



上海元佐电子
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SMK1060F

Advanced N-Ch Power MOSFET

SWITCHING REGULATOR APPLICATIONS

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Features

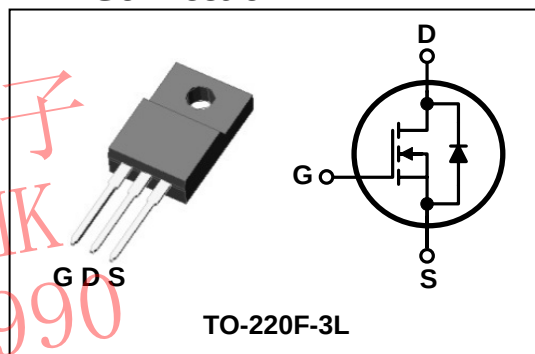
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- High Voltage: $BV_{DSS}=600V(\text{Min.})$
- Low C_{RSS} : $C_{RSS}=18pF(\text{Typ.})$
- Low gate charge : $Q_g=35nc(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.75\Omega(\text{Max.})$

Ordering Information

Type No.	Marking	Package Code
SMK1060F	SMK1060	TO-220F-3L

PIN Connection



Absolute maximum ratings ($T_C=25^{\circ}C$ unless otherwise noted)

Characteristic	Symbol		Rating	Unit
Drain-source voltage	V _{DSS}		600	V
Gate-source voltage	V _{GSS}		±30	V
Drain current (DC)*	I _D	(T _C =25℃)	10	A
		(T _C =100℃)	5.8	A
Drain current (Pulsed)*	I _{DM}		38	A
Drain power dissipation	P _D		40	W
Avalanche current (Single) ②	I _{AS}		10	A
Single pulsed avalanche energy ②	E _{AS}		490	mJ
Avalanche current (Repetitive) ①	I _{AR}		10	A
Repetitive avalanche energy ①	E _{AR}		11.6	mJ
Junction temperature	T _J		150	℃
Storage temperature range	T _{stg}		-55~150	

* Limited by maximum junction temperature

Characteristic		Symbol	Typ.	Max	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	-	3.1	$^{\circ}C/W$
	Junction-ambient	$R_{th(J-a)}$	-	62.5	

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Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0$	600	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu\text{A}$, $V_{DS}=V_{GS}$	2.0	-	4.0	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=600\text{V}$, $V_{GS}=0\text{V}$	-	-	1	μA
Gate leakage current	I_{GSS}	$V_{DS}=0\text{V}$, $V_{GS}=\pm 30\text{V}$	-	-	± 100	nA
Drain-source on-resistance ④	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=5.0\text{A}$	-	0.60	0.75	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=10\text{V}$, $I_D=5.0\text{A}$	-	8.0	-	S
Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$ $f=1\text{MHz}$	-	2000	2350	pF
Output capacitance	C_{oss}		-	160	215	
Reverse transfer capacitance	C_{rss}		-	18	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=300\text{V}$, $I_D=10\text{A}$ $R_G=25\Omega$	-	23	-	ns
Rise time	t_r		-	69	-	
Turn-off delay time	$t_{d(off)}$		-	144	-	
Fall time	t_f		-	77	-	
Total gate charge	Q_g	$V_{DS}=480\text{V}$, $V_{GS}=10\text{V}$ $I_D=10\text{A}$	-	35	57	nC
Gate-source charge	Q_{gs}		-	9.0	-	
Gate-drain charge	Q_{gd}		-	10	-	

Source-Drain Diode Ratings and Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

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}	$V_{GS}=0\text{V}$, $I_S=10\text{A}$	-	-	1.4	V
Reverse recovery time	t_{rr}	$I_S=10\text{A}$, $V_{GS}=0$, $di_S/dt=100\text{A}/\mu\text{s}$	-	470	-	ns
Reverse recovery charge	Q_{rr}		-	6	-	μC

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- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② $L=10\text{mH}$, $I_{AS}=9.5\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J = 25^\circ\text{C}$
- ③ Pulse Test : Pulse Width < 300 μs , Duty cycle $\leq 2\%$
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

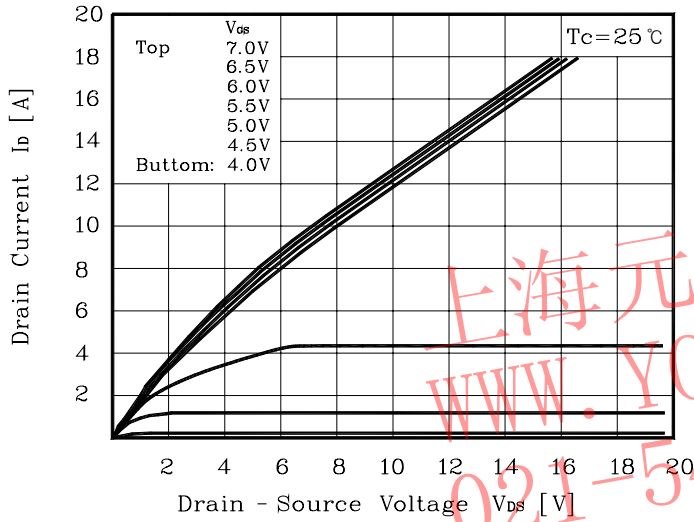


Fig. 2 $I_D - V_{GS}$

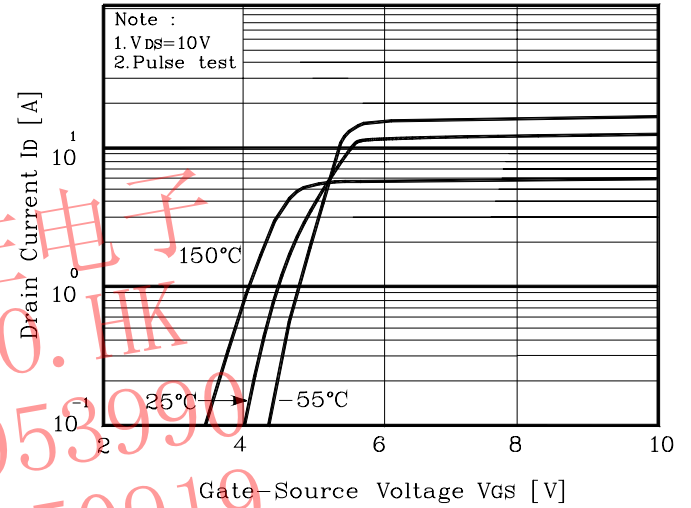


Fig. 3 $R_{DS(on)} - I_D$

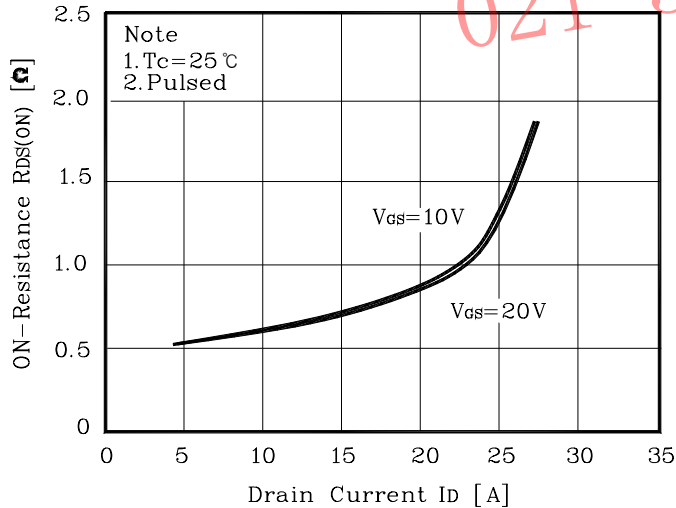


Fig. 4 $I_S - V_{SD}$

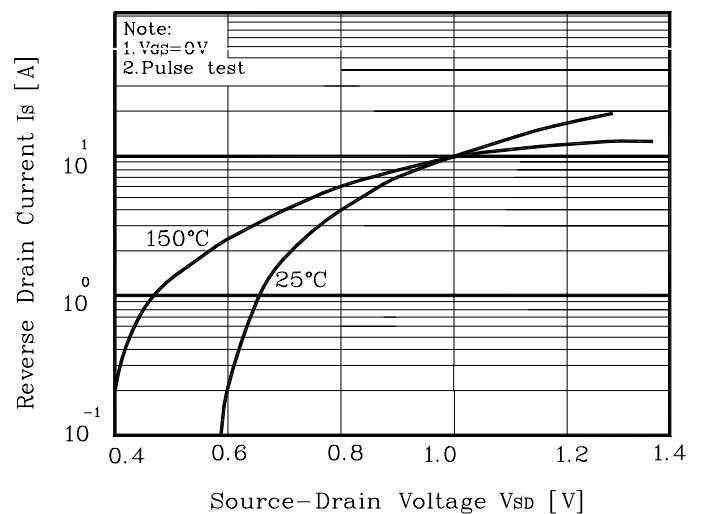


Fig. 5 Capacitance - V_{DS}

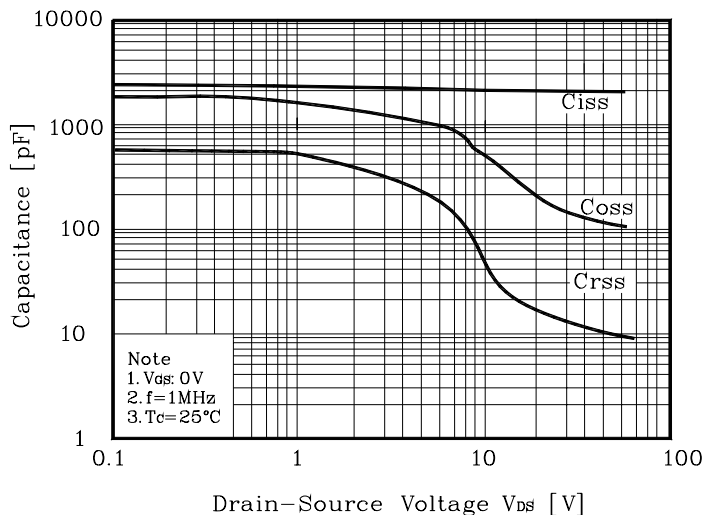
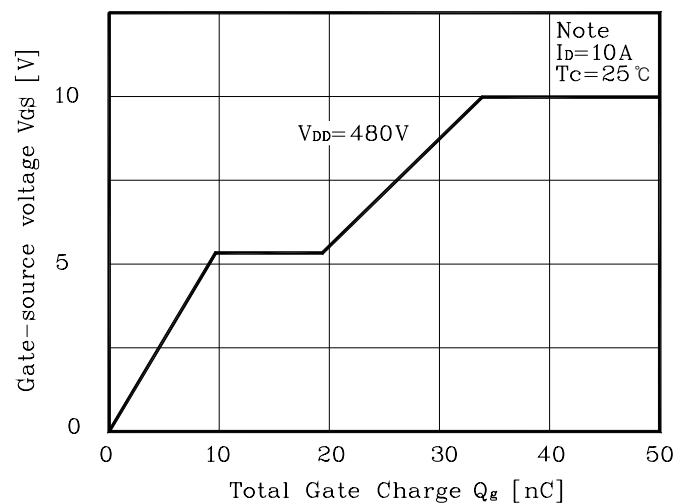


Fig. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DS} - T_J$

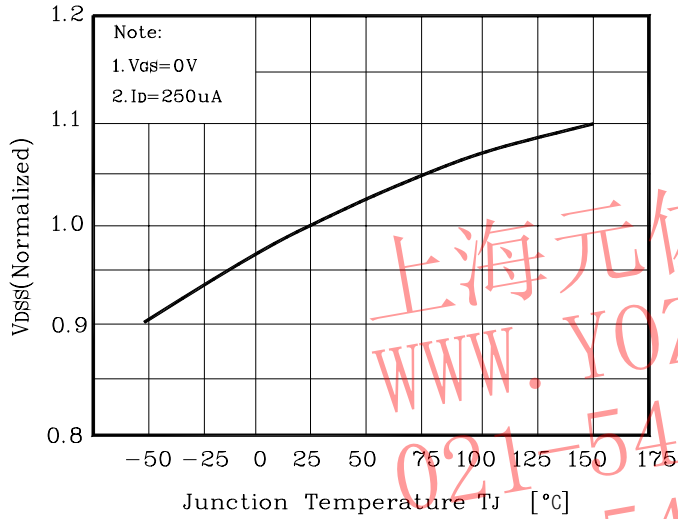


Fig.8 $R_{DS(on)} - T_J$

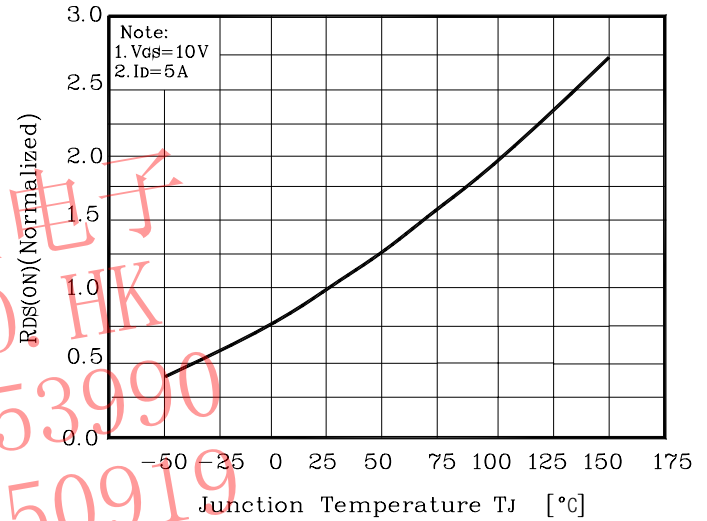


Fig. 9 $I_D - T_C$

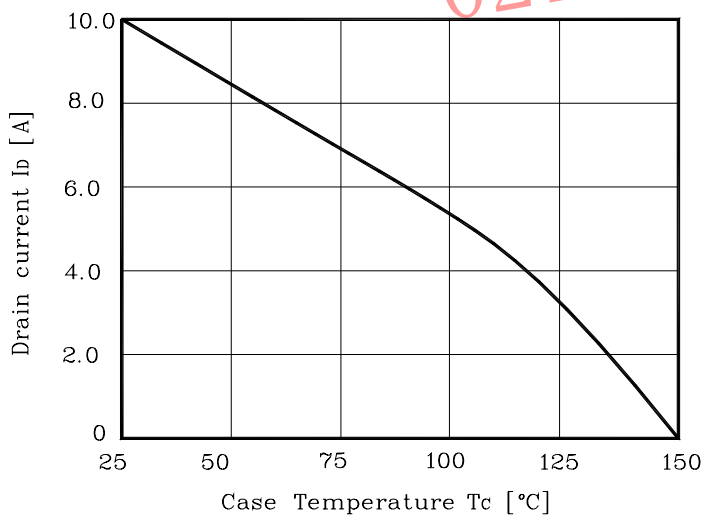


Fig. 10 Safe Operating Area

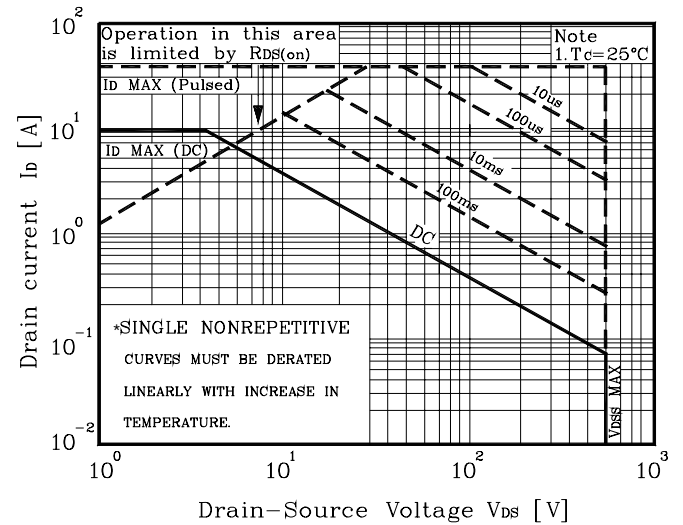


Fig. 10 Gate Charge Test Circuit & Waveform

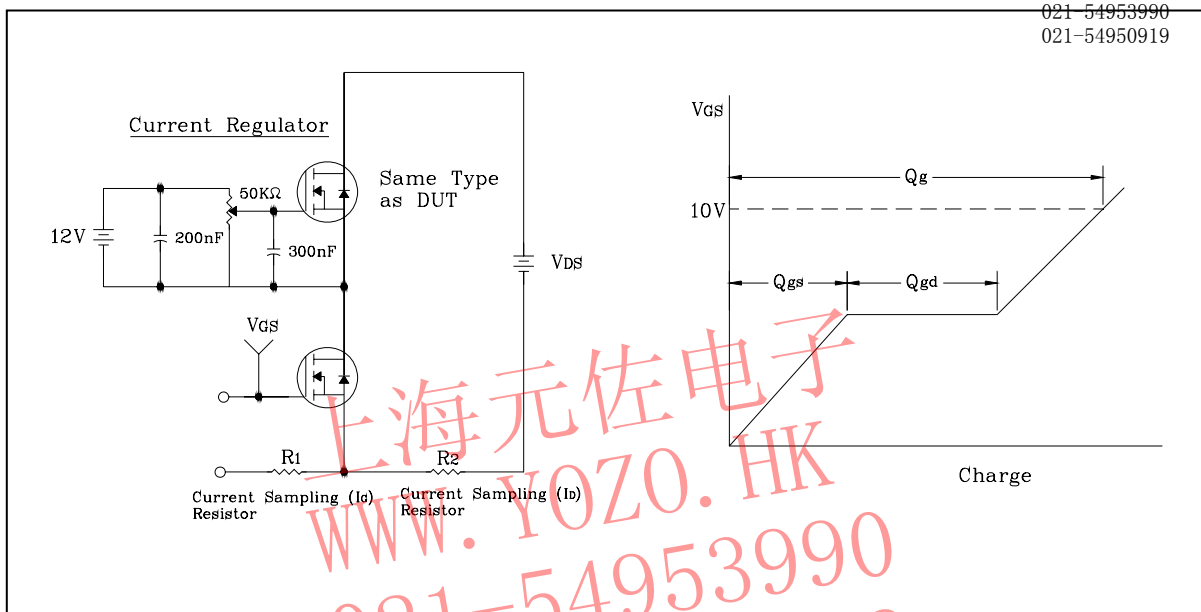


Fig. 11 Resistive Switching Test Circuit & Waveform

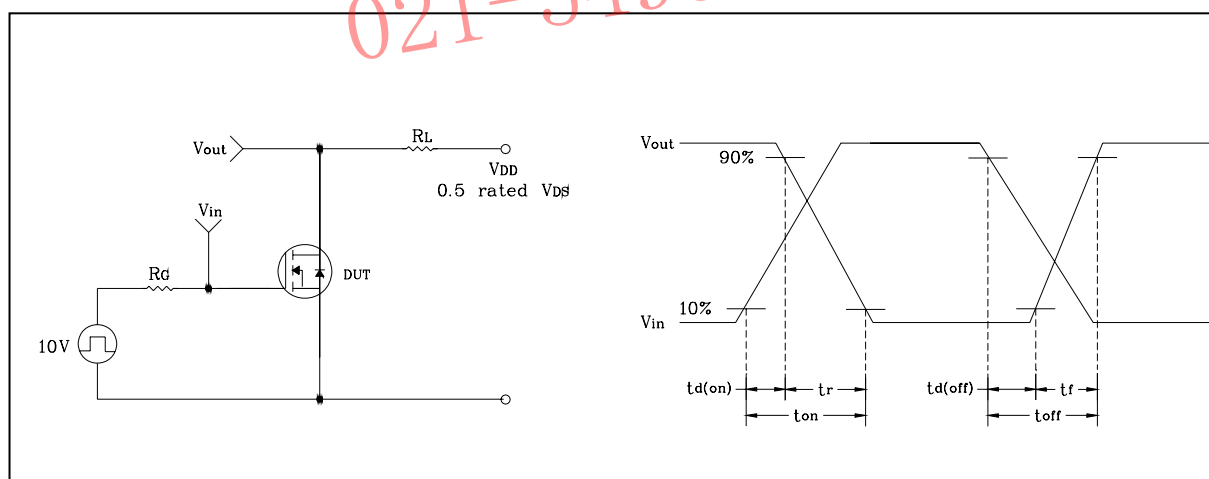
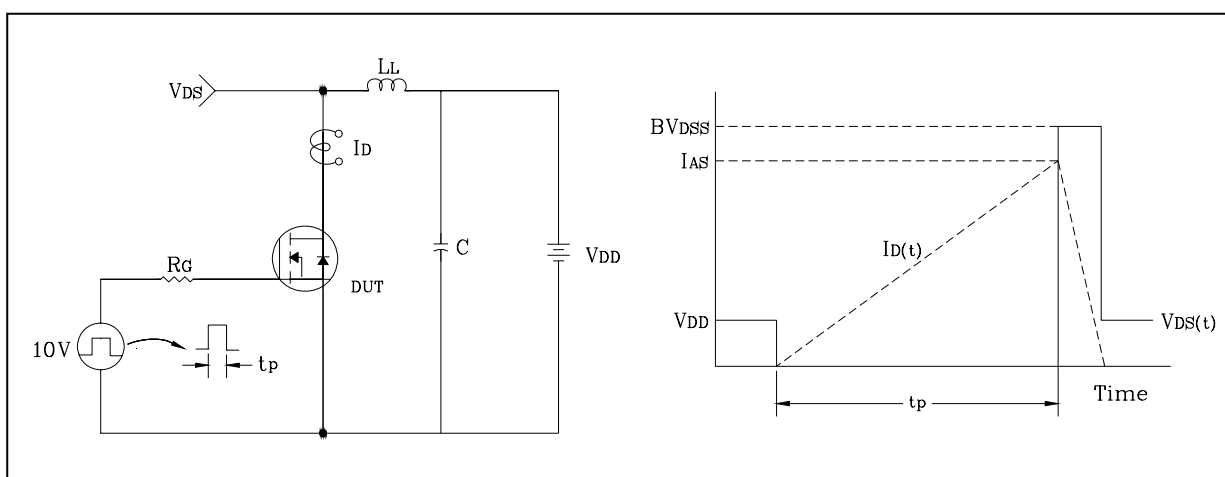
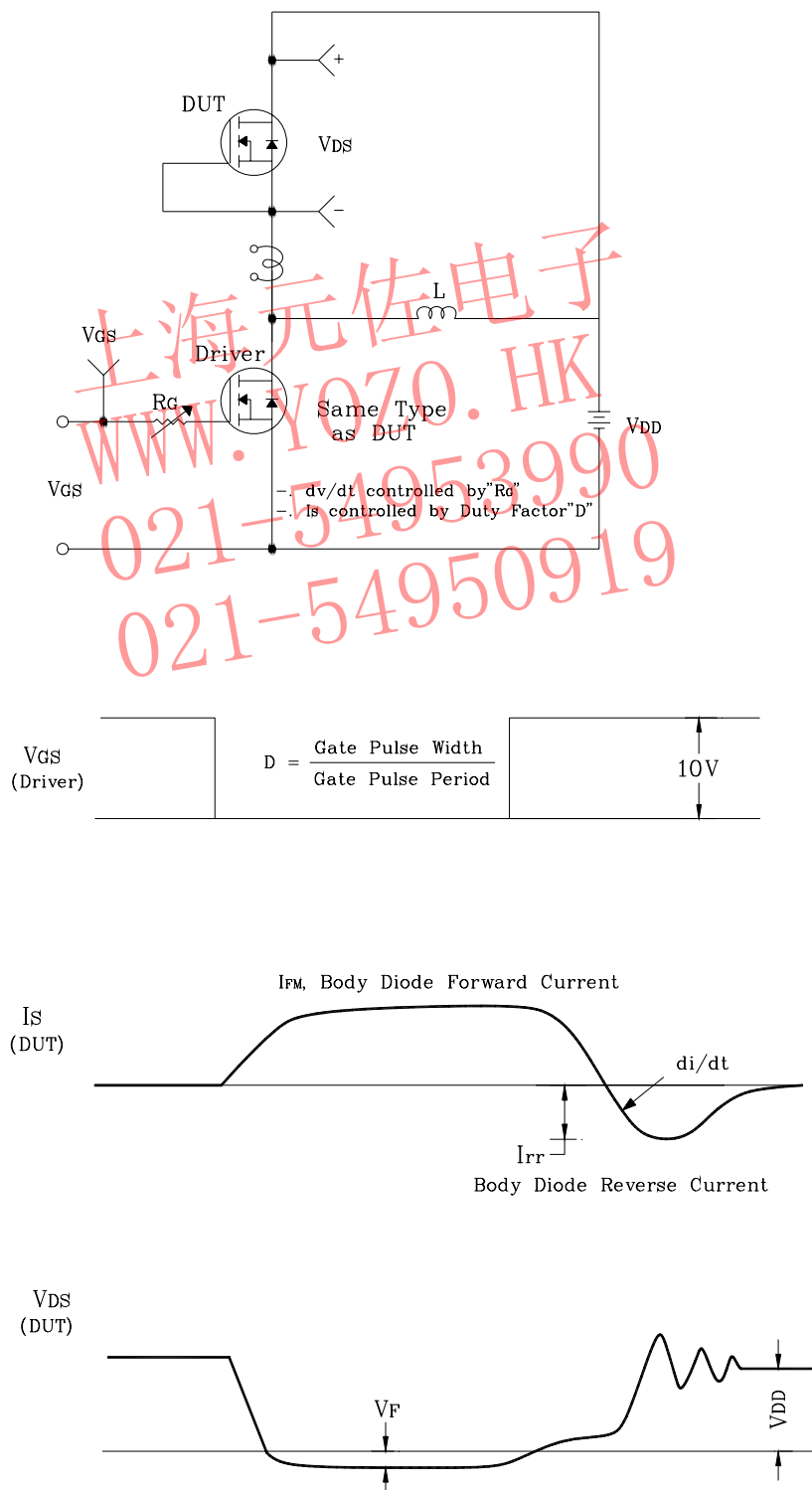
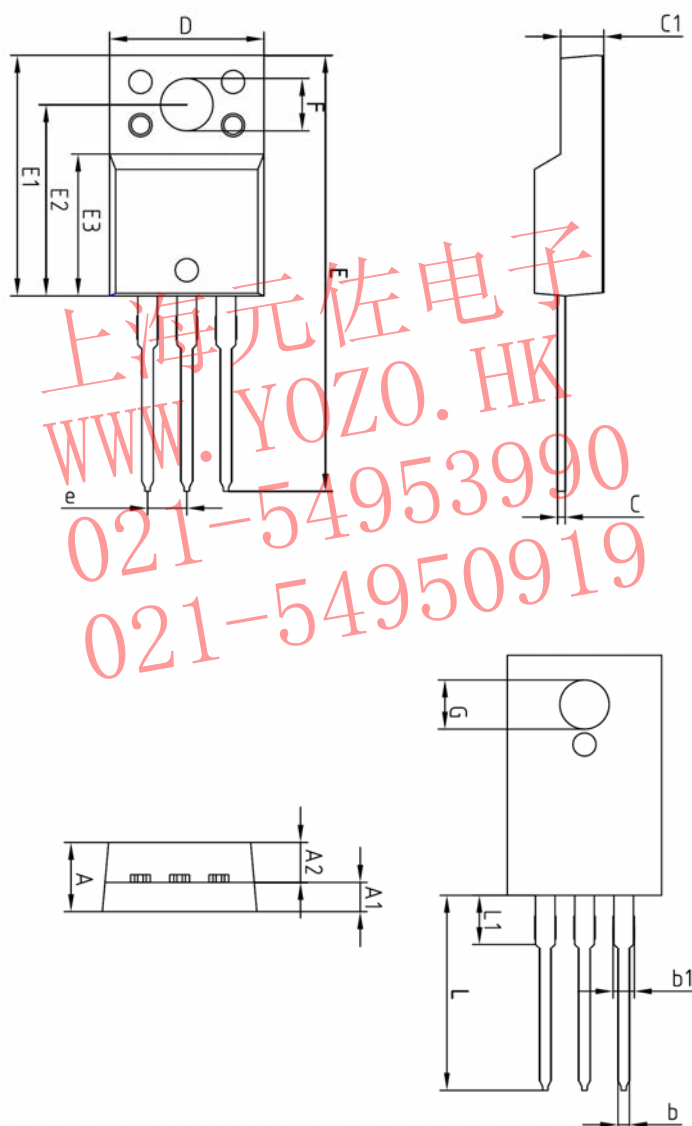
Fig. 12 E_{AS} Test Circuit & Waveform

Fig. 13 Diode Reverse Recovery Time Test Circuit & Waveform





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			