



SK12N90B-TF

900VN-Channel MOSFET

General Features

- Advanced Planar Process
- $R_{DS(ON),typ.}=750\text{ m}\Omega@V_{GS}=10\text{V}$
- Low Gate Charge Minimize Switching Loss
- Rugged Polysilicon Gate Structure

BV_{DSS}	$R_{DS(ON),typ.}$	I_D
900V	700m Ω	12A

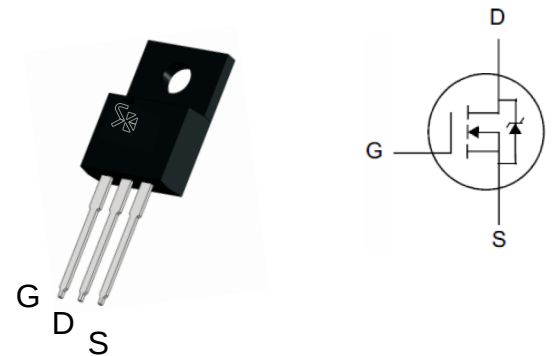
TO-220F-3L

Applications

- BLDC Motor Driver
- Electric Welder
- High Efficiency SMPS

Ordering Information

Part Number	Package
SK12N90B-TF	TO-220F



Absolute Maximum Ratings

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

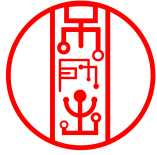
Symbol	Parameter	SK12N90	Unit
V_{DSS}	Drain-to-Source Voltage	900	V
V_{GSS}	Gate-to-Source Voltage	± 30	
I_D	Continuous Drain Current	12	A
	Continuous Drain Current @ $T_C=100^\circ\text{C}$	7.5	
I_{DM}	Pulsed Drain Current at $V_{GS}=10\text{V}^{[2,4]}$	48	
T_L T_{PAK}	Maximum Temperature for Soldering 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.

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	$V_{GS}=0\text{V}$, $I_D=250\mu\text{A}$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=900\text{V}$, $V_{GS}=0\text{V}$
		--	--	125		$V_{DS}=720\text{V}$, $V_{GS}=0\text{V}$, $T_J=125^\circ\text{C}$
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	$V_{GS}=+30\text{V}$, $V_{DS}=0\text{V}$
		--	--	-100		$V_{GS}=-30\text{V}$, $V_{DS}=0\text{V}$



SK12N90B-TF

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	--	0.70	1.0	Ω	$V_{GS}=10\text{V}$, $I_D=6\text{A}$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$
g_{FS}	Forward Transconductance	--	32	--	S	$V_{DS}=25\text{V}$, $I_D=6\text{A}$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	3000	--	pF	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$
C_{rss}	Reverse Transfer Capacitance	--	300	--		
C_{oss}	Output Capacitance	--	250	--		
Q_g	Total Gate Charge	--	83	--	nC	$V_{DD}=450\text{V}$, $I_D=12\text{A}$, $V_{GS}=0$ to 10V
Q_{gs}	Gate-to-Source Charge	--	18	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	32	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

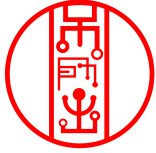
Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	27	--	ns	$V_{DD}=450\text{V}$, $I_D=12\text{A}$, $V_{GS}=10\text{V}$ $R_G=10\Omega$
t_{rise}	Rise Time	--	80	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	67	--		
t_{fall}	Fall Time	--	79	--		

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 ^[2]	--	--	12	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current ^[2]	--	--	48		
V_{SD}	Diode Forward Voltage	--	--	1.5	V	$I_S=12\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse recovery time	--	550	--	ns	$V_{GS}=0\text{V}$, $I_F=12\text{A}$, $di_F/dt=100\text{A}/\mu\text{s}$
Q_{rr}	Reverse recovery charge	--	4.5	--	μC	

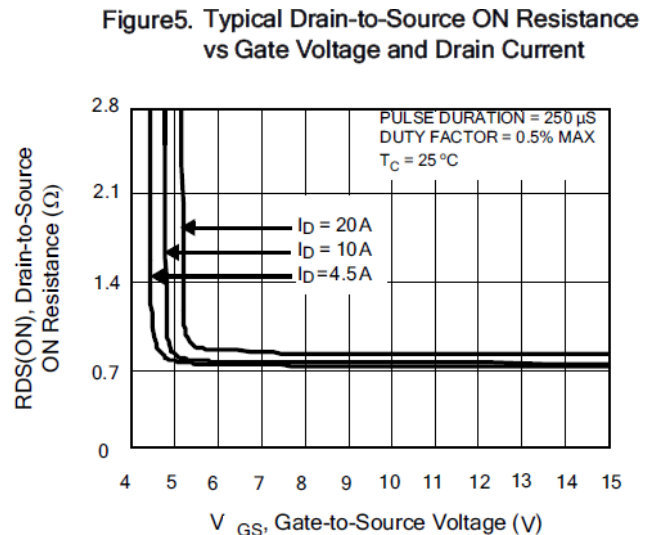
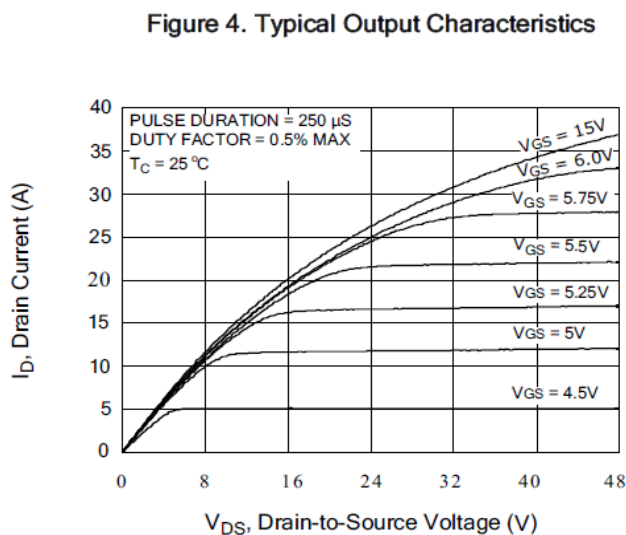
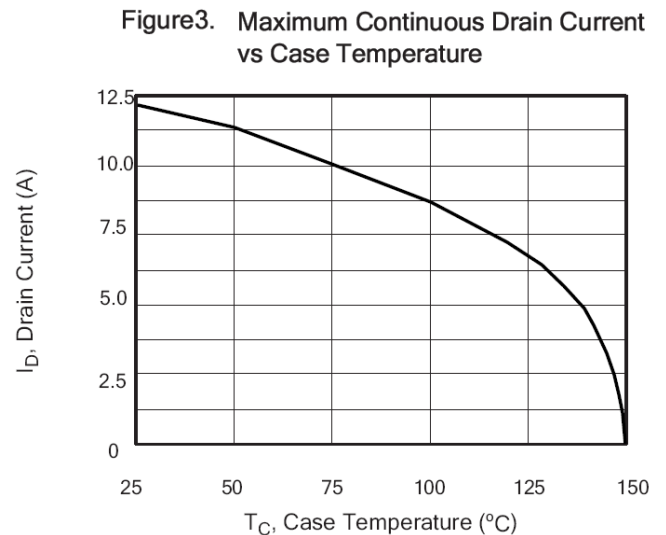
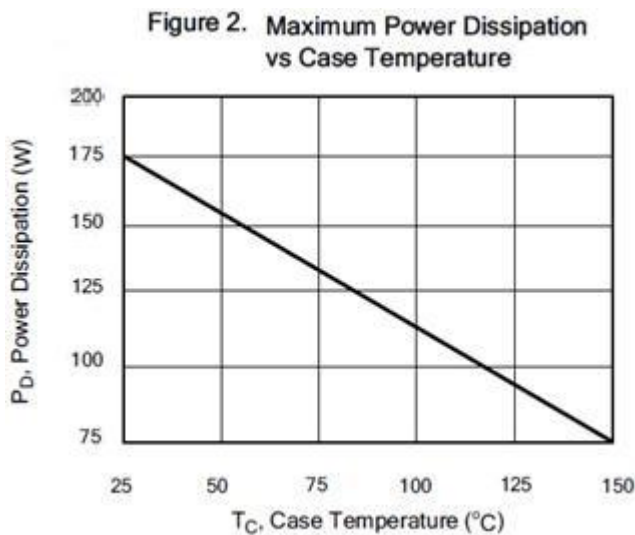
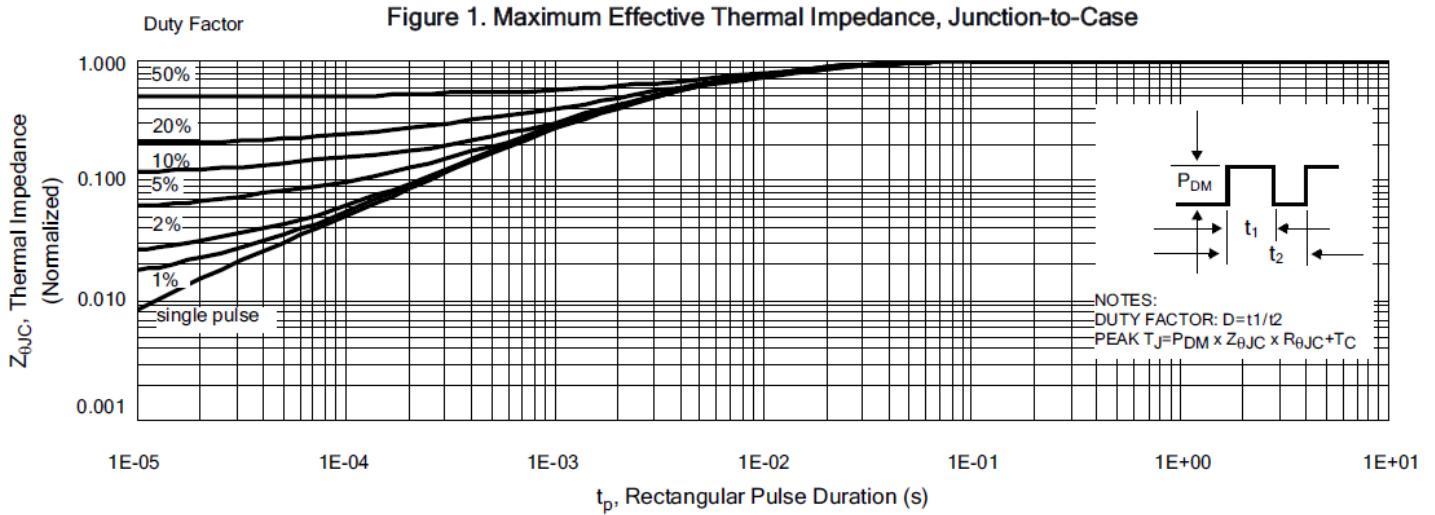
Note:

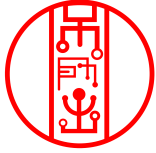
- [1] $T_J=+25^\circ\text{C}$ to $+150^\circ\text{C}$.
[2] Silicon limited current only.
[3] Package limited current.
[4] Repetitive rating; pulse width limited by maximum junction temperature.
[5] Pulse width $\leq 380\mu\text{s}$; duty cycles $\leq 2\%$.



SK12N90B-TF

Typical Characteristics





SK12N90B-TF

Typical Characteristics(Cont.)

Figure 6. Maximum Peak Current Capability

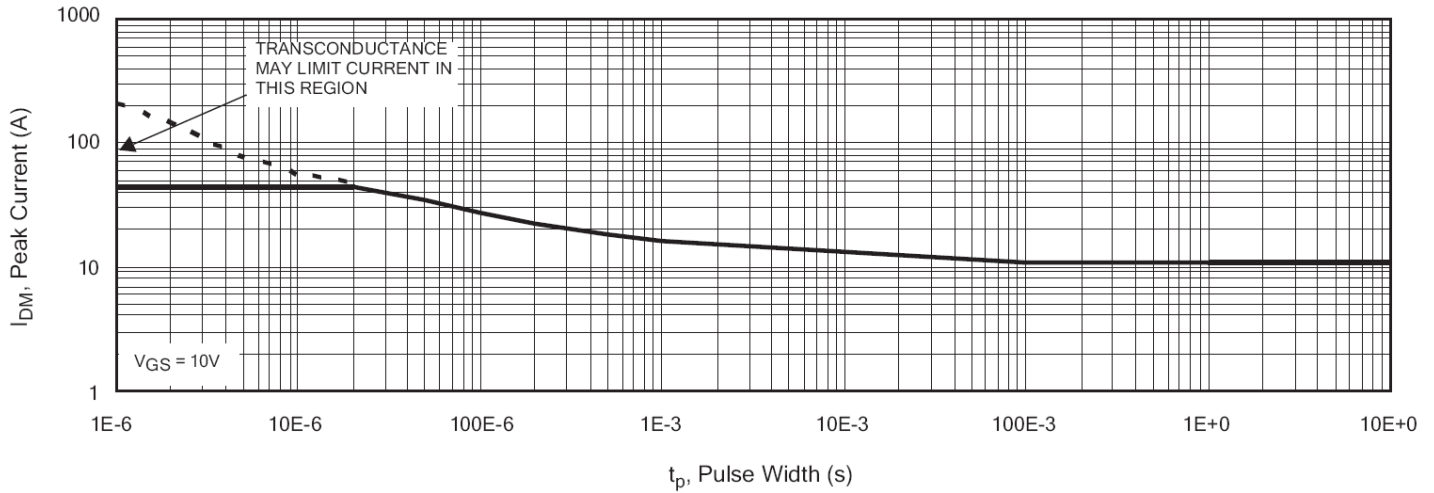


Figure 7. Typical Transfer Characteristics

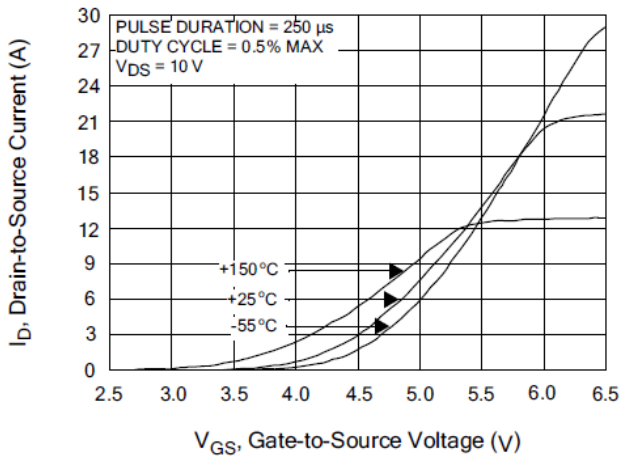


Figure 8. Unclamped Inductive Switching Capability

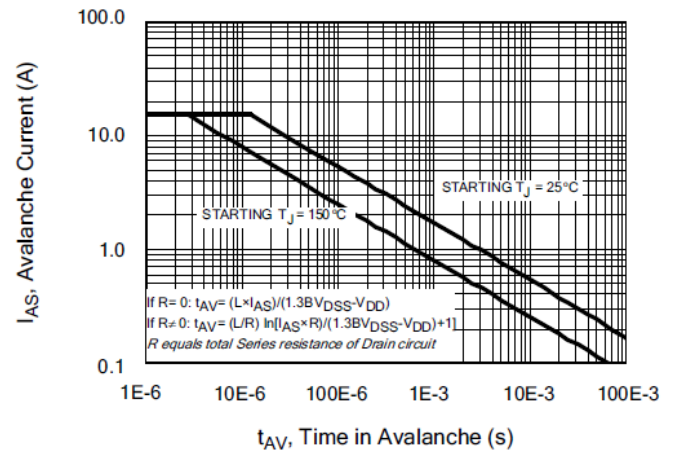


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

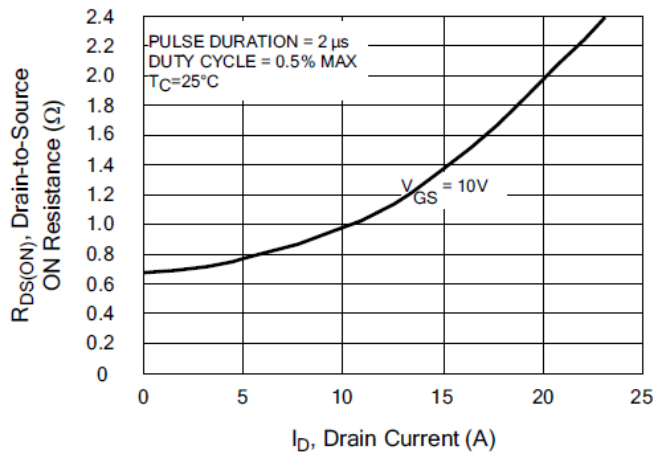
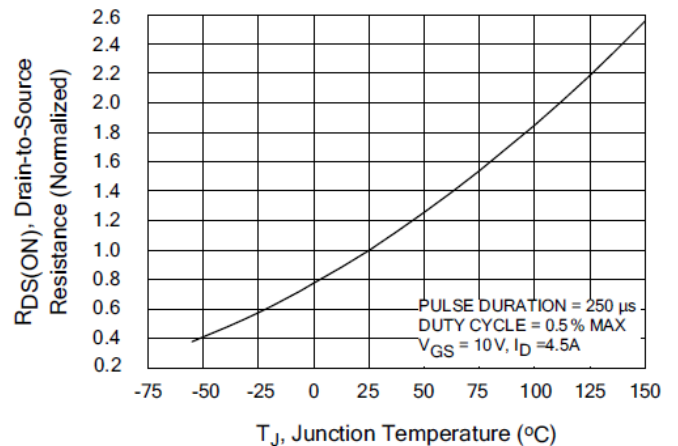
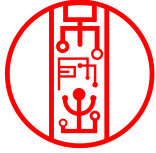


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature





SK12N90B-TF

Typical Characteristics(Cont.)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

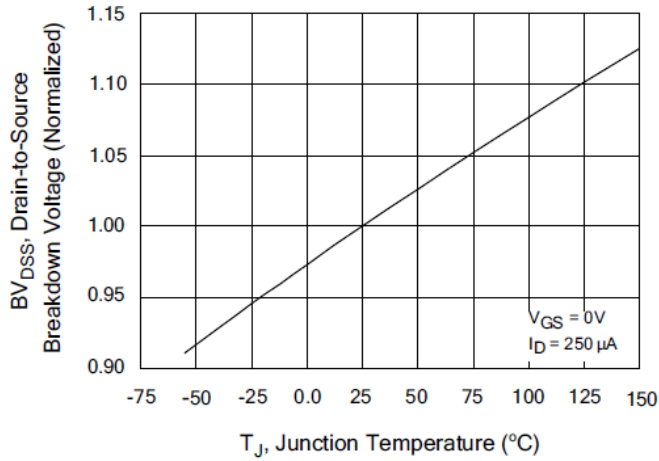


Figure 12. Typical Threshold Voltage vs Junction Temperature

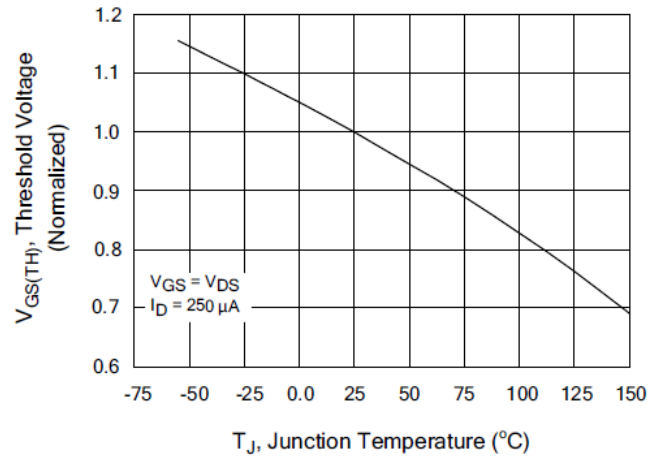


Figure 13. Maximum Forward Bias Safe Operating Area

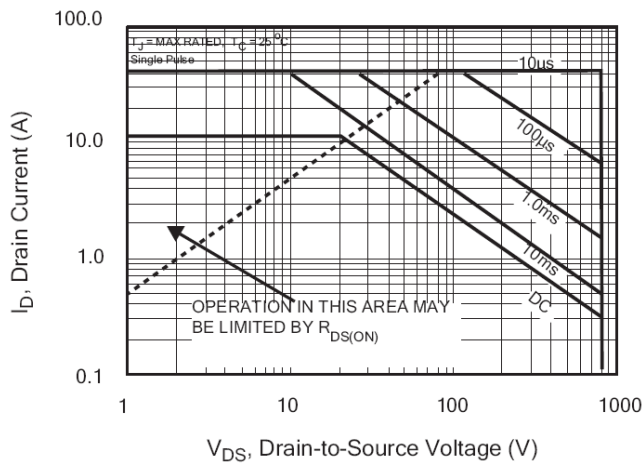
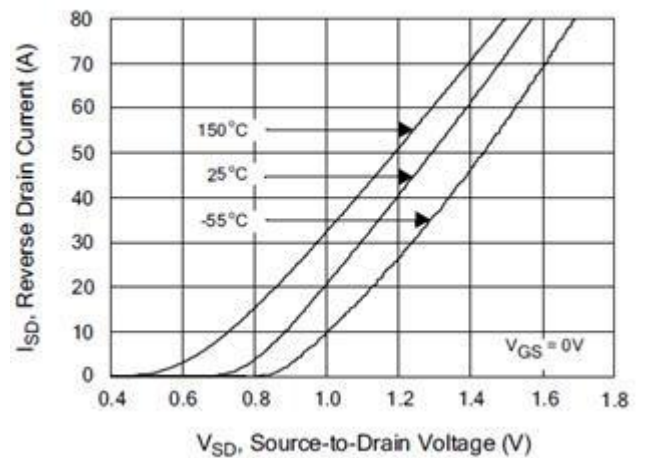
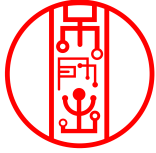


Figure 14. Typical Body Diode Transfer Characteristics





TestCircuitsandWaveforms

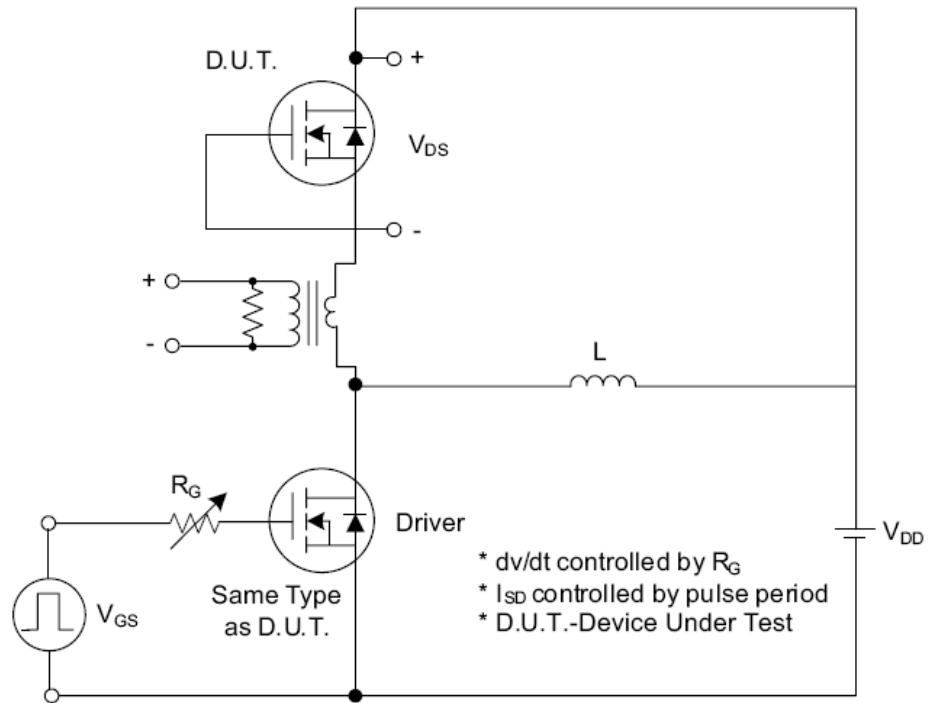


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

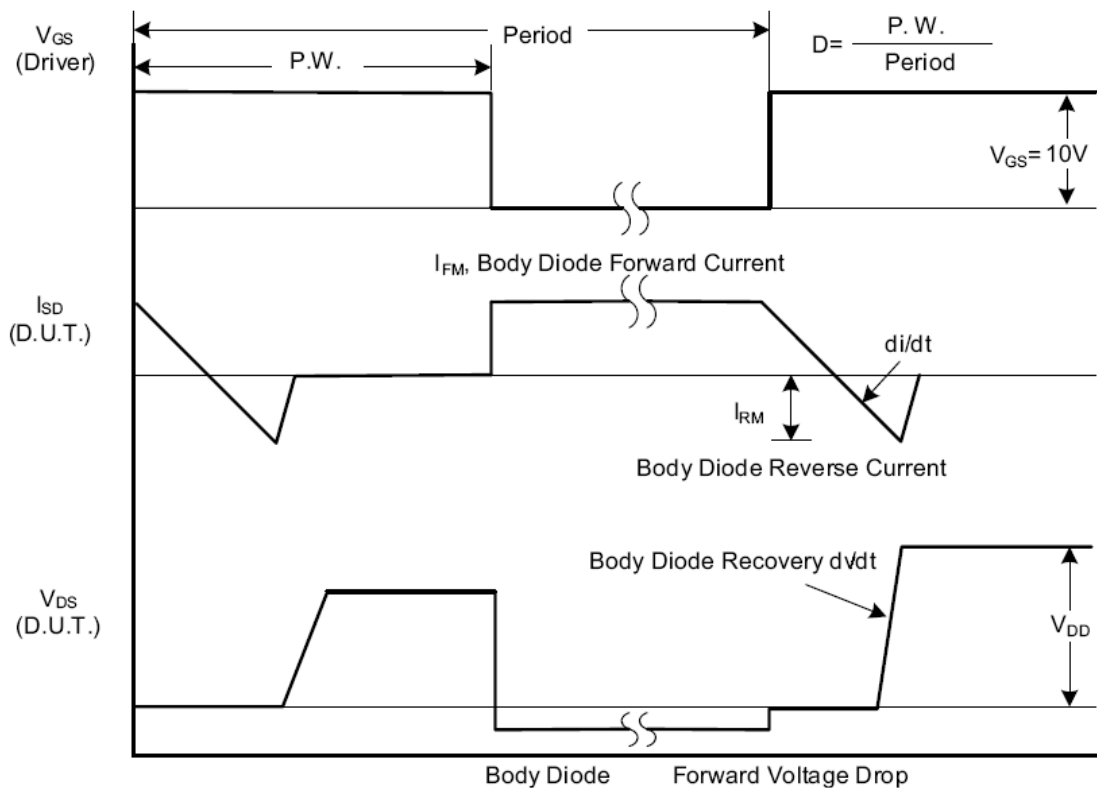
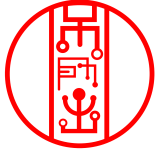


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms



SK12N90B-TF

TestCircuitsandWaveforms(Cont.)

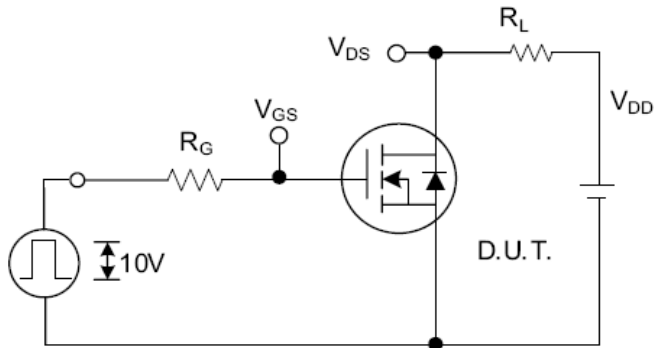


Fig. 2.1 Switching Test Circuit

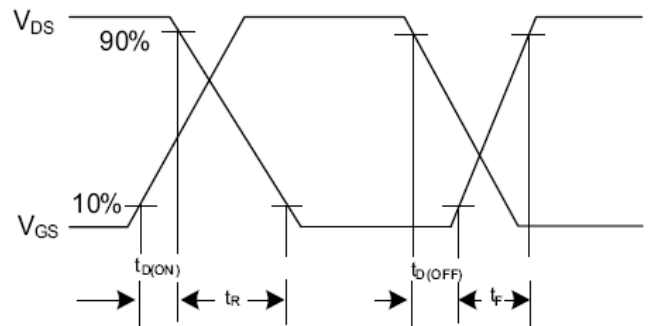


Fig. 2.2 Switching Waveforms

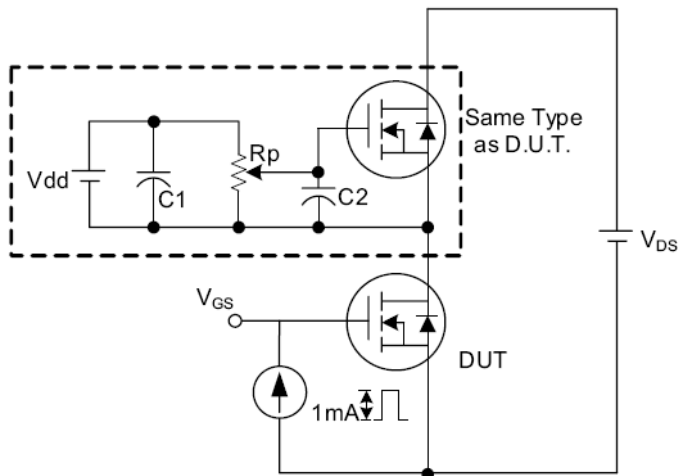


Fig. 3.1 Gate Charge Test Circuit

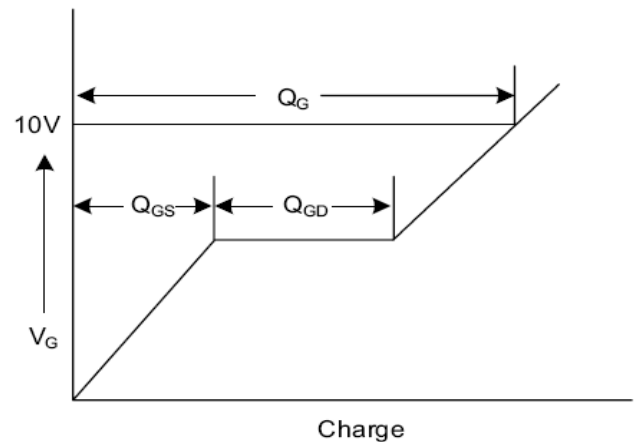


Fig. 3.2 Gate Charge Waveform

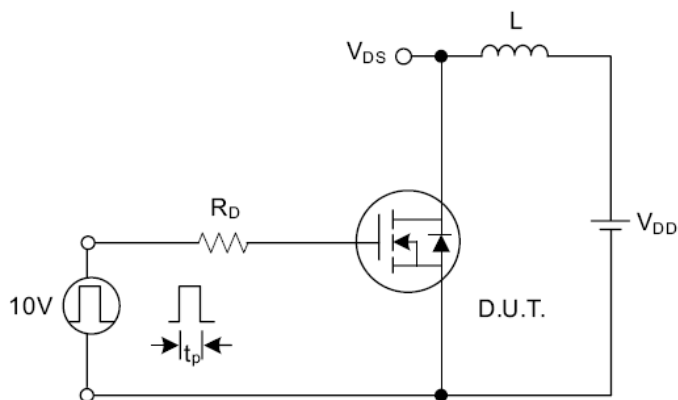


Fig. 4.1 Unclamped Inductive Switching Test Circuit

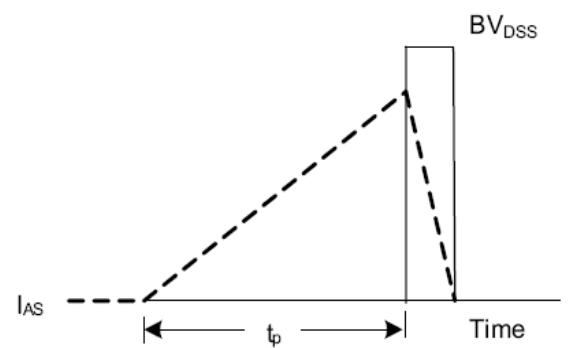


Fig. 4.2 Unclamped Inductive Switching Waveforms

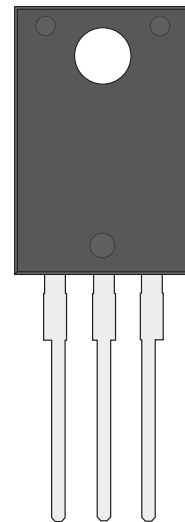
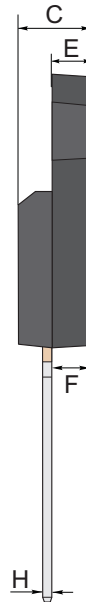
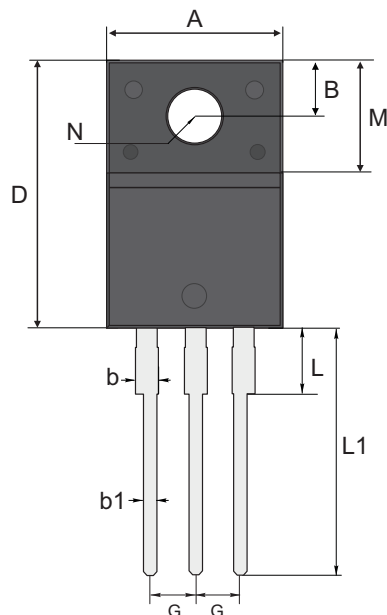


SK12N90B-TF

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

TO-220F-3L



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	