

650V N-ch Planar MOSFET

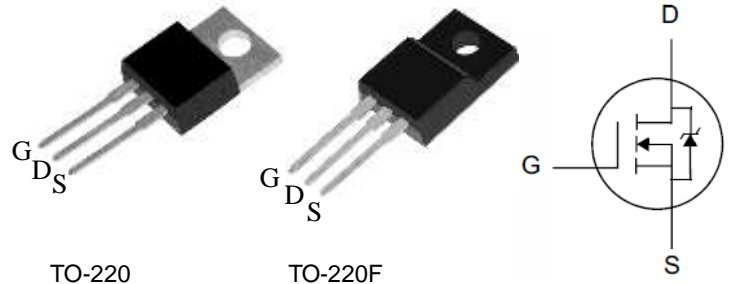
V_{DSS}	$R_{DS(ON)}$ (Typ.)	I_D
650 V	0.75Ω	10 A

General Features

- RoHS Compliant
- $R_{DS(ON),typ.}=0.75\ \Omega@V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

Applications

- Adaptor
- Charger
- SMPS Standby Power



Package No to Scale

Ordering Information

PART NUMBE	SK10N65B-T	SK10N65B-TF
PACKAGE	TO-220	TO-220F

Absolute Maximum Ratings

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

Symbol	Parameter	SK10N65B-T	SK10N65B-TF	Units
V_{DSS}	Drain-to-Source Voltage	650		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	800		mJ
P_D	Power Dissipation	125	45	W
	Derating Factor above 25°C	1.0	0.36	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	SK10N65B-T	SK10N65B-TF	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.0	2.78	°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.	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	650	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	uA	$V_{DS}=650V, V_{GS}=0V$
		--	--	100		$V_{DS}=520V, V_{GS}=0V, T_J=125^\circ\text{C}$
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.	Units	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	0.75	0.90	Ω	$V_{GS}=10V, I_D=5.0A$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
gfs	Forward Transconductance	--	8.0	--	S	$V_{DS}=15V, I_D=5.0A$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	1660	--	pF	$V_{GS}=0V, V_{DS}=25V, f=1.0\text{MHz}$
C_{rss}	Reverse Transfer Capacitance	--	15	--		
C_{oss}	Output Capacitance	--	130	--		
Q_g	Total Gate Charge	--	32	--	nC	$V_{DD}=520V, I_D=10A, V_{GS}=0 \text{ to } 10V$
Q_{gs}	Gate-to-Source Charge	--	8.0	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	8.5	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	11	--	nS	$V_{DD}=325V, I_D=10A, V_{GS}=10V, R_g=4.7\Omega$
t_{rise}	Rise Time	--	15	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	40	--		
t_{fall}	Fall Time	--	17	--		

Source-Drain Body Diode Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	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	--	460	--	ns	$V_{GS}=0\text{V}$ $I_F=I_S$, $di/dt=100\text{A}/\mu\text{s}$
Q_{rr}	Reverse Recovery Charge	--	1.5	--	nC	

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 Transient Thermal Impedance

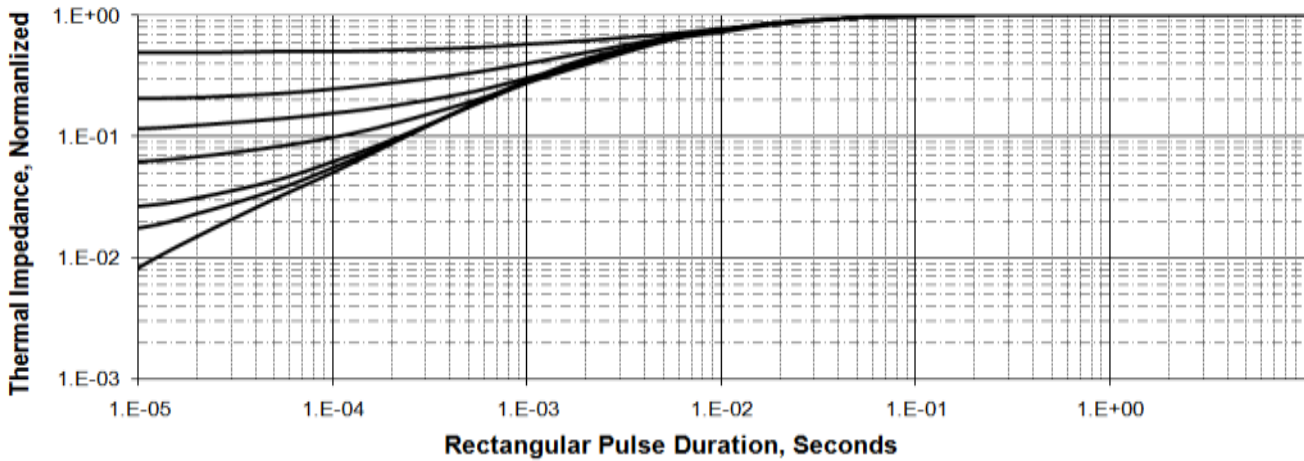


Figure 2. Max. Power Dissipation vs Case Temperature

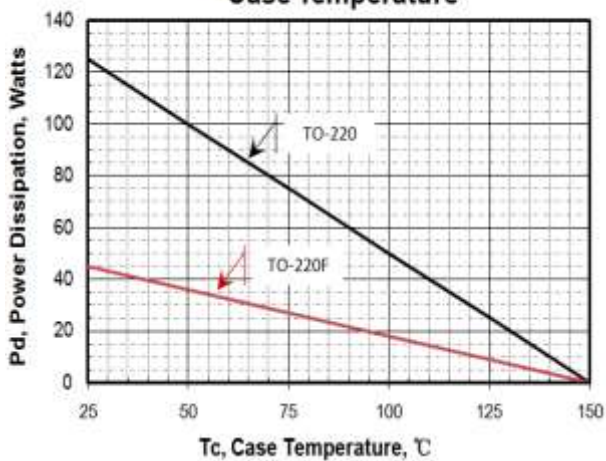


Figure 3. Maximum Continuous Drain Current vs Tc

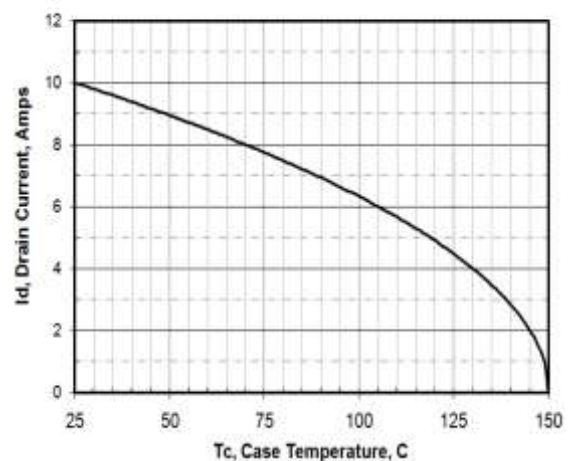


Figure 4. Output Characteristics

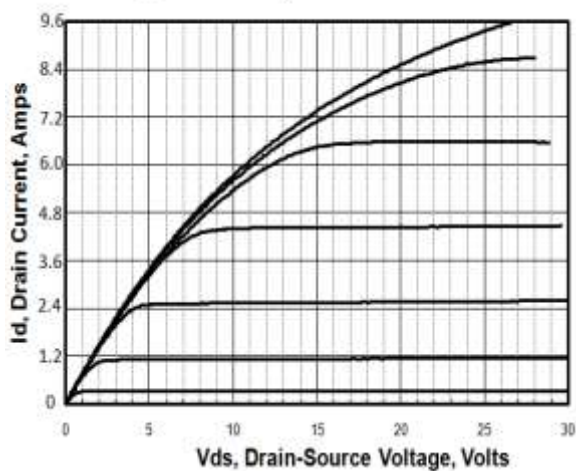
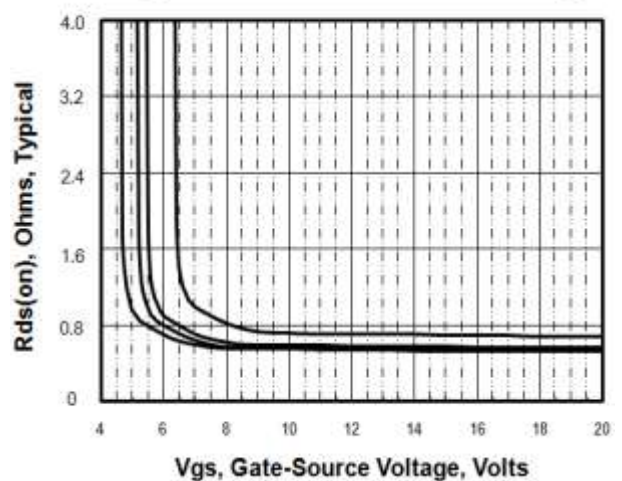


Figure 5. Rds(on) vs Gate Voltage



Typical Characteristics(Cont.)

Figure 6. Peak Current Capability

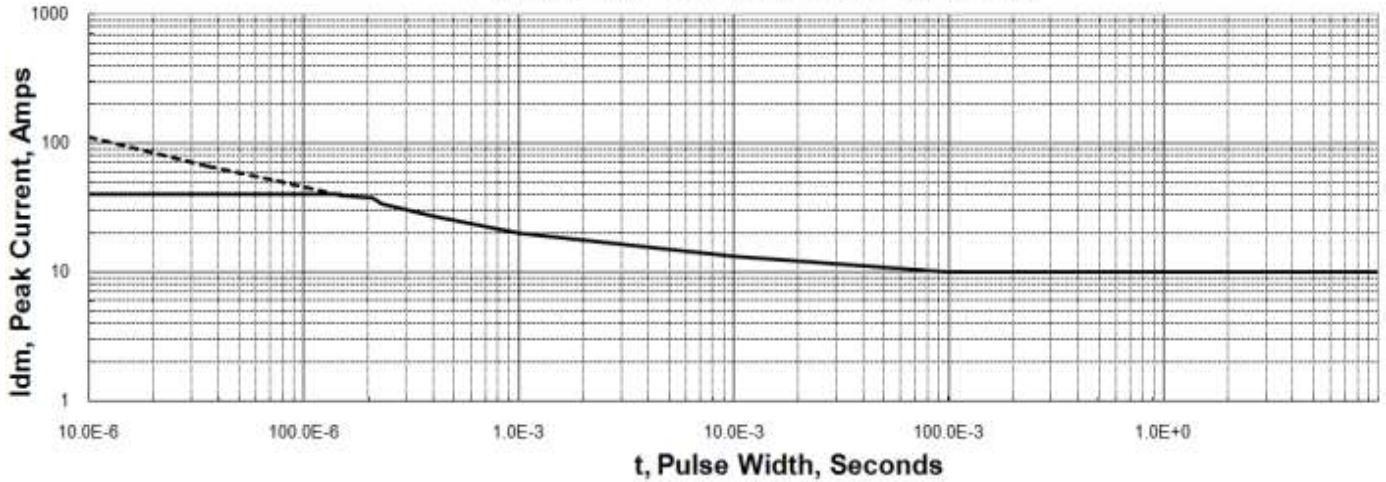


Figure 7. Transfer Characteristics

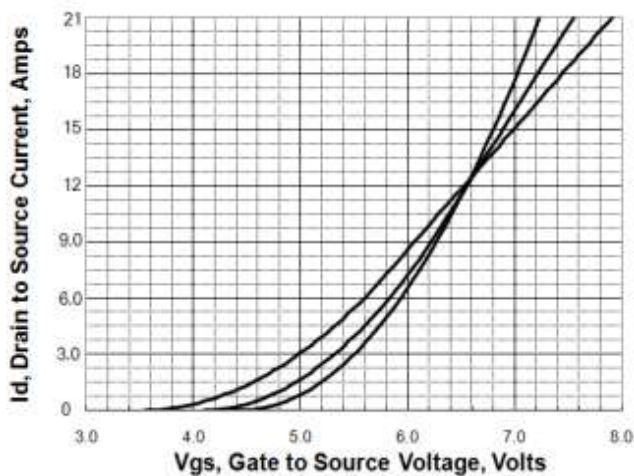


Figure 8. Unclamped Inductive Switching Capability

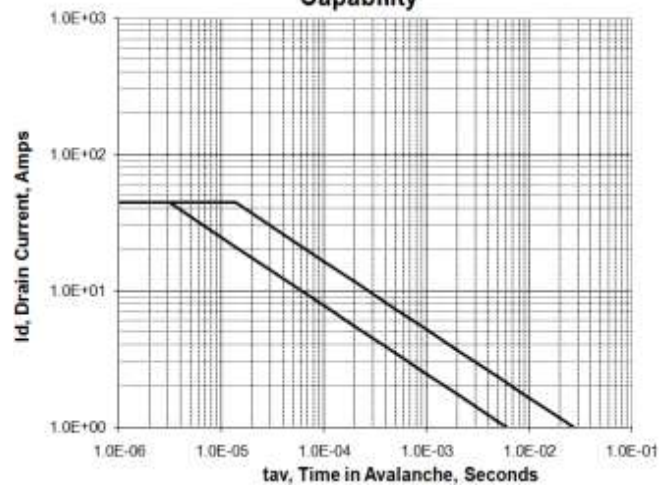


Figure 9. Drain to Source ON Resistance vs Drain Current

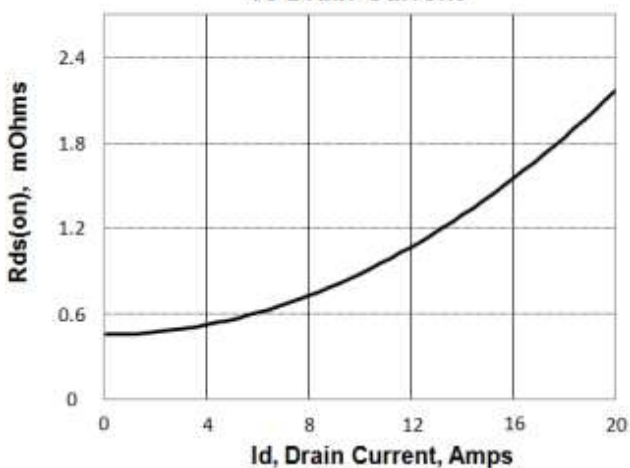
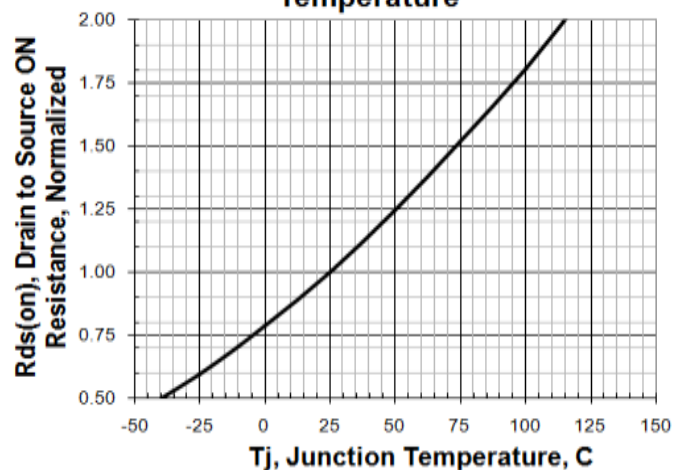


Figure 10. Rds(on) vs Junction Temperature



Typical Characteristics(Cont.)

Figure 11. Breakdown Voltage vs Temperature

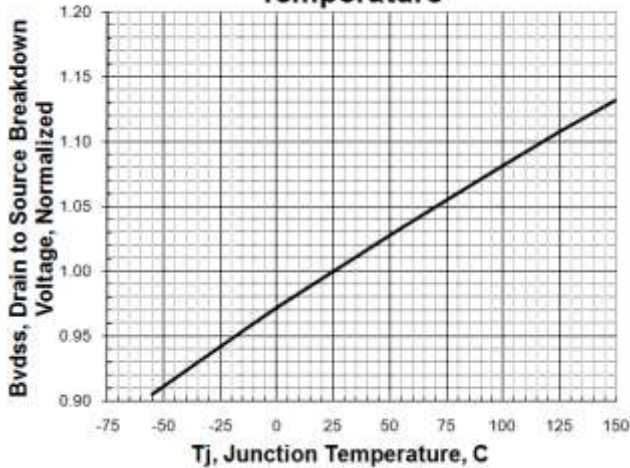


Figure 12. Threshold Voltage vs Temperature

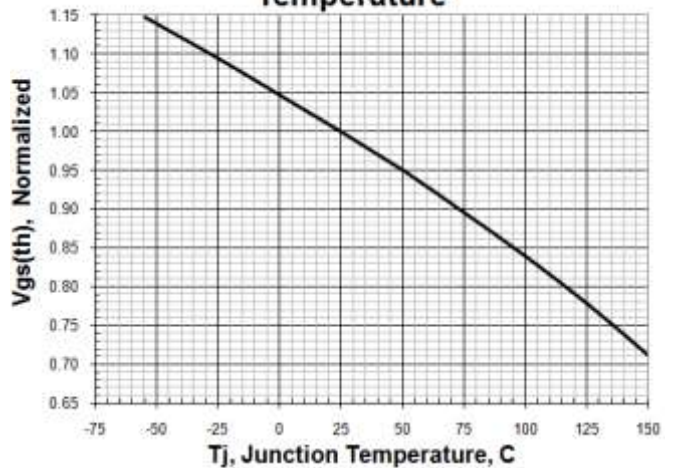


Figure 13 . Maximum Safe Operating Area

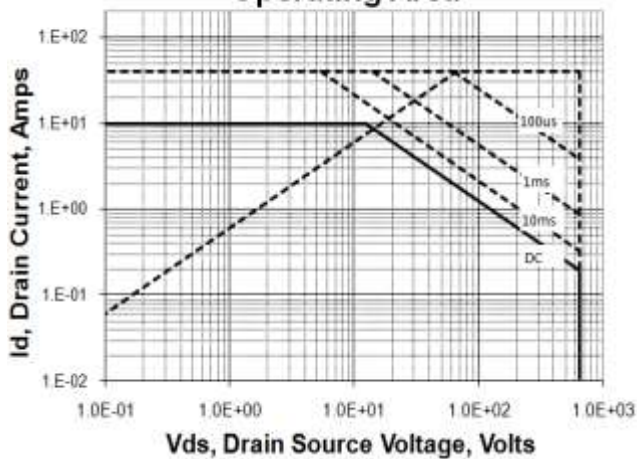


Figure 14. Capacitance vs Vds

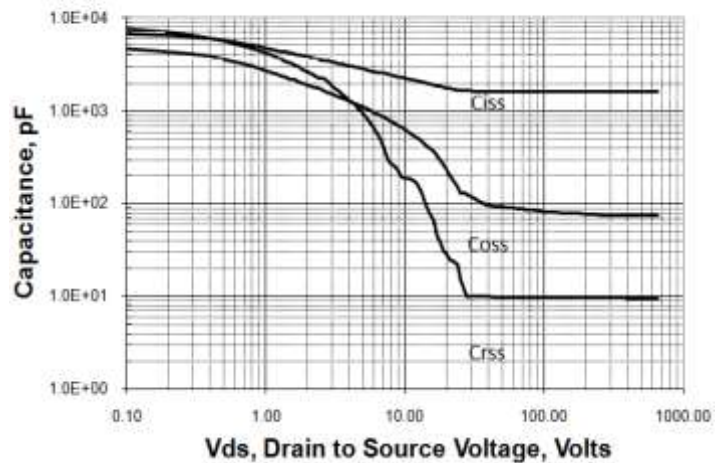


Figure 15 . Typical Gate Charge

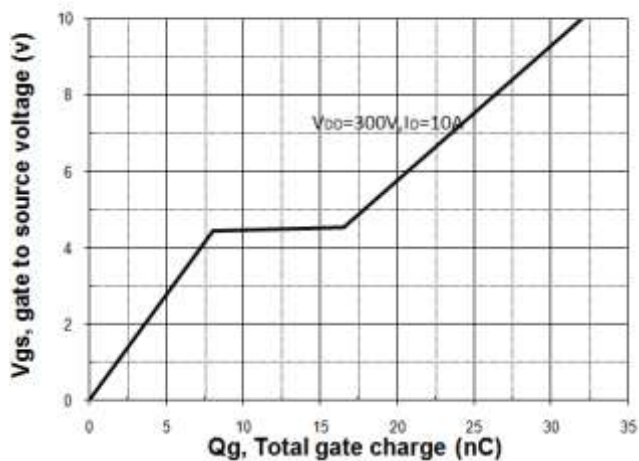
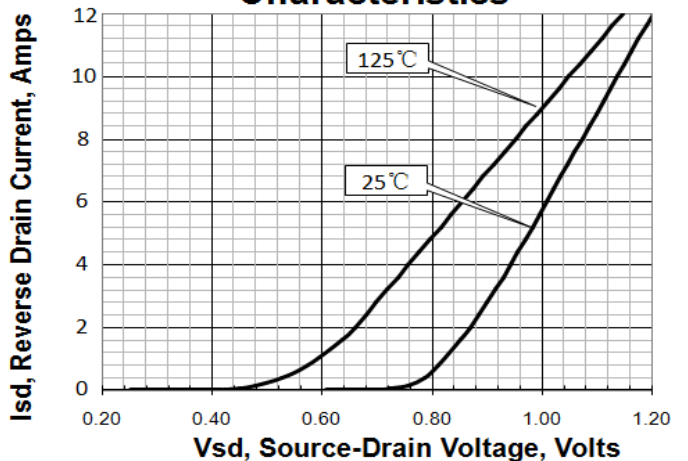


Figure 16. Body Diode Transfer Characteristics



Test Circuits and Waveforms

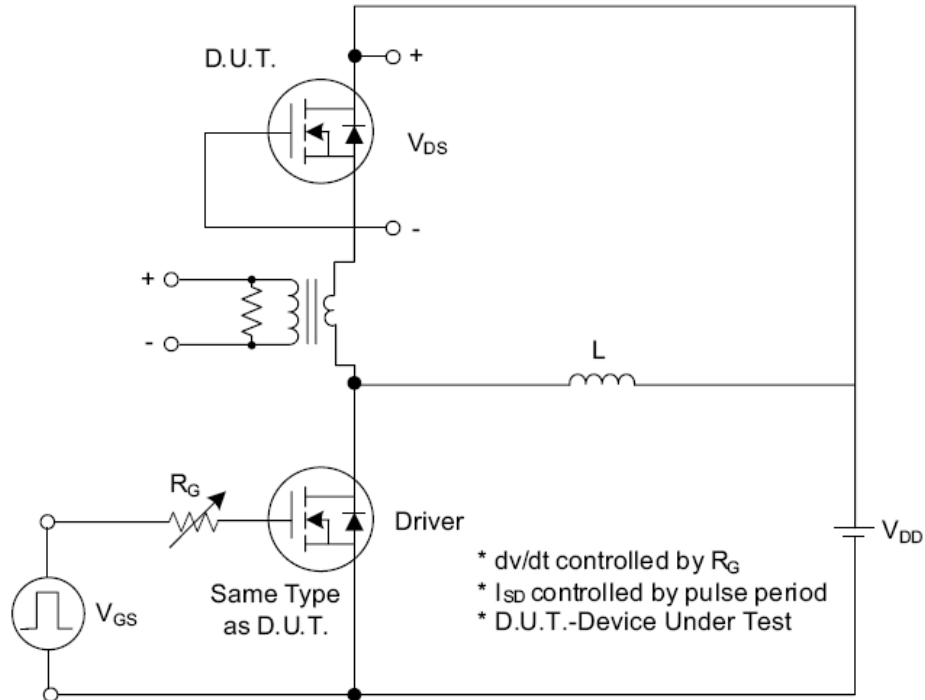


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

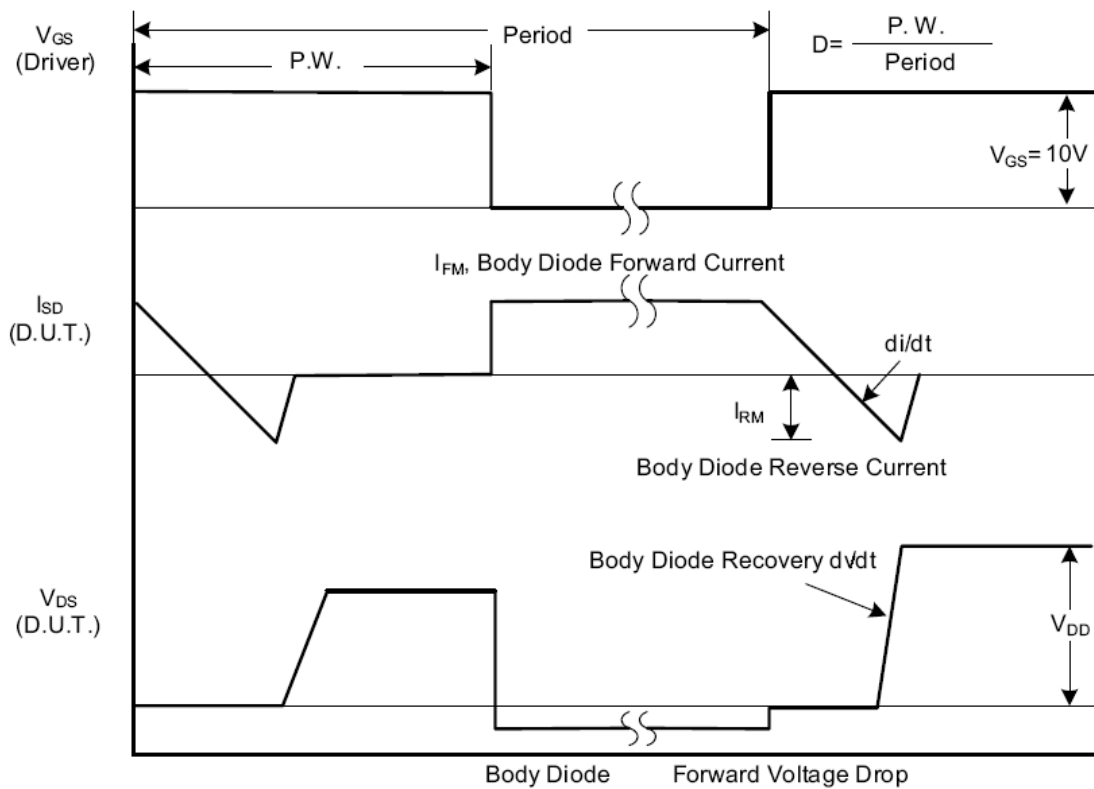


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

Test Circuits and Waveforms

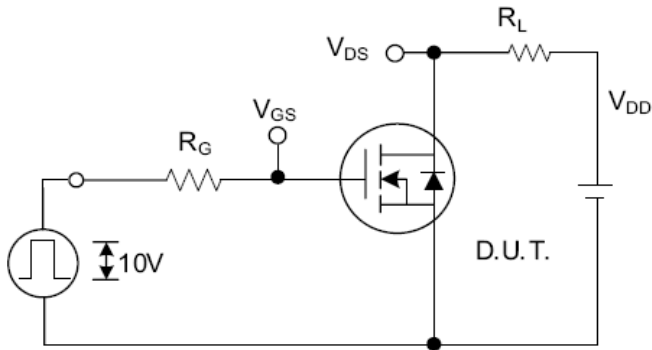


Fig. 2.1 Switching Test Circuit

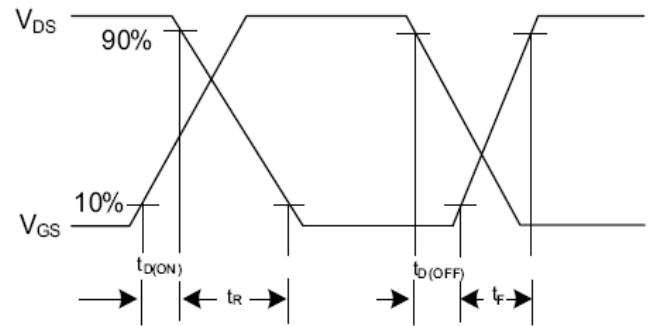


Fig. 2.2 Switching Waveforms

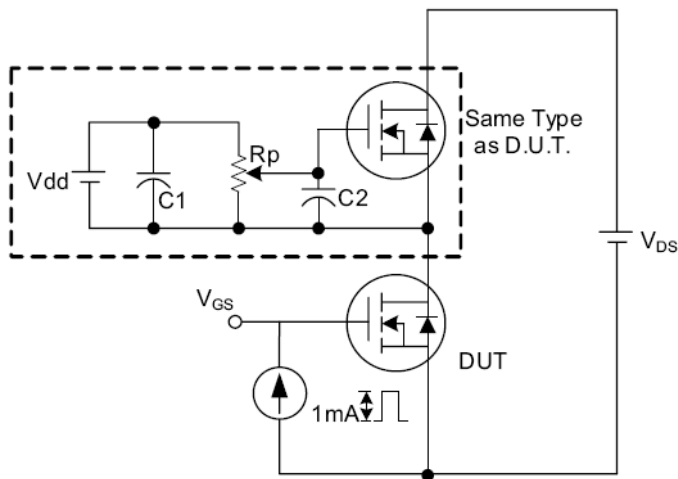


Fig. 3.1 Gate Charge Test Circuit

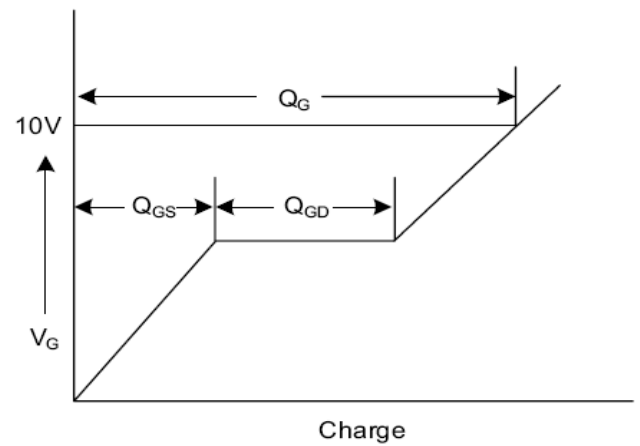


Fig. 3.2 Gate Charge Waveform

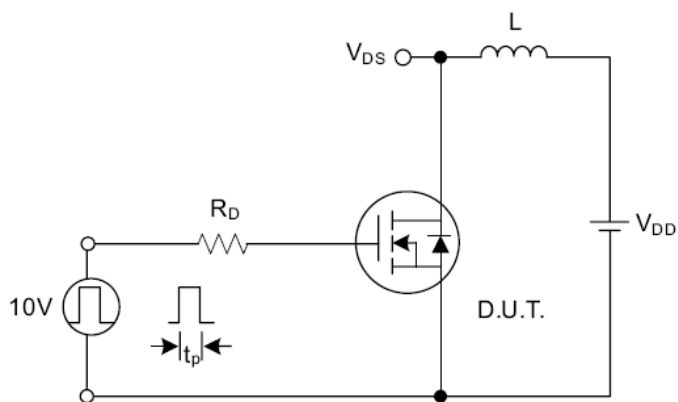


Fig. 4.1 Unclamped Inductive Switching Test Circuit

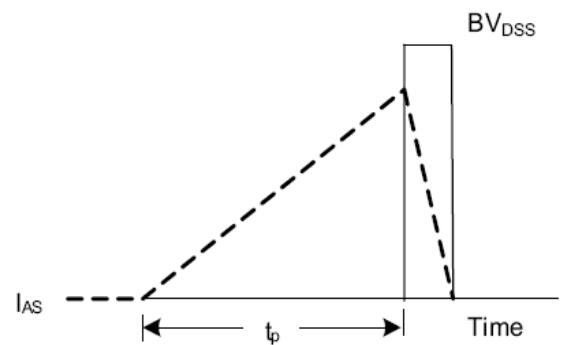
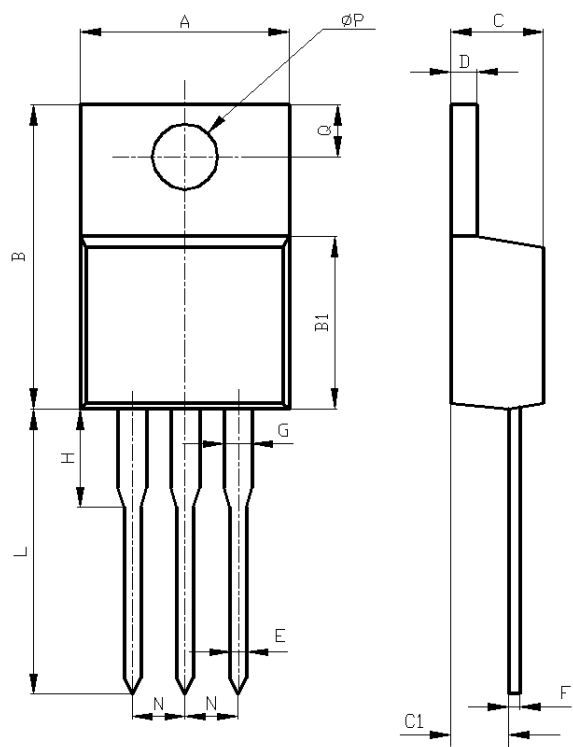


Fig. 4.2 Unclamped Inductive Switching Waveforms

PACKAGE OUTLINE

TO-220

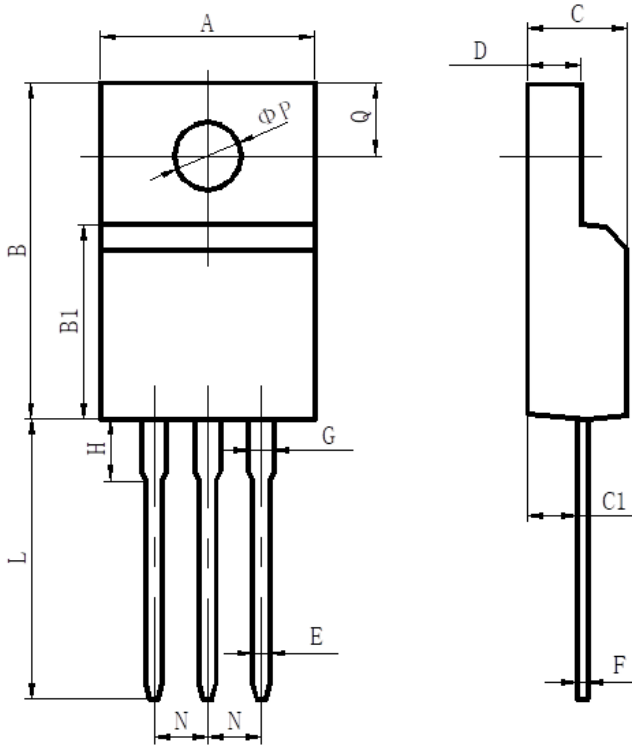


: mm

	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
ϕP	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
ϕP	3.00	3.30

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