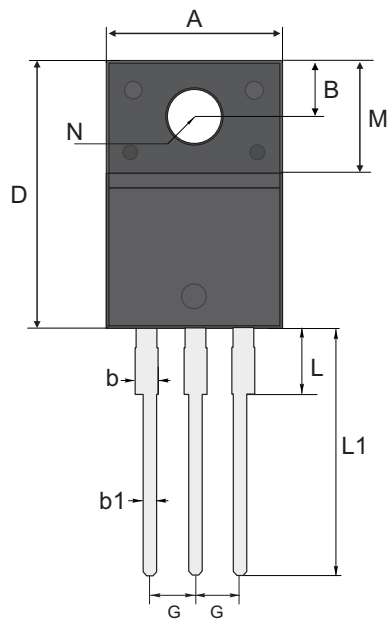
Fig. 4.2 Unclamped Inductive Switching Waveforms



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PACKAGE OUTLINE
Plastic surface mounted package; 3 leads

TO-220F



TO-220F-3L mechanical data

UNIT		A	B	b	b1	C	D	E	F	G	H	L	L1	M	N
mm	max	10.28	3.37	1.34	0.9	4.9	16.07	2.74	2.74	2.64	0.60	2.85	13.7	6.88	3.18 TYPICAL
	typ	10.18	3.27	1.24	0.8	4.7	15.87	2.54	2.54	2.54	0.50	2.65	13.5	6.68	
	min	10.08	3.17	1.14	0.7	4.5	15.67	2.34	2.34	2.44	0.40	2.45	13.3	6.48	
mil	max	405	133	53	35	193	630	108	108	104	27	112	539	271	125 TYPICAL
	typ	401	129	49	31	185	590	100	100	100	20	104	531	267	
	min	397	125	45	28	177	580	92	92	96	16	96	524	255	