

700V N-ch Planar MOSFET

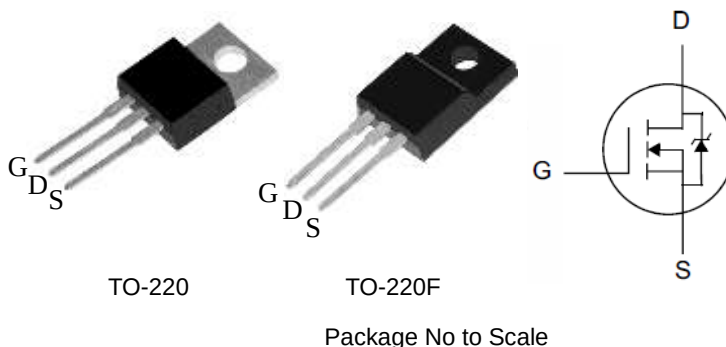
General Features

- RoHS Compliant
- $R_{DS(ON),typ.}=0.80\ \Omega @ V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

Applications

- Adaptor
- Charger
- SMPS Standby Power

BV_{DSS}	$R_{DS(ON),typ.}$	I_D
700V	0.80 Ω	10A



Ordering Information

PART NUMBE	SK10N70B-T	SK10N70B-TF
PACKAGE	TO-220	TO-220F

Absolute Maximum Ratings

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

Symbol	Parameter	SK10N70B-T	SK10N70B-TF	Unit
V _{DSS}	Drain-to-Source Voltage	700		V
V _{GSS}	Gate-to-Source Voltage	±30		
I _D	Continuous Drain Current	10		A
I _{DM}	Pulsed Drain Current at V _{GS} =10V	40		
E _{AS}	Single Pulse Avalanche Energy	500		mJ
dv/dt	Peak Diode Recovery dv/dt	5.5		V/ns
P _D	Power Dissipation	218	51	W
	Derating Factor above 25°C	1.75	0.4	W/°C
T _L	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300		°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	SK10N70B-T	SK10N70B-TF	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.57	2.45	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	100	

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	700	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=700V, V_{GS}=0V$
		--	--	125		$V_{DS}=560V, V_{GS}=0V, T_J=125^\circ\text{C}$
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	--	0.80	0.90	Ω	$V_{GS}=10V, I_D=5A$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
gfs	Forward Transconductance	--	10	--	S	$V_{DS}=15V, I_D=5A$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	1540	--	pF	$V_{GS}=0V, V_{DS}=25V, f=1.0\text{MHz}$
C_{rss}	Reverse Transfer Capacitance	--	16	--		
C_{oss}	Output Capacitance	--	150	--		
Q_g	Total Gate Charge	--	40	--	nC	$V_{DD}=350V, I_D=10A, V_{GS}=0 \text{ to } 10V$
Q_{gs}	Gate-to-Source Charge	--	7	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	17	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	14	--	ns	$V_{DD}=350V, I_D=10A, V_{GS}=10V, R_g=9.1\Omega$
t_{rise}	Rise Time	--	23	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	48	--		
t_{fall}	Fall Time	--	32	--		

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]	--	--	10	A	Integral pn-diode in MOSFET
I_{SM}	Pulsed Source Current ^[2]	--	--	40		
V_{SD}	Diode Forward Voltage	--	--	1.5	V	$I_S=10\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse Recovery Time	--	289	--	ns	$V_{GS}=0\text{V}$ $I_F=10\text{A}$, $di/dt=100\text{A}/\mu\text{s}$
Q_{rr}	Reverse Recovery Charge	--	1.9	--	uC	

Note:

- [1] $T_J=+25^{\circ}\text{C}$ to $+150^{\circ}\text{C}$
 [2] Pulse width $\leq 380\mu\text{s}$; duty cycle $\leq 2\%$.

Typical Characteristics

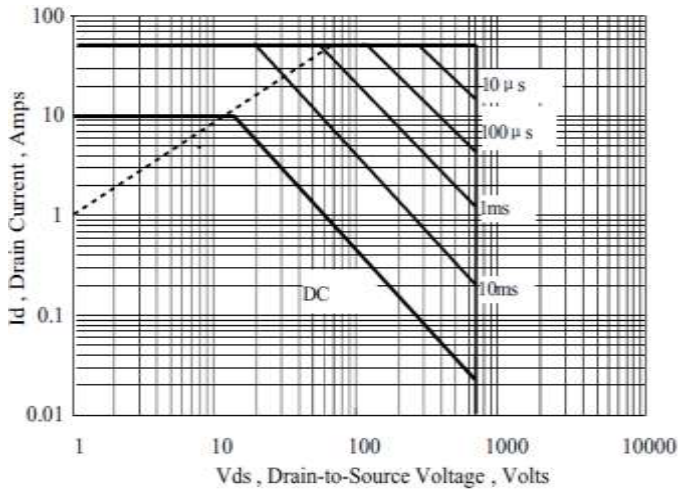


Figure 1 Maximum Forward Bias Safe Operating Area

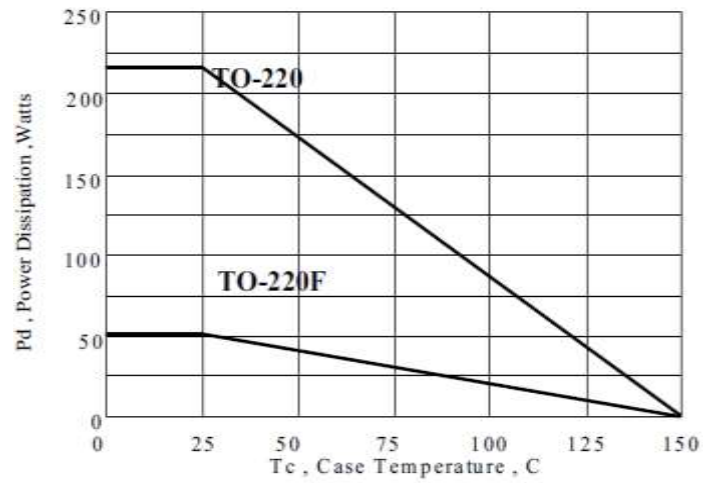


Figure 2 Maximum Power Dissipation vs Case Temperature

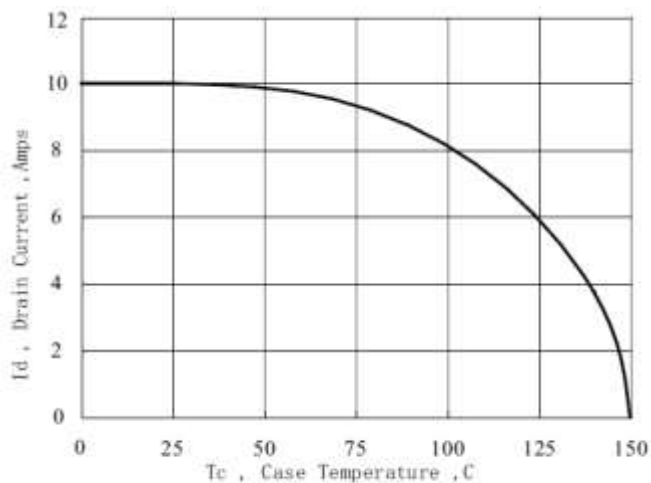


Figure 3 Maximum Continuous Drain Current vs Case Temperature

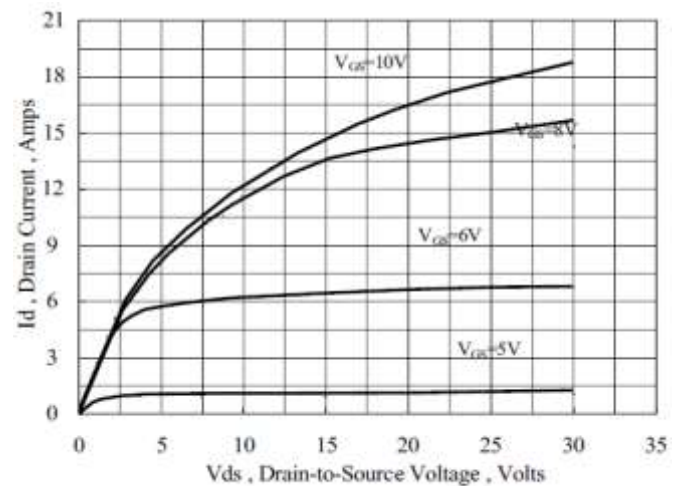


Figure 4 Typical Output Characteristics

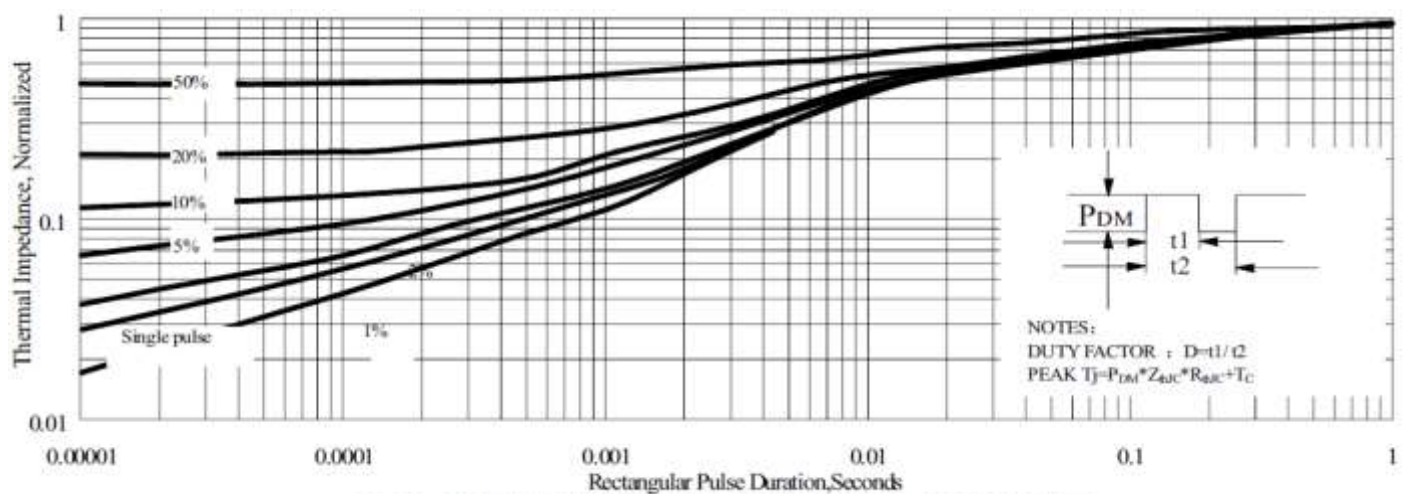


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

Typical Characteristics(Cont.)

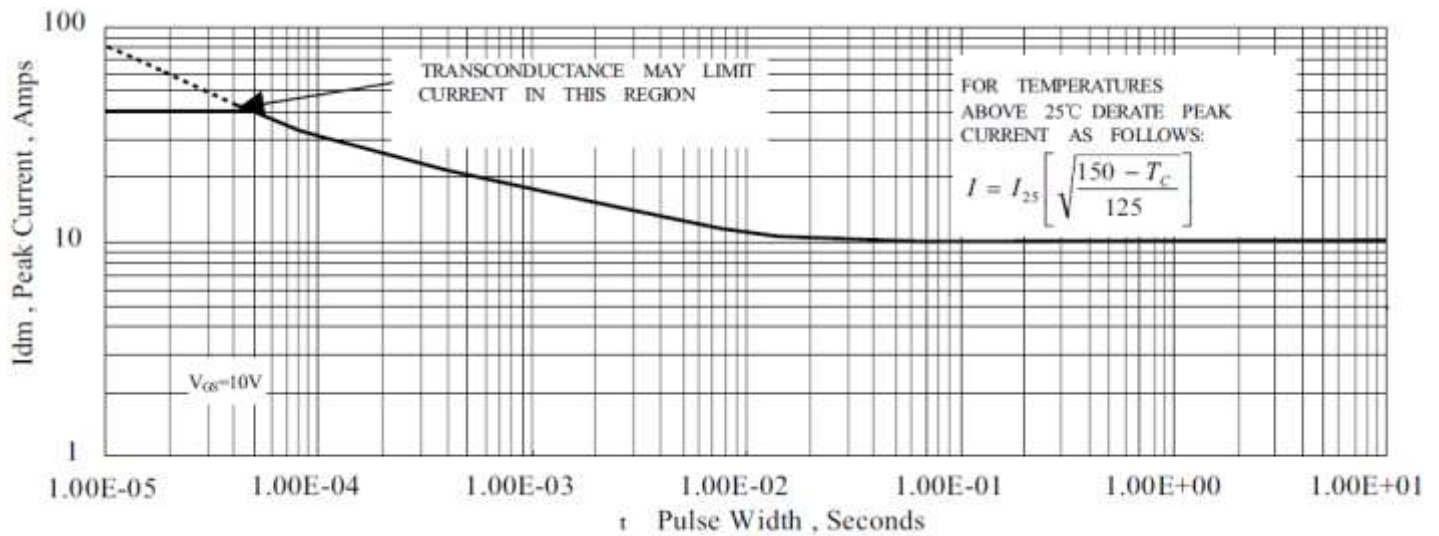


Figure 6 Maximum Peak Current Capability

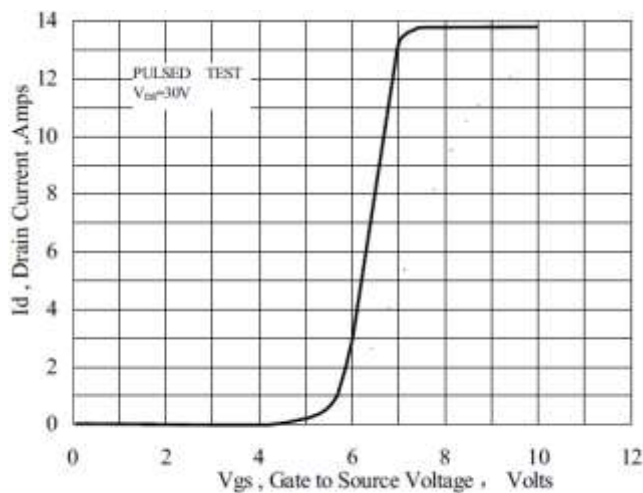


Figure 7 Typical Transfer Characteristics

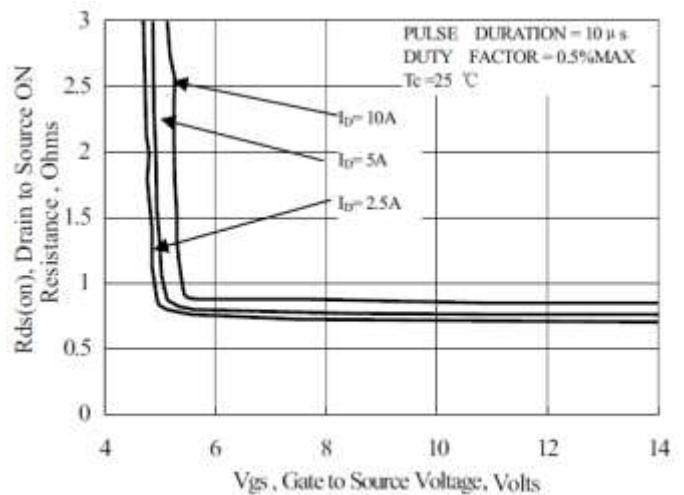


Figure 8 Typical Drain to Source ON Resistance vs. Gate Voltage

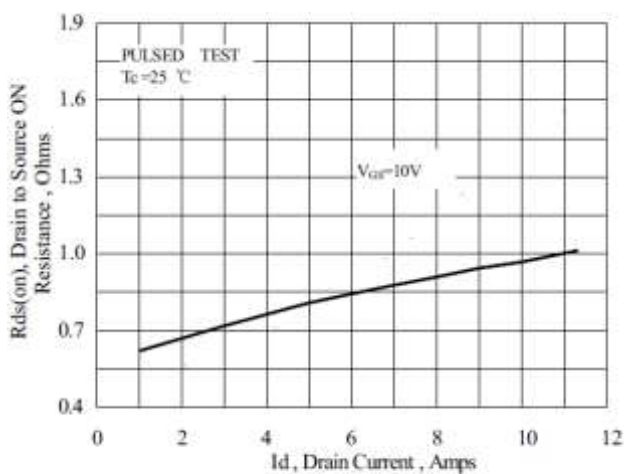


Figure 9 Typical Drain to Source ON Resistance vs. Drain Current

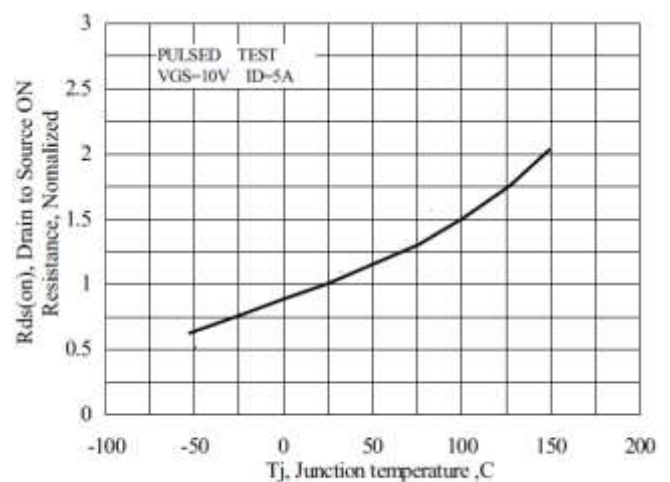


Figure 10 Typical Drain to Source on Resistance vs. Junction Temperature

Typical Characteristics(Cont.)

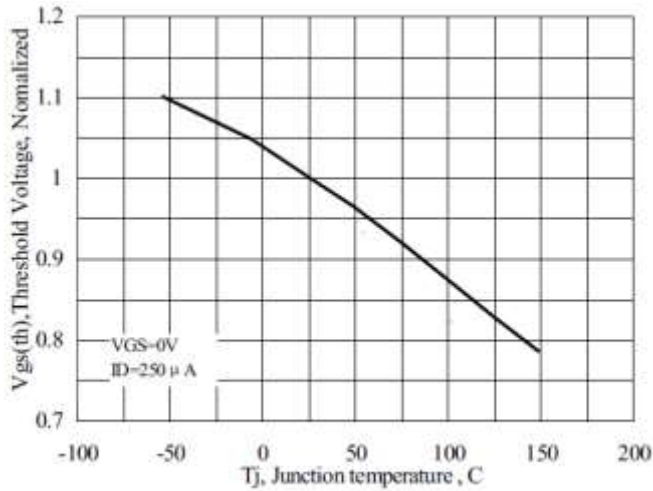


Figure 11 Typical Threshold Voltage vs Junction Temperature

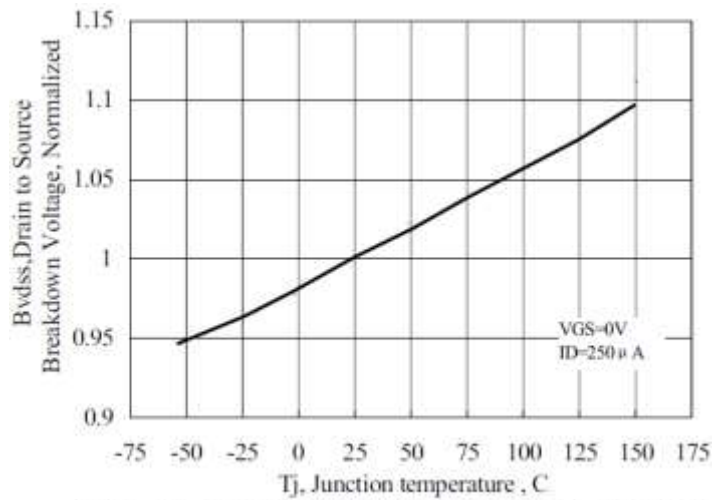


Figure 12 Typical Breakdown Voltage vs Junction Temperature

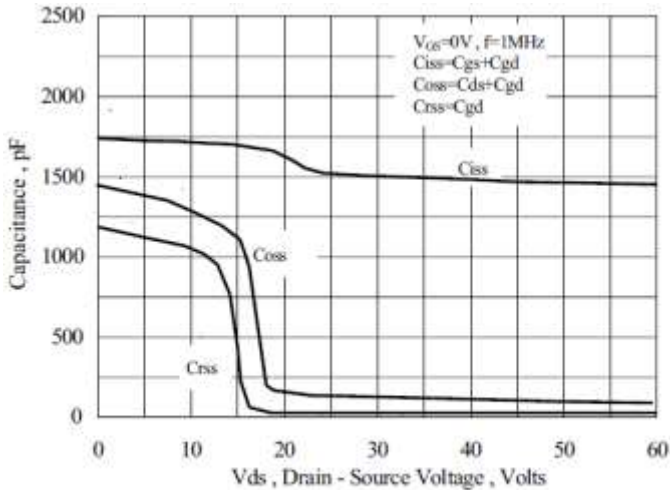


Figure 13 Typical Capacitance vs Drain to Source Voltage

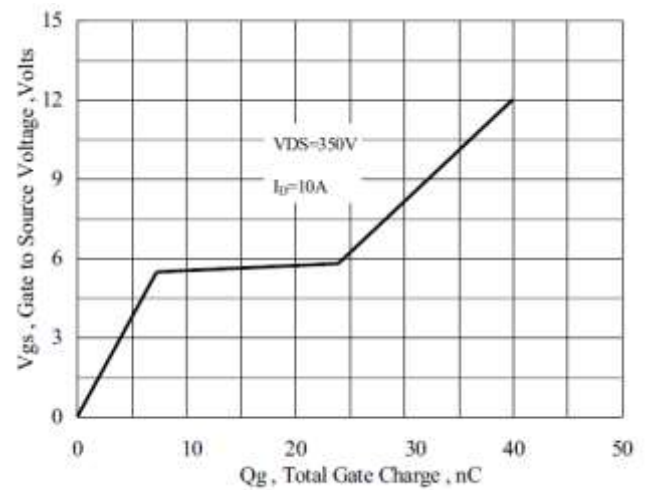


Figure 14 Typical Gate Charge vs Gate to Source Voltage

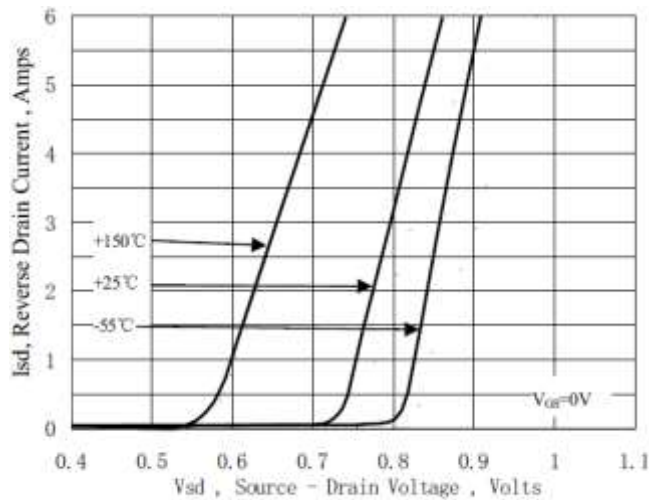


Figure 15 Typical Body Diode Transfer Characteristics

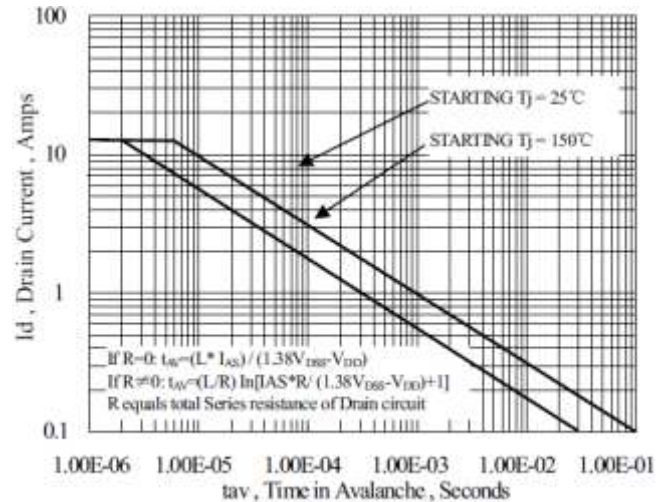


Figure 16 Unclamped Inductive Switching Capability

Test Circuits and Waveforms

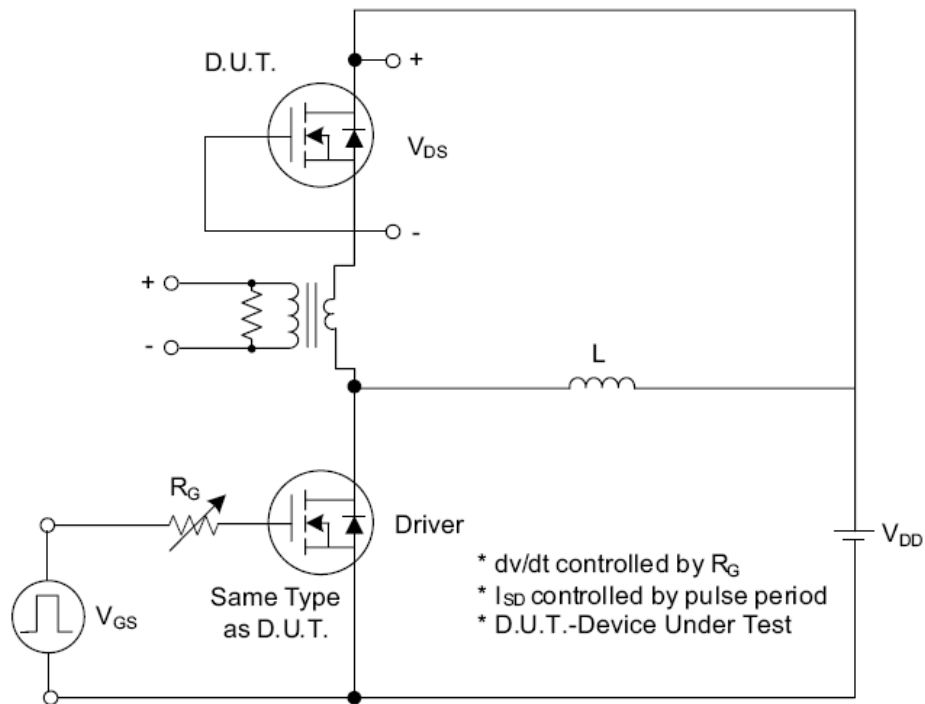


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

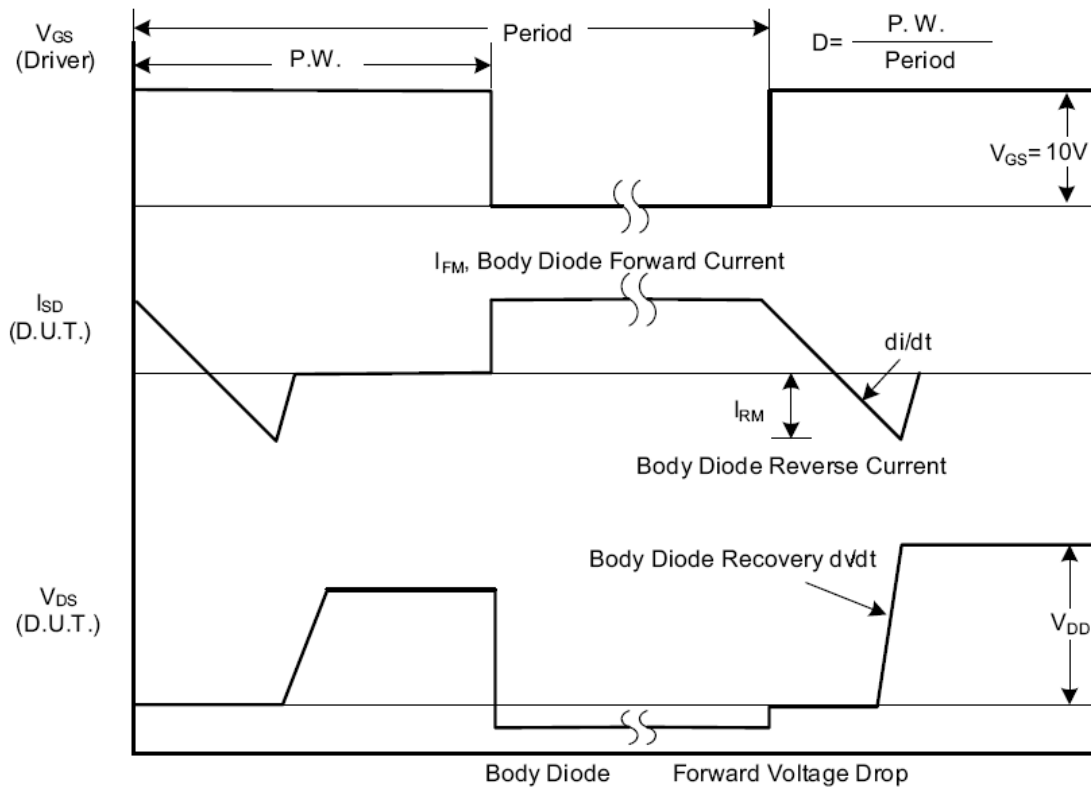


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

Test Circuits and Waveforms(Cont.)

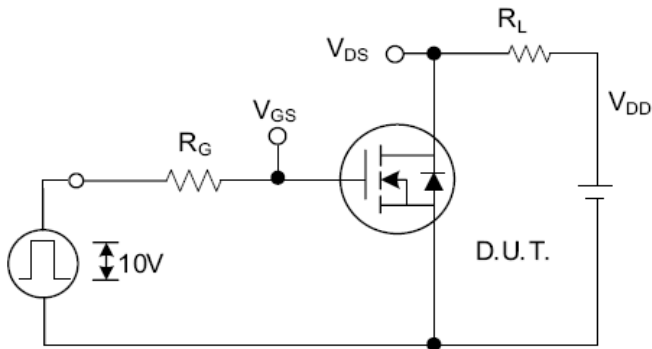


Fig. 2.1 Switching Test Circuit

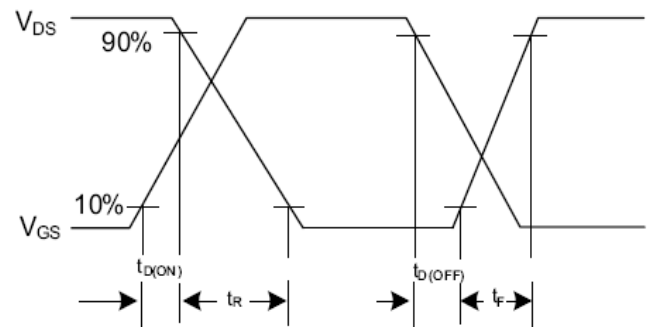


Fig. 2.2 Switching Waveforms

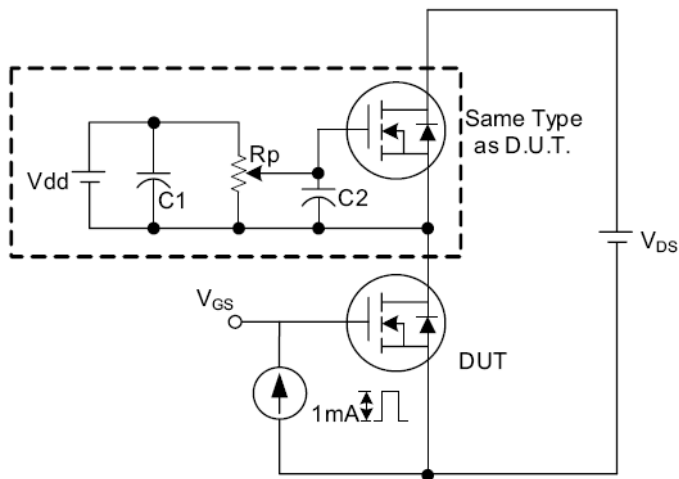


Fig. 3.1 Gate Charge Test Circuit

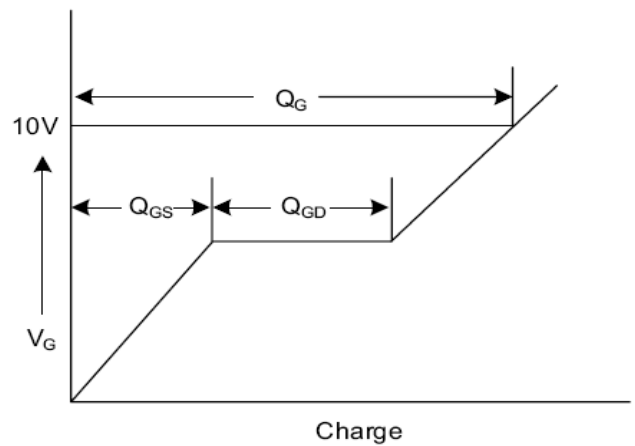


Fig. 3.2 Gate Charge Waveform

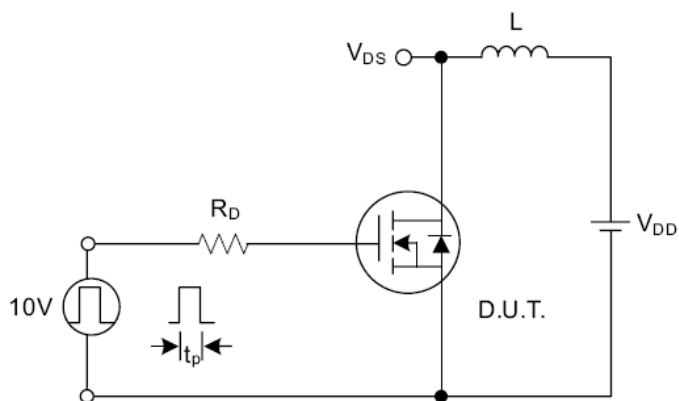


Fig. 4.1 Unclamped Inductive Switching Test Circuit

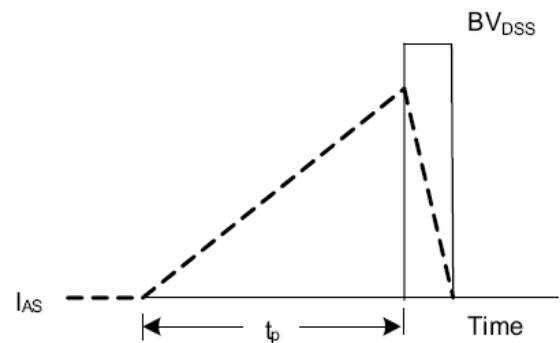
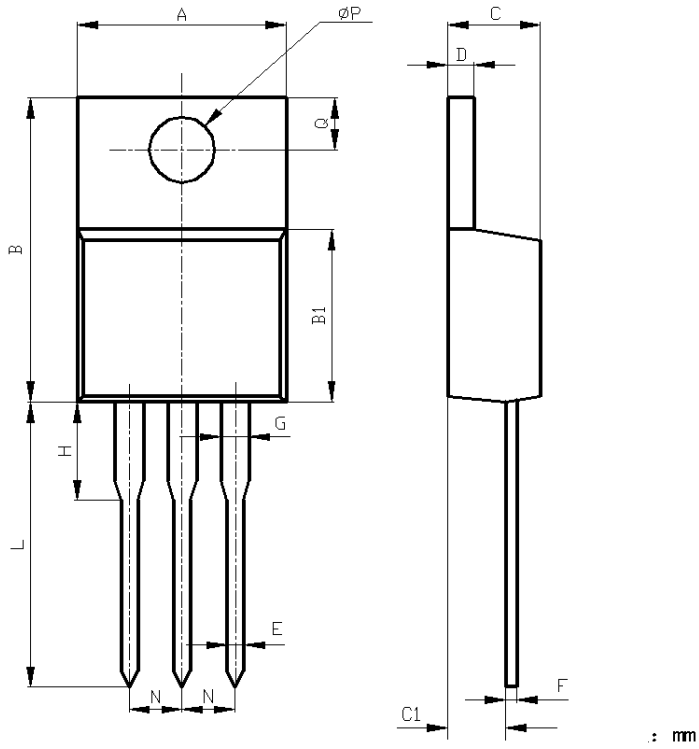


Fig. 4.2 Unclamped Inductive Switching Waveforms

PACKAGE OUTLINE

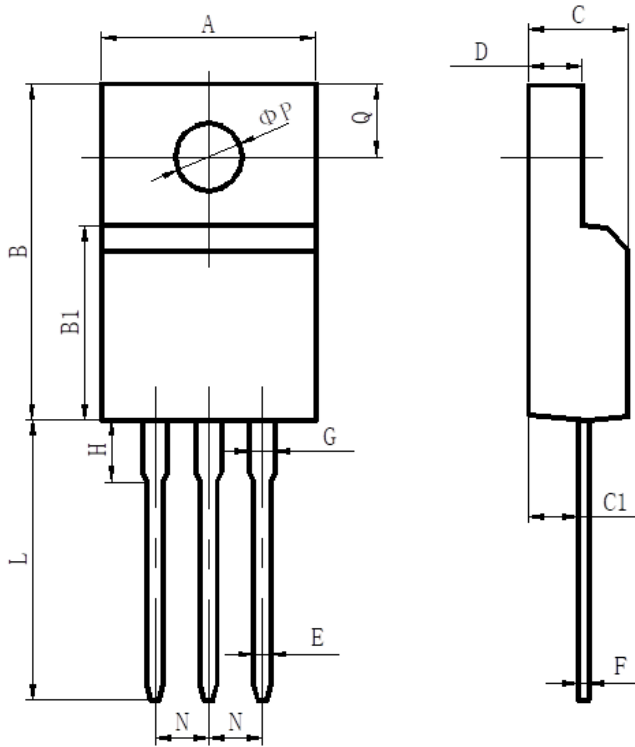
TO-220



	Unit (mm)	
	MIN	MAX
A	10.1	10.5
B	15.2	15.6
B1	9.00	9.40
C	4.40	4.60
C1	2.40	3.00
D	1.20	1.40
E	0.70	0.90
F	0.40	0.60
G	1.17	1.37
H	3.30	3.80
L	13.1	13.7
N	2.34	2.74
Q	2.40	3.00
Ø P	3.70	3.90

PACKAGE OUTLINE

TO-220F



	Unit (mm)	
	MIN	MAX
A	9.70	10.30
B	15.50	16.10
B1	8.99	9.39
C	4.40	4.80
C1	2.15	2.55
D	2.50	2.90
E	0.70	0.90
F	0.40	0.60
G	1.12	1.42
H	3.40	3.80
L	12.6	13.6
N	2.34	2.74
Q	3.15	3.55
Φ P	3.00	3.30