

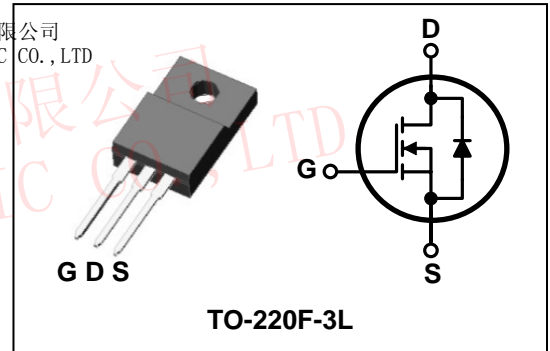
SWITCHING REGULATOR APPLICATIONS

Features

- High Voltage: $BV_{DSS}=400V(\text{Min.})$
- Low C_{RSS} : $C_{RSS}=12pF(\text{Typ.})$
- Low gate charge : $Q_g=28nc(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.53\Omega(\text{Max.})$

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PIN Connection



Type No.	Marking	Package Code
SMK1040F	SMK1040	TO-220F-3L

Absolute maximum ratings

(Tc=25°C)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	400	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current (DC)	I_D	(Tc=25°C)	10
		(Tc=100°C)	5.5
Drain current (Pulsed) *	I_{DM}	40	A
Drain power dissipation	P_D	40	W
Avalanche current (Single) ②	I_{AS}	10	A
Single pulsed avalanche energy ②	E_{AS}	360	mJ
Avalanche current (Repetitive) ①	I_{AR}	10	A
Repetitive avalanche energy ①	E_{AR}	8.5	mJ
Junction temperature	T_J	150	°C
Storage temperature range	T_{stg}	-55~150	

* Limited by maximum junction temperature

Characteristic	Symbol	Typ.	Max	Unit
Thermal resistance	Junction-case	-	3.12	°C/W
	Junction-ambient	-	62.5	

Electrical Characteristics

(Tc=25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0$	400	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	2.0	-	4.0	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=400V, V_{GS}=0V$	-	-	1	μA
Gate leakage current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 30V$	-	-	± 100	nA
Drain-source on-resistance ④	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.0A$	-	0.46	0.53	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=10V, I_D=5.0A$	-	6.2	-	S
Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V$ $f=1MHz$	-	950	1430	pF
Output capacitance	C_{oss}		-	120	180	
Reverse transfer capacitance	C_{rss}		-	12	18	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=200V, I_D=10A$ $R_G=25\Omega$	-	14	-	ns
Rise time	t_r		-	89	-	
Turn-off delay time	$t_{d(off)}$ ③④		-	81	-	
Fall time	t_f		-	81	-	
Total gate charge	Q_g	$V_{DS}=200V, V_{GS}=10V$ $I_D=10A$	-	28	42	nC
Gate-source charge	Q_{gs} ③④		-	4	6	
Gate-drain charge	Q_{gd}		-	15	23	

Source-Drain Diode Ratings and Characteristics

(Tc=25°C)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Source current (DC)	I_S	Integral reverse diode in the MOSFET	-	-	10	A
Source current (Pulsed) ①	I_{SM}		-	-	40	
Forward voltage ④	V_{SD}	$V_{GS}=0V, I_S=10A$	-	-	1.4	V
Reverse recovery time	t_{rr}	$I_S=10A, V_{GS}=0,$ $di_S/dt=100A/\mu s$	-	290	-	ns
Reverse recovery charge	Q_{rr}		-	5.04	-	μC

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② $L=6.6mH, I_{AS}=10A, V_{DD}=50V, R_G=27\Omega$
- ③ Pulse Test : Pulse Width < 300us, Duty cycle ≤ 2%
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

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Fig. 1 $I_D - V_{DS}$

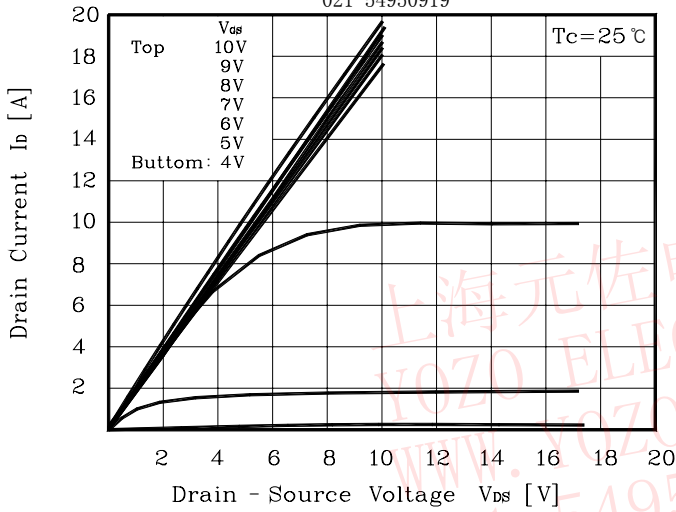


Fig. 2 $I_D - V_{GS}$

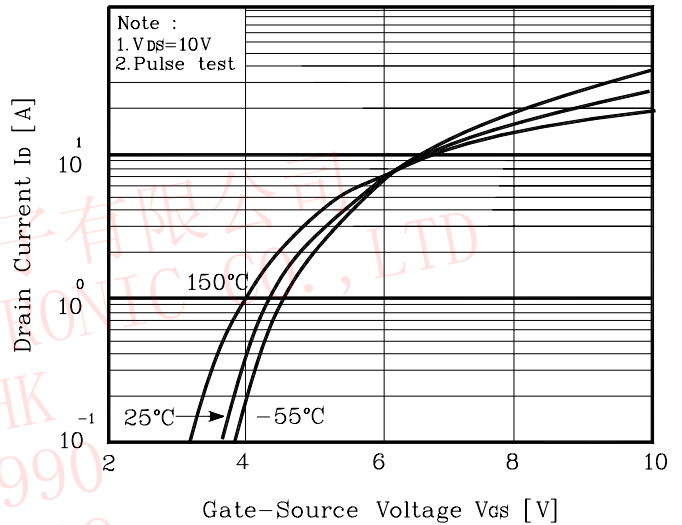


Fig. 3 $R_{DS(on)} - I_D$

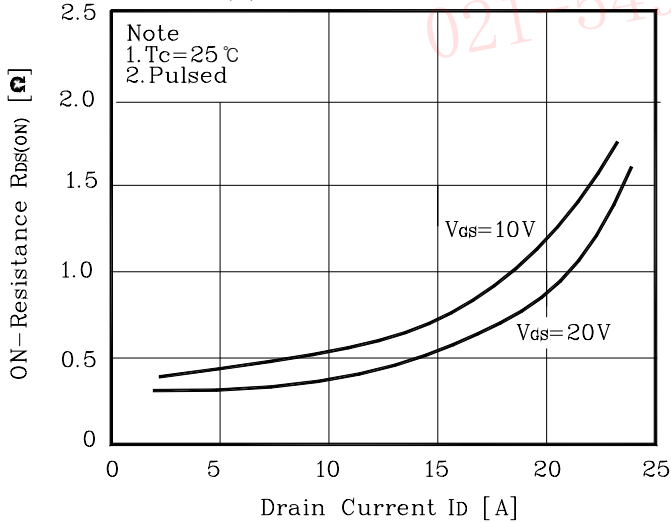


Fig. 4 $I_S - V_{SD}$

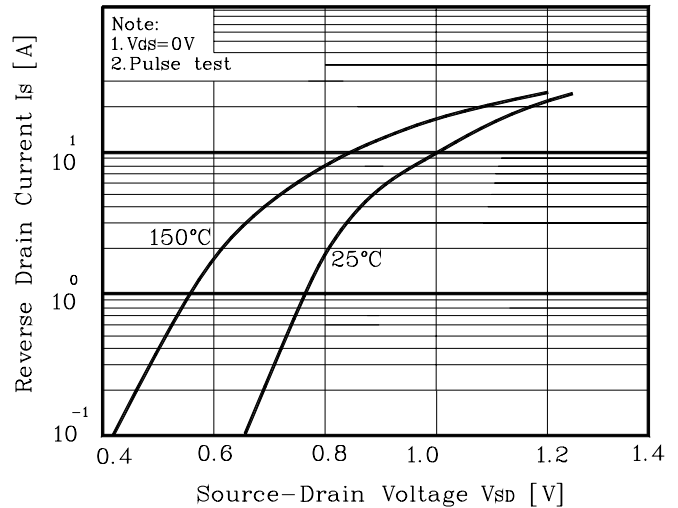


Fig. 5 Capacitance - V_{DS}

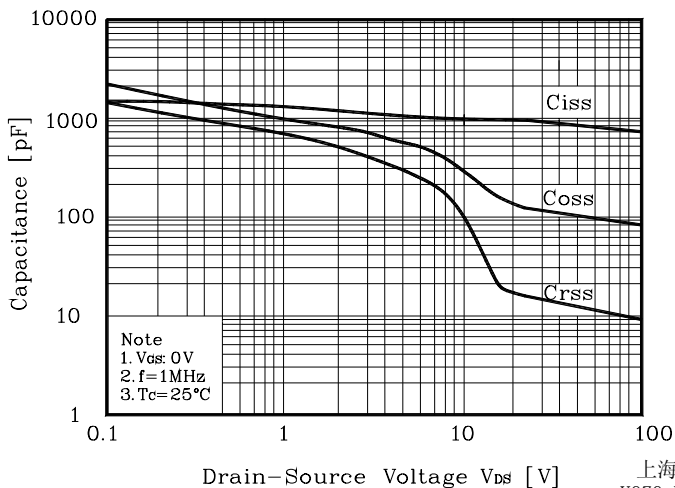
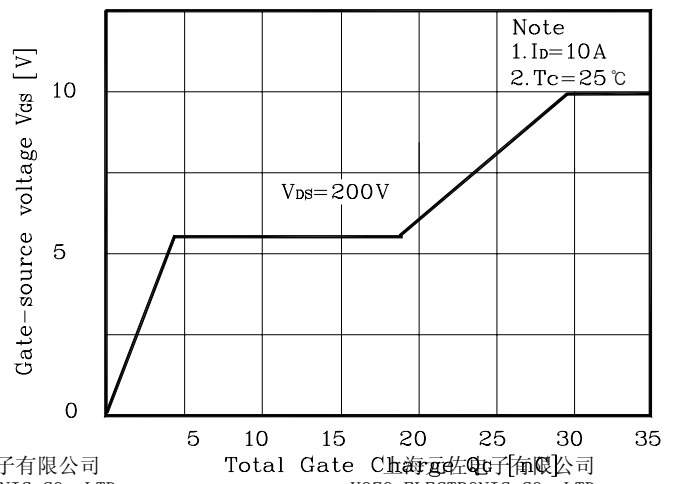


Fig. 6 $V_{GS} - Q_G$



STK1040F

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Fig. 7 $V_{DSS} - T_J$

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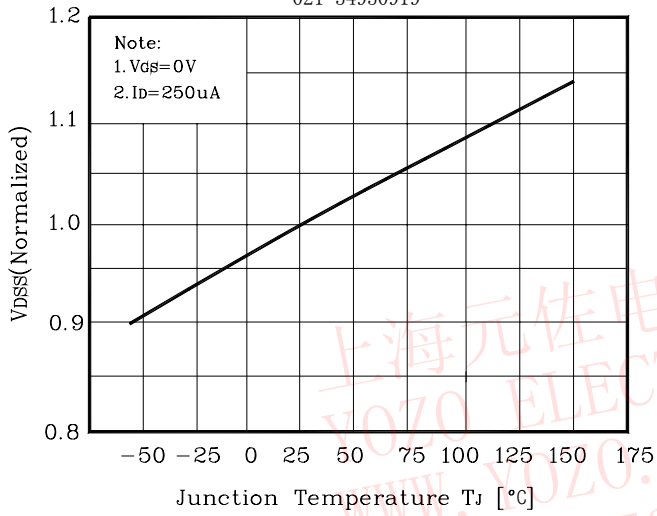


Fig. 8 $R_{DS(on)} - T_J$

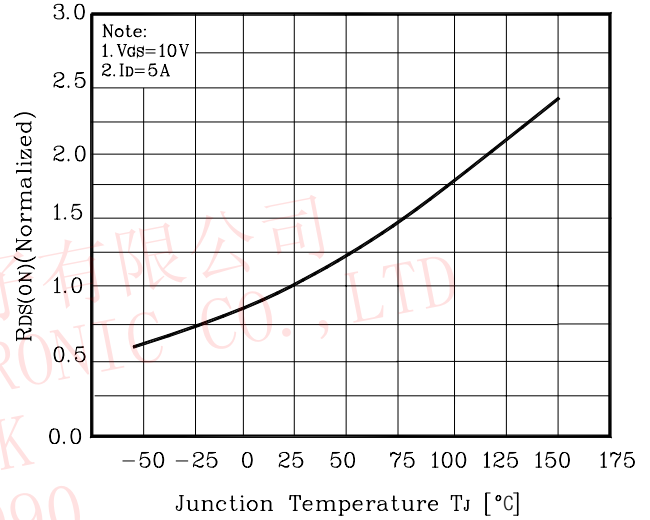


Fig. 9 $I_D - T_C$

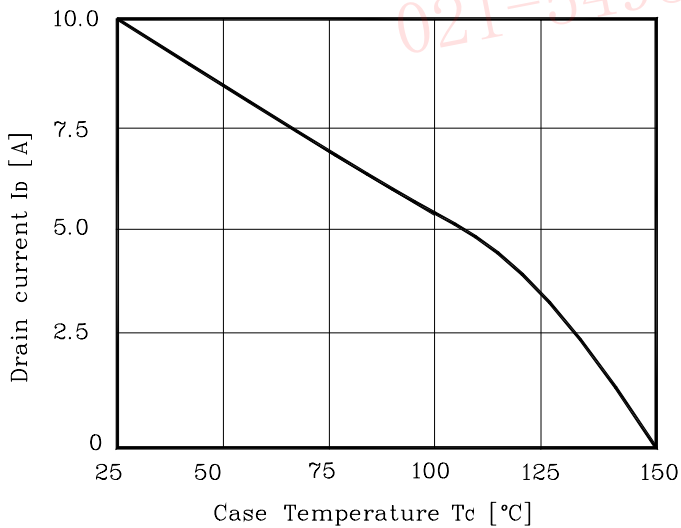


Fig. 10 Safe Operating Area

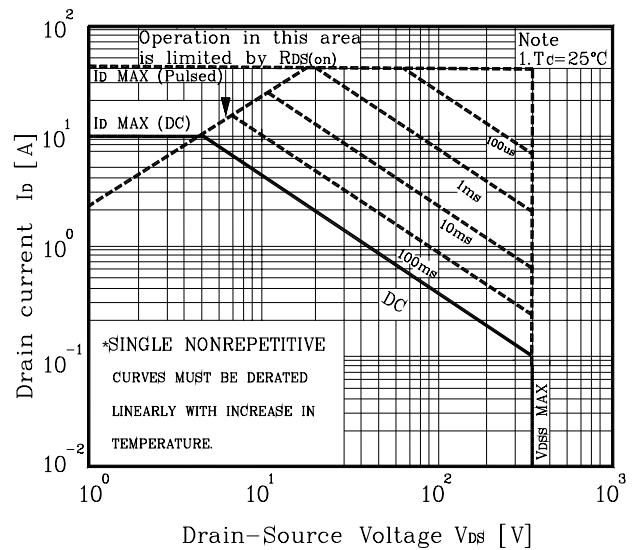


Fig. 11 Gate Charge Test Circuit & Waveform

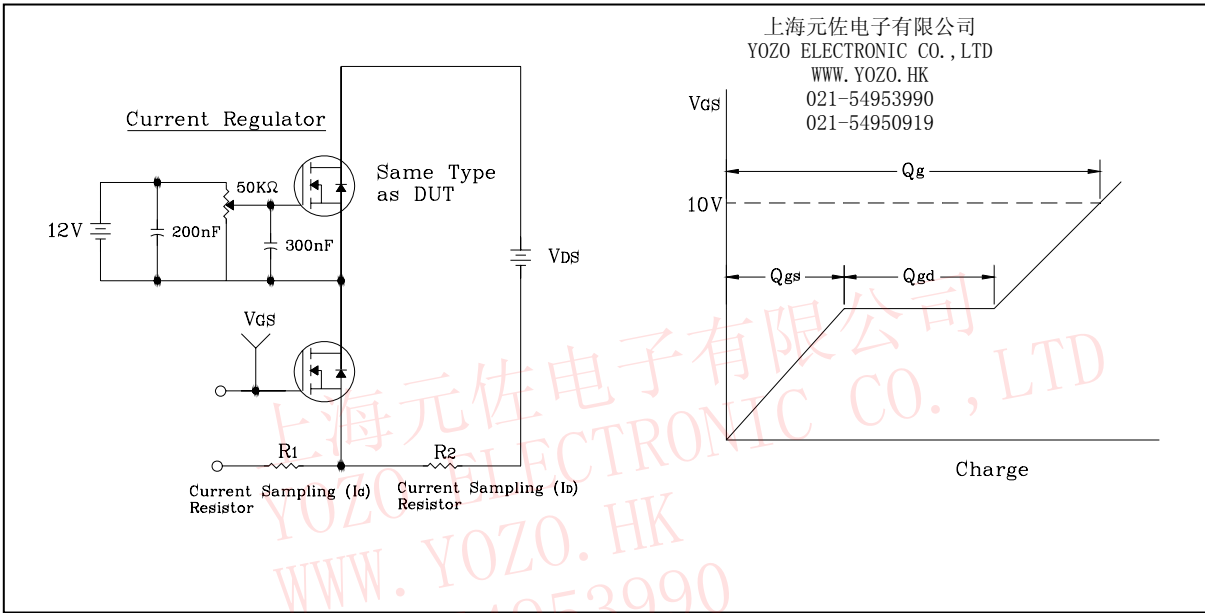


Fig. 12 Resistive Switching Test Circuit & Waveform

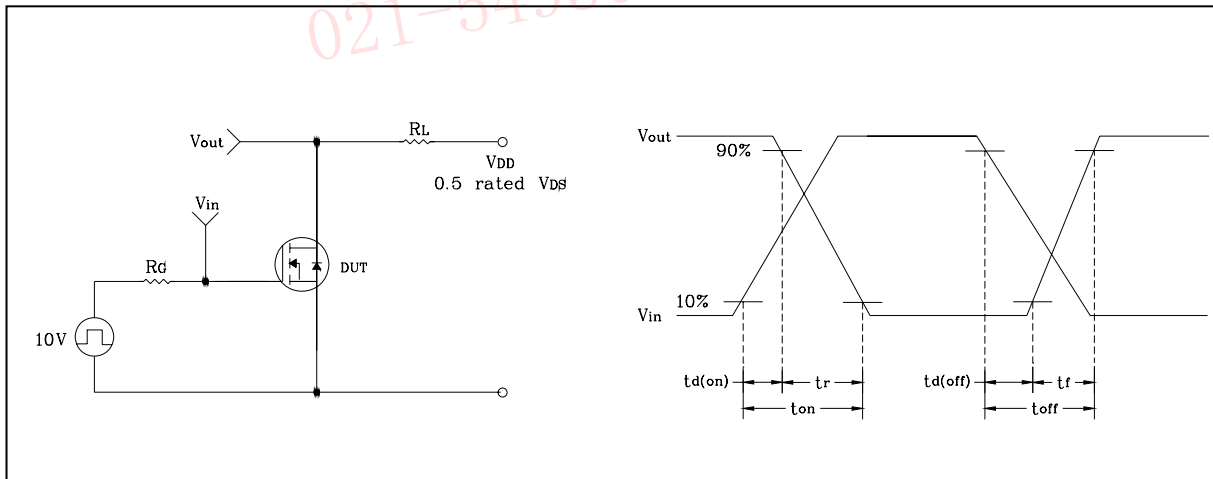


Fig. 13 EAS Test Circuit & Waveform

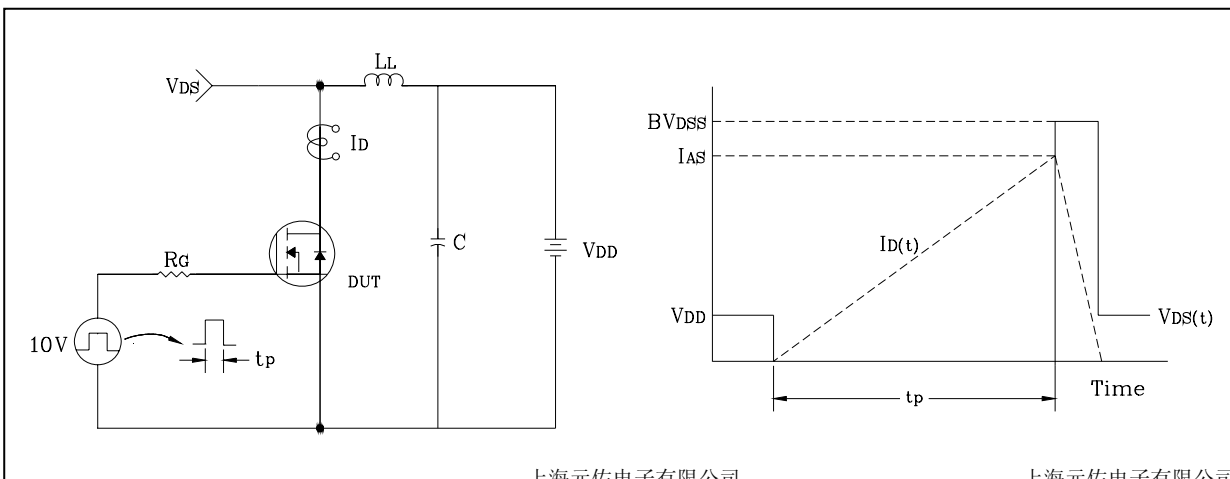
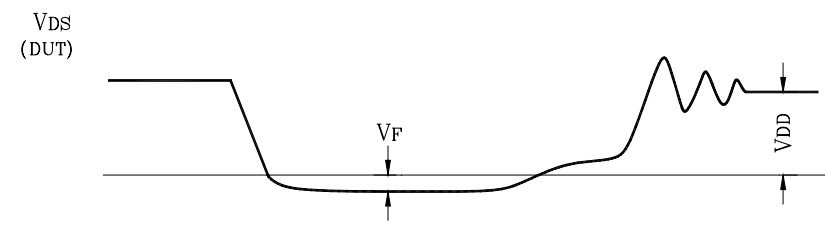
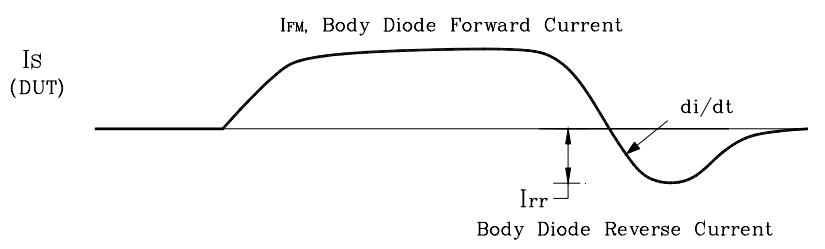
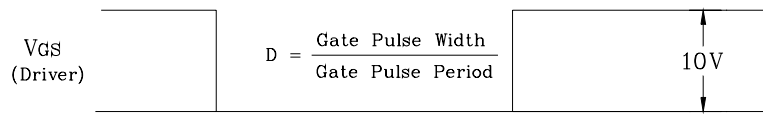
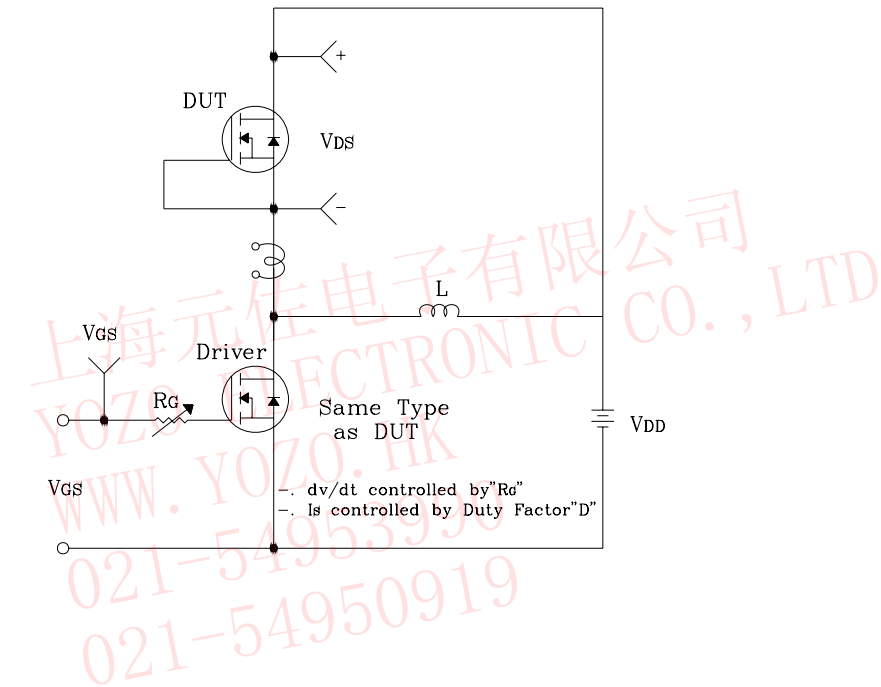
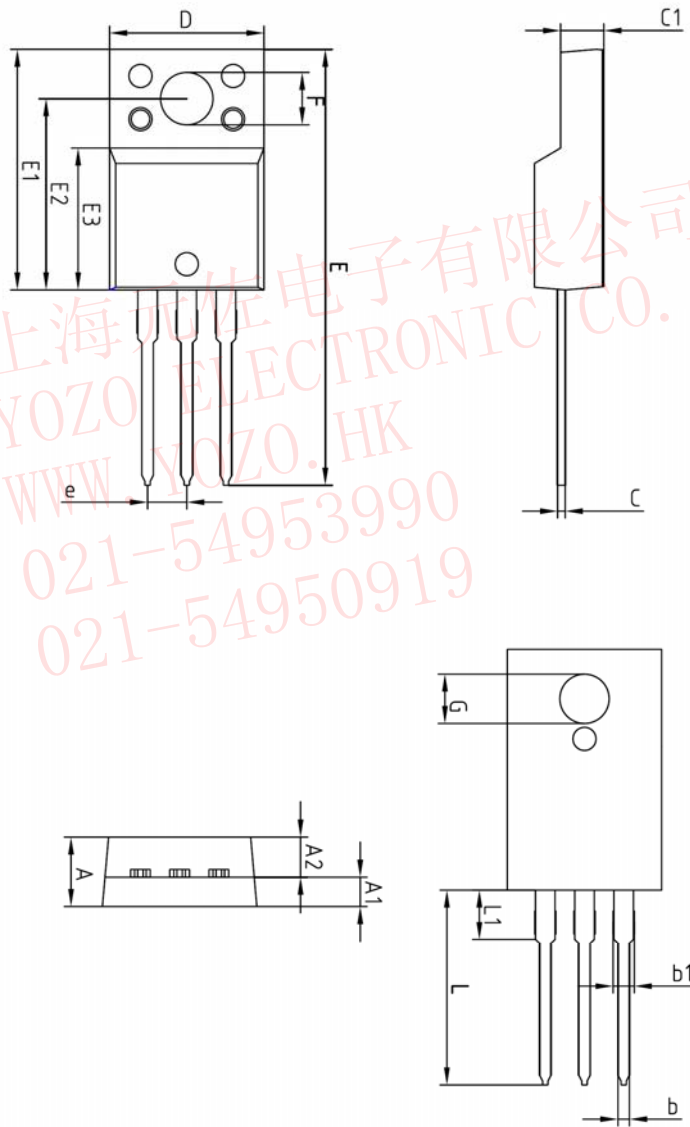


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension

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SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	-	-	4.60	
A1	2.45	2.50	2.55	
A2	1.95	2.00	2.05	
b	0.65	0.75	0.85	
b1	1.07	1.27	1.47	
C	0.40	0.50	0.60	
C1	2.70	2.80	2.90	
D	9.90	10.00	10.10	
E	28.00	-	28.60	
E1	15.50	15.60	15.70	
E2	12.30	12.40	12.50	
E3	9.15	9.20	9.25	
F	3.30	3.40	3.50	
G	3.10	3.20	3.30	
e	2.54 BSC			
L	12.40	-	13.00	
L1	3.46 BSC			