



SK10N65E

650V N-Channel MOSFET

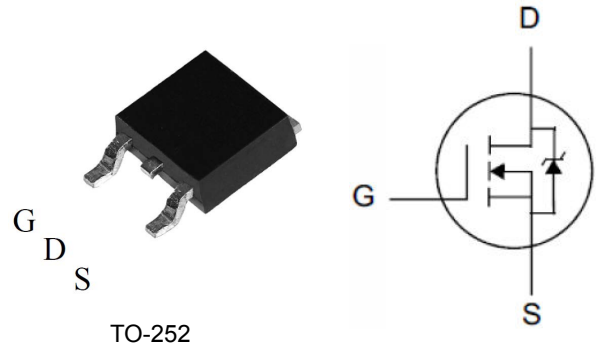
BV_{DSS}	$R_{DS(ON),typ.}$	I_D
650V	0.85Ω	9A

General Features

- Proprietary New Planar Technology
- $R_{DS(ON),typ.}=0.85\ \Omega@V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

Applications

- Adaptor
- TV Main Power
- SMPS Power Supply
- LCD Panel Power



TO-252

Package No to Scale

Absolute Maximum Ratings

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

Symbol	Parameter	SK10N65E	Unit
V_{DSS}	Drain-to-Source Voltage ^[1]	650	V
V_{GSS}	Gate-to-Source Voltage	±30	
I_D	Continuous Drain Current	9	A
$I_D@T_C=100^{\circ}C$	Continuous Drain Current @ $T_C=100^{\circ}C$	Figure 3	
I_{DM}	Pulsed Drain Current at $V_{GS}=10V$ ^[2]	Figure 6	
E_{AS}	Single Pulse Avalanche Energy	450	mJ
dv/dt	Peak Diode Recovery dv/dt ^[3]	5.0	V/ns
P_D	Power Dissipation	120	W
	Derating Factor above $25^{\circ}C$	0.96	W/ $^{\circ}C$
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	$^{\circ}C$
$T_J&T_{STG}$	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	SK10N65E	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.04	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	75	



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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	650	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=650V, V_{GS}=0V$
		--	--	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.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance ^[4]	--	0.85	1.3	Ω	$V_{GS}=10V, I_D=4.5A$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
gfs	Forward Transconductance ^[4]	--	10	--	S	$V_{DS}=20V, I_D=9A$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	1600	--	pF	$V_{GS}=0V, V_{DS}=25V, f=1.0\text{MHz}$
C_{rss}	Reverse Transfer Capacitance	--	14	--		
C_{oss}	Output Capacitance	--	120	--		
Q_g	Total Gate Charge	--	30	--	nC	$V_{DD}=325V, I_D=9A, V_{GS}=0 \text{ to } 10V$
Q_{gs}	Gate-to-Source Charge	--	8.0	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	10	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	12	--	nS	$V_{DD}=325V, I_D=9A, V_{GS}=10V, R_G=4.7\Omega$
t_{rise}	Rise Time	--	15	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	40	--		
t_{fall}	Fall Time	--	17	--		



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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]	--	--	9	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current ^[4]	--	--	36		
V_{SD}	Diode Forward Voltage	--	--	1.5	V	$I_S=9\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse recovery time	--	460	--	ns	$V_{GS}=0\text{V}$, $I_F=9\text{A}$, $di_F/dt=100\text{A}/\mu\text{s}$
Q_{rr}	Reverse recovery charge	--	1.5	--	uC	

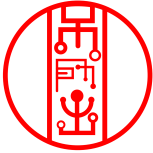
Note:

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

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

[3] $I_{SD}=9\text{A}$, $di/dt < 100\text{A}/\mu\text{s}$, $V_{DD} < BV_{DSS}$, $T_J=+150^{\circ}\text{C}$.

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



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Typical Characteristics

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

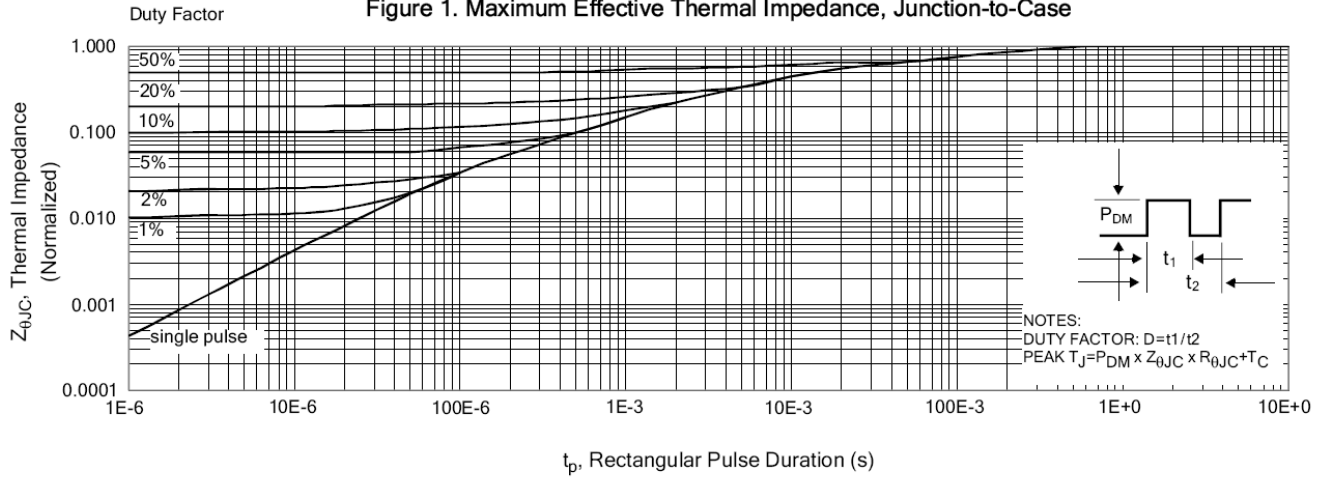


Figure 2. Maximum Power Dissipation vs Case Temperature

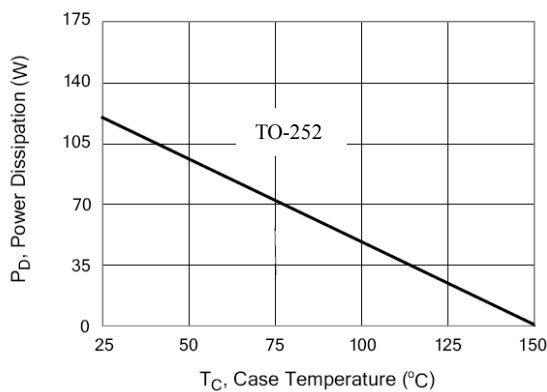


Figure 3. Maximum Continuous Drain Current vs Tc

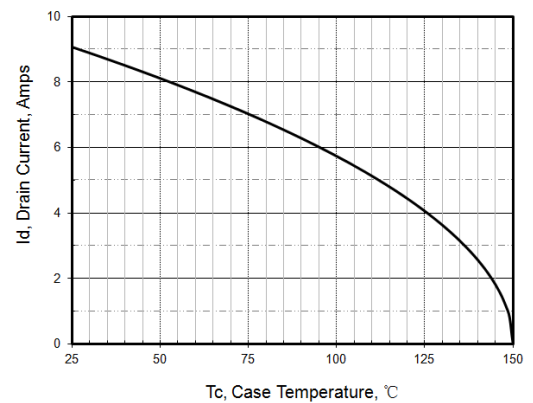


Figure 4. Typical Output Characteristics

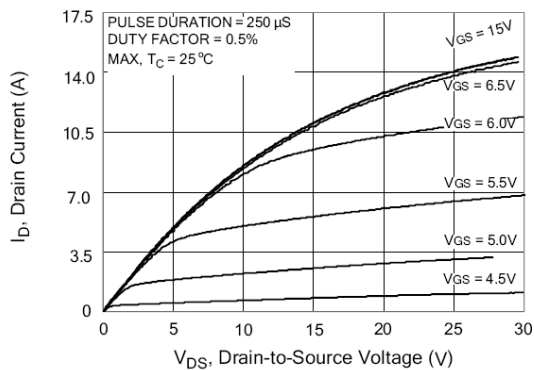
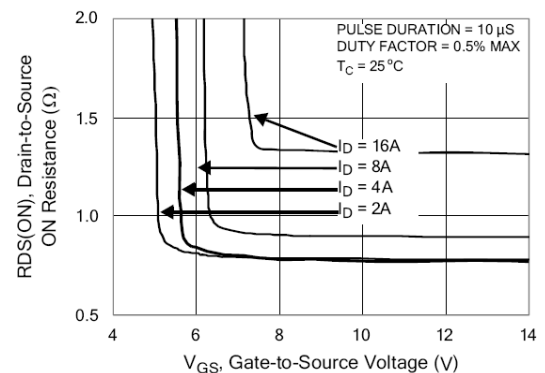
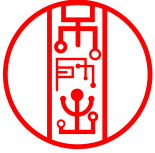


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current





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Typical Characteristics(Cont.)

Figure 6. Peak Current Capability

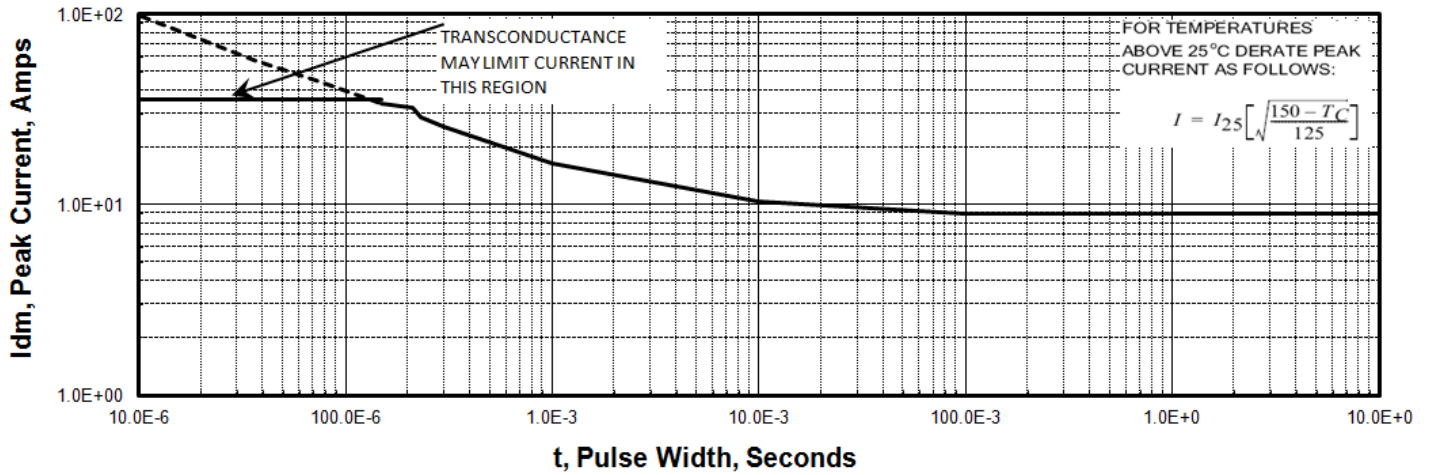


Figure 7. Typical Transfer Characteristics

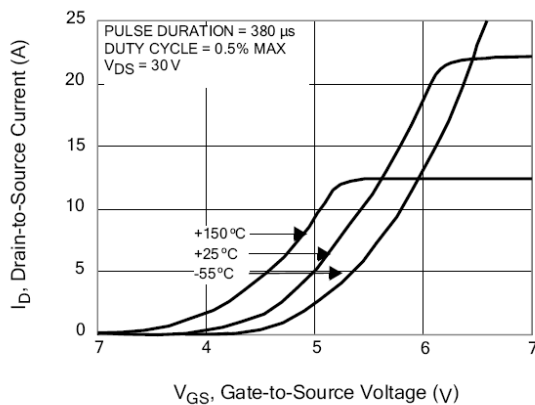


Figure 8. Unclamped Inductive Switching Capability

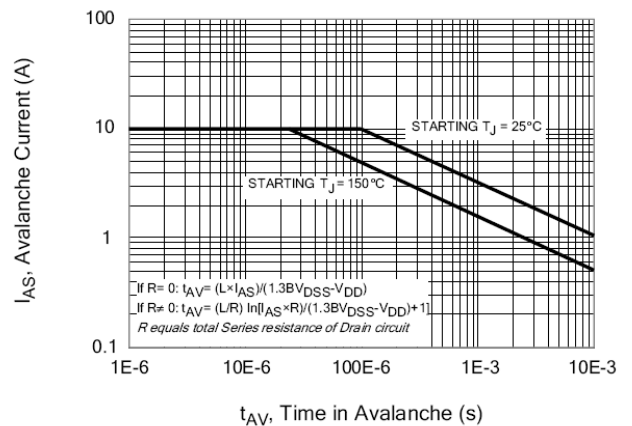


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

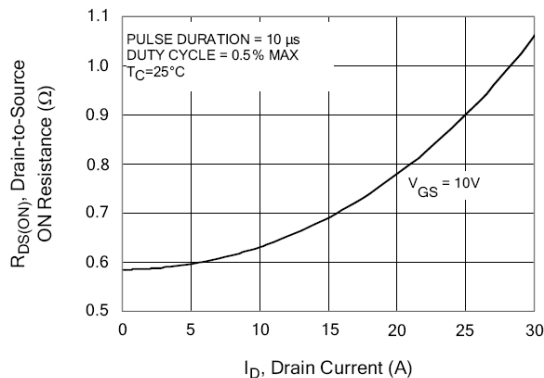


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature

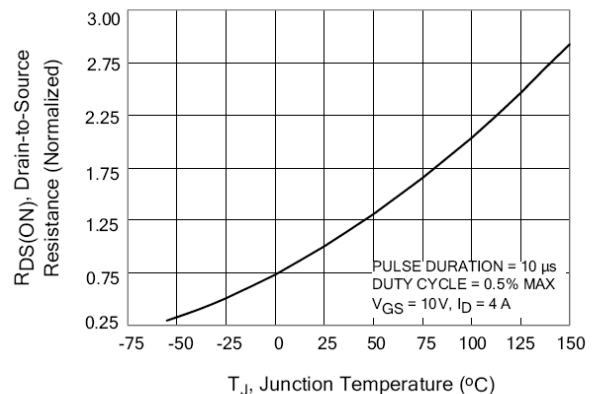
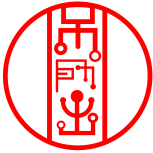




Figure 16. Typical Body Diode Transfer Characteristics

The graph plots the reverse drain current I_{SD} (A) on the y-axis against the source-to-drain voltage V_{SD} (V) on the x-axis. The y-axis ranges from 0 to 20 A with major grid lines every 5 A. The x-axis ranges from 0.2 to 1.2 V with major grid lines every 0.2 V. Two curves are shown for $V_{GS} = 0V$: one for $+150^{\circ}C$ and one for $+25^{\circ}C$. The $+150^{\circ}C$ curve is shifted to the left of the $+25^{\circ}C$ curve, indicating higher current for the same voltage at the higher temperature.

V_{SD} (V)	I_{SD} (A) at $+150^{\circ}C$	I_{SD} (A) at $+25^{\circ}C$
0.4	0.2	0.1
0.6	1.0	0.5
0.8	4.0	2.0
0.9	6.0	4.0
1.0	10.0	8.0
1.1	15.0	12.0
1.2	20.0	16.0



Test Circuits and Waveforms

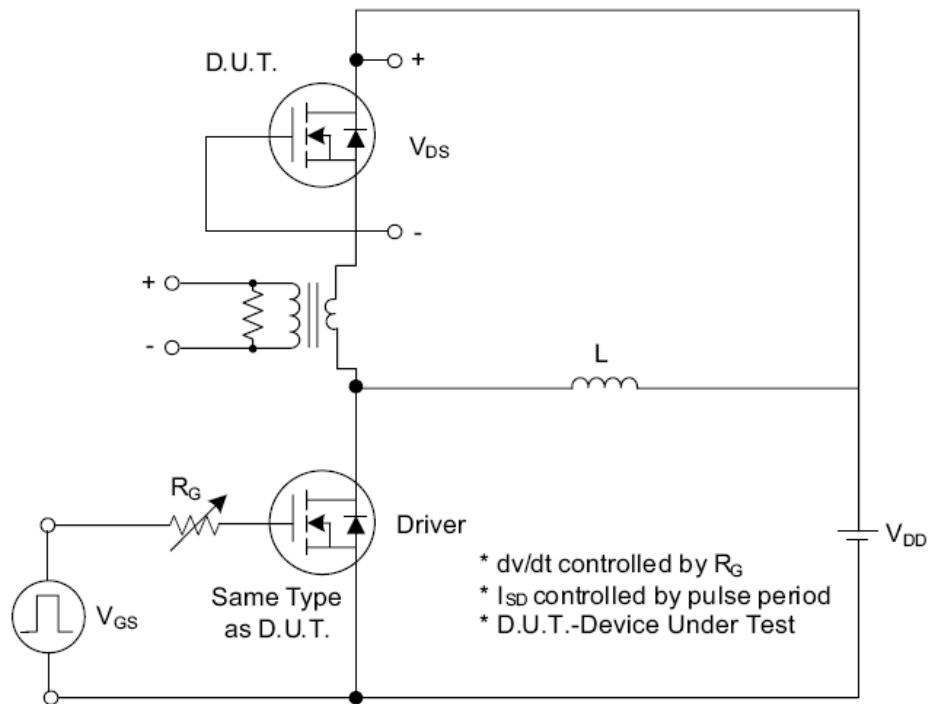


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

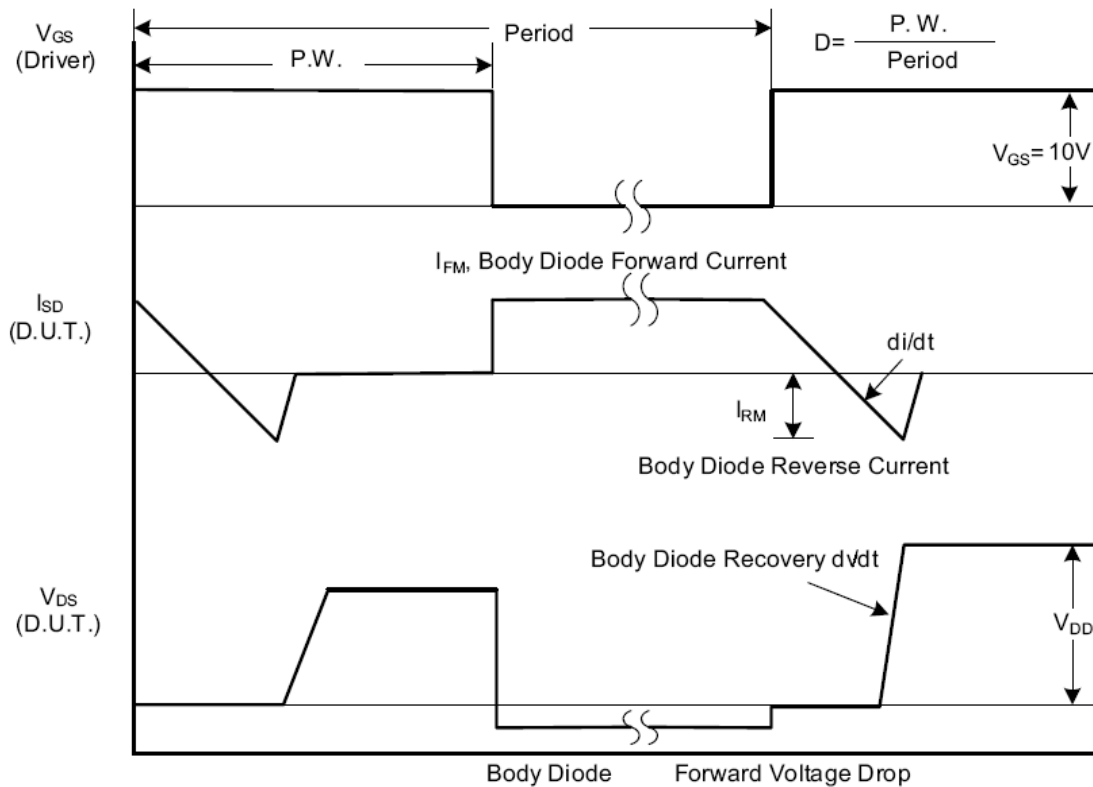


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms



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Test Circuits and Waveforms (Cont.)

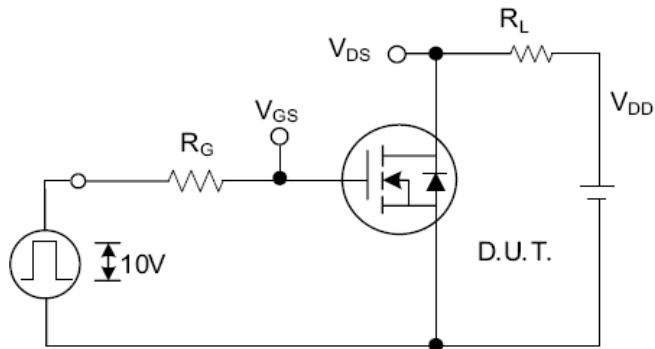


Fig. 2.1 Switching Test Circuit

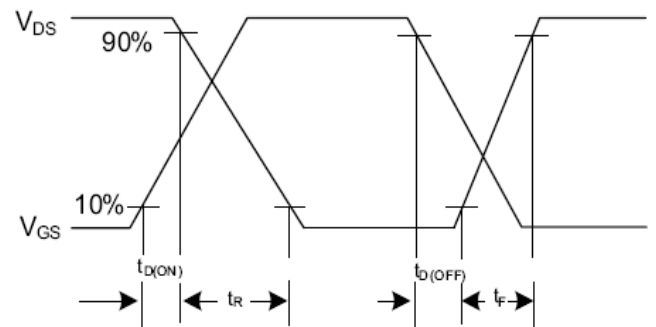


Fig. 2.2 Switching Waveforms

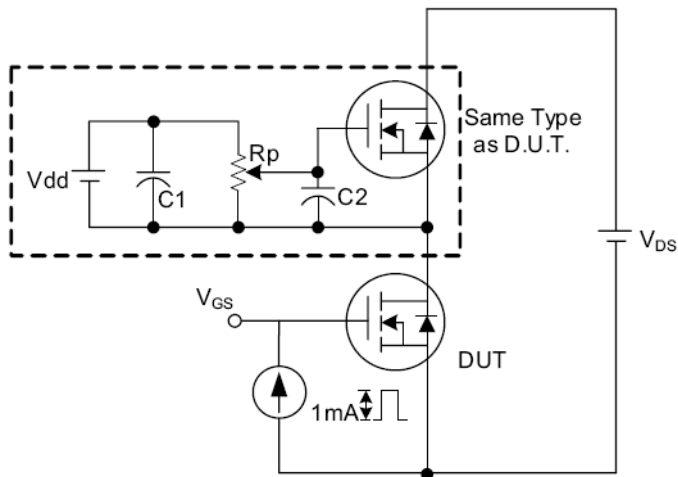


Fig. 3.1 Gate Charge Test Circuit

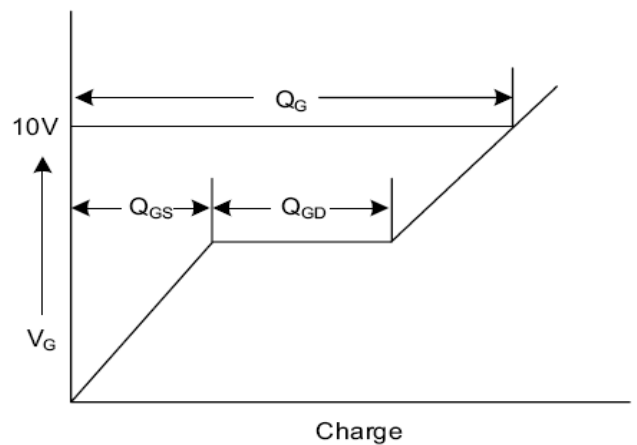


Fig. 3.2 Gate Charge Waveform

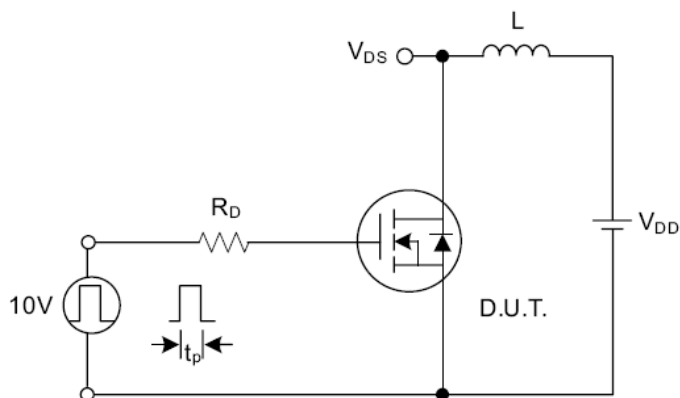


Fig. 4.1 Unclamped Inductive Switching Test Circuit

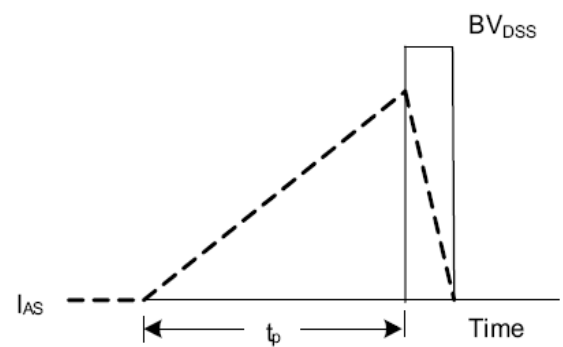
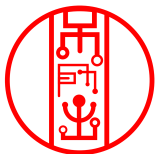


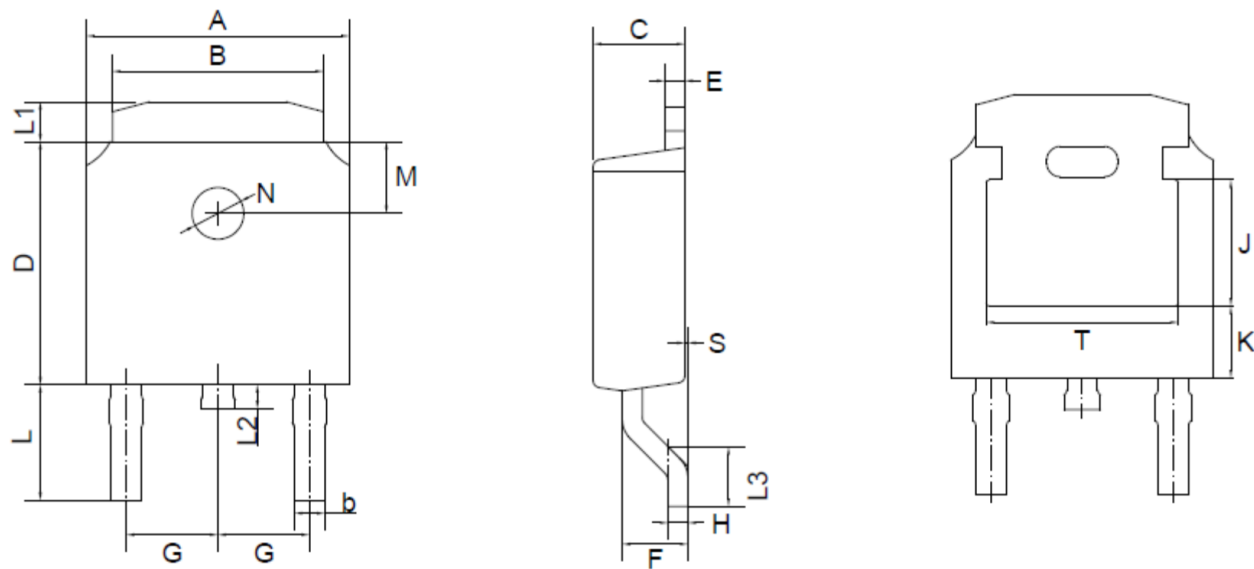
Fig. 4.2 Unclamped Inductive Switching Waveforms



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PACKAGE OUTLINE

TO-252(D-PAK)



TO-252(D-PAK) mechanical data

UNIT		A	B	b	C	D	E	F	G	H	L	L1	L2	L3	S	M	N	J	K	T
mm	max	6.7	5.5	0.8	2.5	6.3	0.6	1.8	2.29 TYPICAL	0.55	3.1	1.2	1.0	1.75	0.1	1.8 TYPICAL	1.3 TYPICAL	3.16 ref.	1.80 ref.	4.83 ref.
	min	6.3	5.1	0.3	2.1	5.9	0.4	1.3		0.45	2.7	0.8	0.6	1.40	0.0					
mil	max	264	217	31	98	248	24	71	90 TYPICAL	22	122	47	39	69	4	71 TYPICAL	51 TYPICAL	124 ref.	71 ref.	190 ref.
	min	248	201	12	83	232	16	51		18	106	31	24	55	0					