

SWITCHING REGULATOR APPLICATIONS

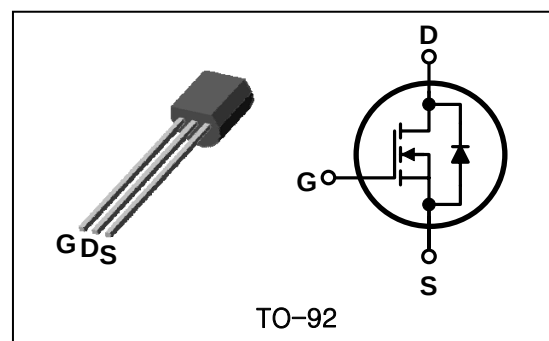
Features

- High Voltage : $BV_{DSS}=600V(\text{Min.})$
- Low C_{rss} : $C_{rss}=3.4pF(\text{Typ.})$
- Low gate charge : $Q_g=3.9nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=11.5\Omega(\text{Max.})$

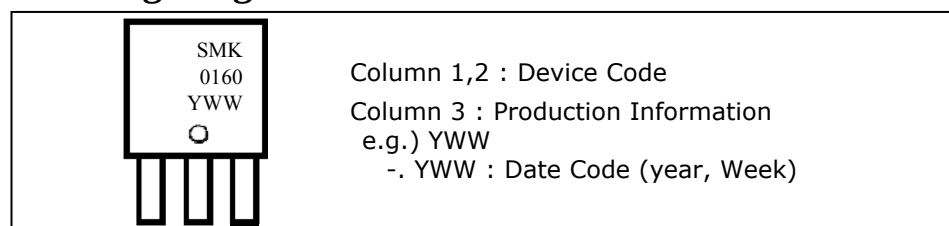
Ordering Information

Type No.	Marking	Package Code
SMK0160	SMK0160	TO-92

PIN Connection



Marking Diagram



Absolute maximum ratings ($T_C=25^\circ\text{C}$ 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	(Tc=25℃)	0.3	A
		(Tc=100℃)	0.18	A
Drain current (Pulsed) *	I _{DM}		1.2	A
Power dissipation	P _D		625	mW
Avalanche current (Single) ②	I _{AS}		0.3	A
Single pulsed avalanche energy ②	E _{AS}		53	mJ
Avalanche current (Repetitive) ①	I _{AR}		0.3	A
Repetitive avalanche energy ①	E _{AR}		1.1	mJ
Junction temperature	T _J		150	℃
Storage temperature range	T _{sta}		-55~150	

* Limited by maximum junction temperature

Characteristic	Symbol	Typ.	Max.	Unit
Thermal resistance Junction-ambient	$R_{th(J-A)}$ **	-	200	$^\circ\text{C/W}$

** Limited by maximum junction temperature

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	$R_{DS(on)}$	$V_{GS}=10\text{V}$, $I_D=150\text{mA}$	-	9.3	11.5	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=10\text{V}$, $I_D=150\text{mA}$	-	0.32	-	S
Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1\text{MHz}$	-	131	164	pF
Output capacitance	C_{oss}		-	19.4	24.3	
Reverse transfer capacitance	C_{rss}		-	3.4	4.3	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=300\text{V}$, $I_D=0.3\text{A}$ $R_G=25\Omega$ ③④	-	5.5	-	ns
Rise time	t_r		-	5	-	
Turn-off delay time	$t_{d(off)}$		-	13	-	
Fall time	t_f		-	28	-	
Total gate charge	Q_g	$V_{DS}=480\text{V}$, $V_{GS}=10\text{V}$ $I_D=0.3\text{A}$ ③④	-	3.9	4.9	nC
Gate-source charge	Q_{gs}		-	1.7	-	
Gate-drain charge	Q_{gd}		-	0.85	-	

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	-	-	0.3	A
Source current (Pulsed) ①	I_{SM}		-	-	1.2	
Forward voltage ④	V_{SD}	$V_{GS}=0\text{V}$, $I_S=0.3\text{A}$	-	-	1.4	V
Reverse recovery time	t_{rr}	$I_S=0.3\text{A}$, $V_{GS}=0\text{V}$ $dI_F/dt=100\text{A}/\mu\text{s}$	-	190	-	ns
Reverse recovery charge	Q_{rr}		-	0.53	-	μC

Note ;

- ① Repetitive rating : Pulse width limited by maximum junction temperature
- ② $L=1080\text{mH}$, $I_{AS}=0.3\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$
- ③ Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

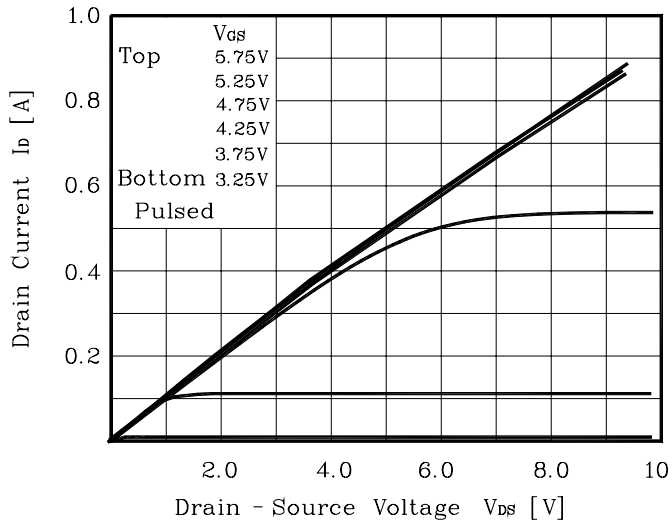


Fig. 2 $I_D - V_{GS}$

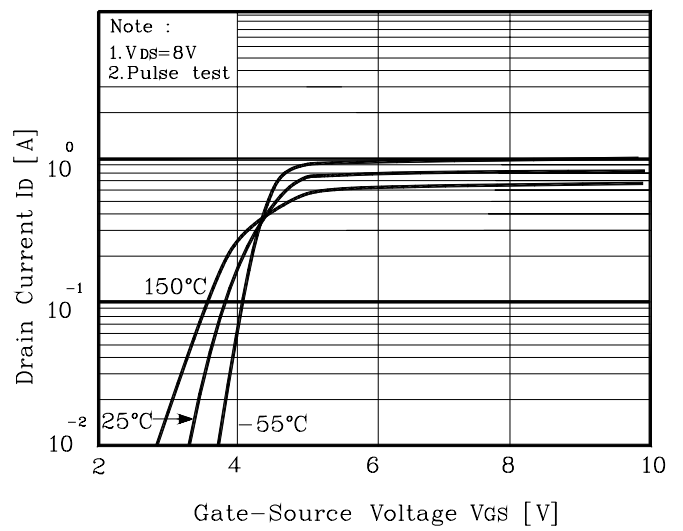


Fig. 3 $R_{DS(on)} - I_D$

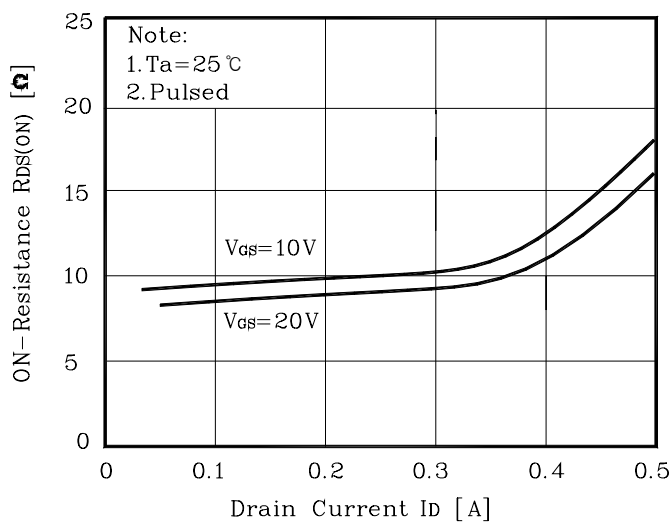


Fig. 4 $I_S - V_{SD}$

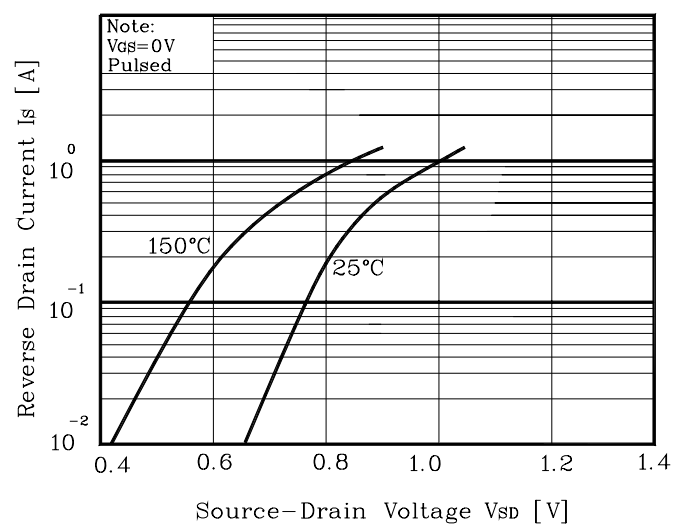


Fig. 5 Capacitance - V_{DS}

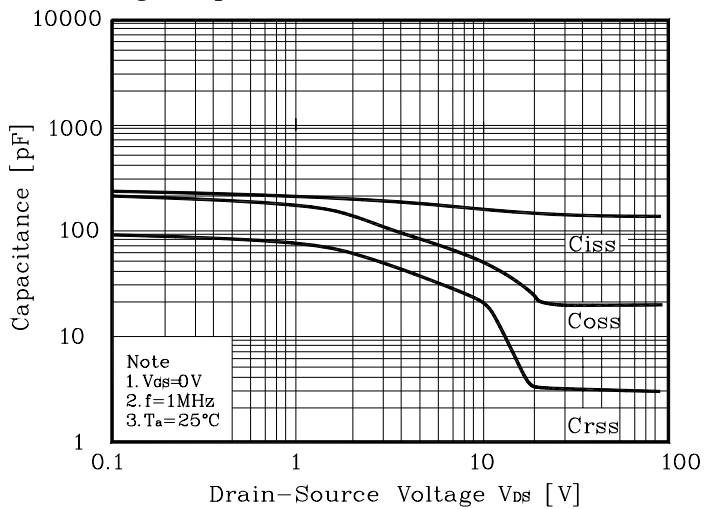


Fig. 6 $V_{GS} - Q_G$

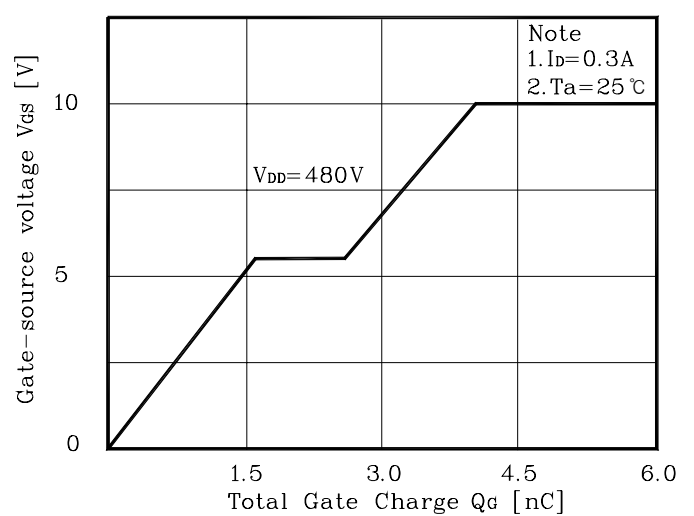


Fig. 7 $V_{DSS} - T_J$

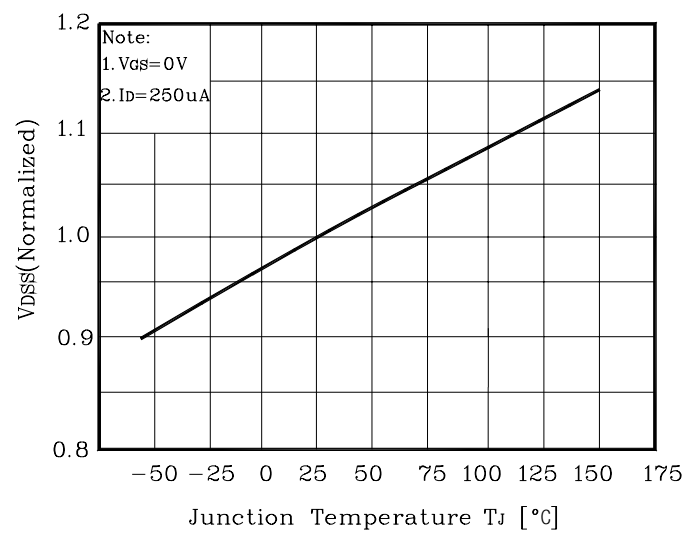


Fig. 8 $R_{DS(on)} - T_J$

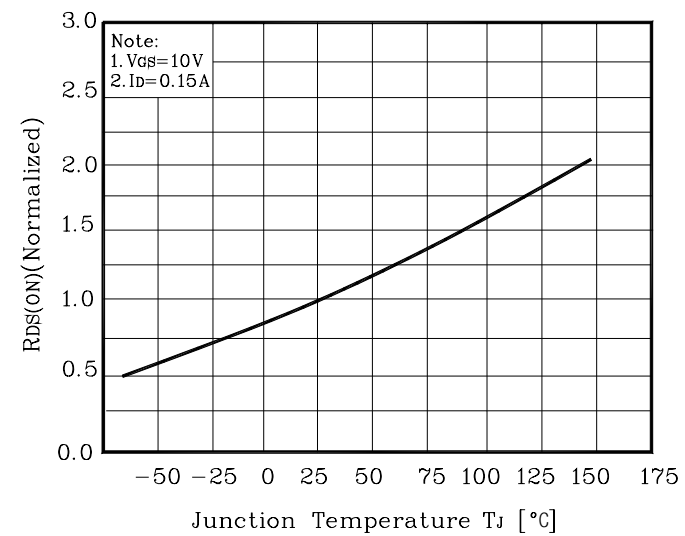


Fig. 9 $I_D - T_a$

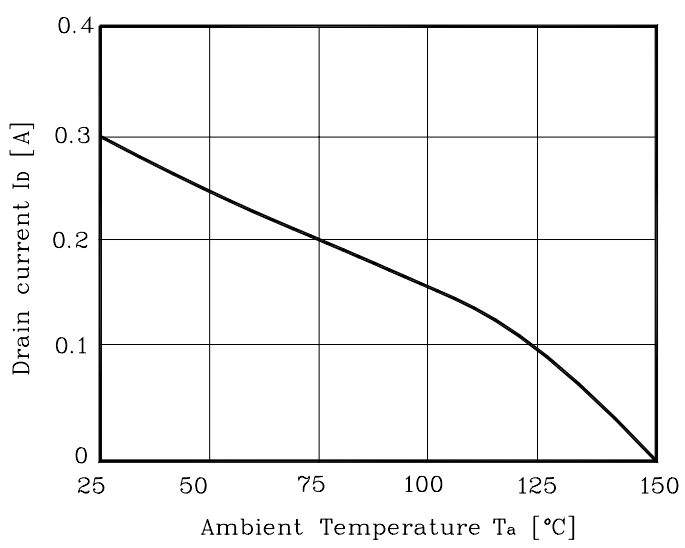


Fig. 10 Safe Operating Area

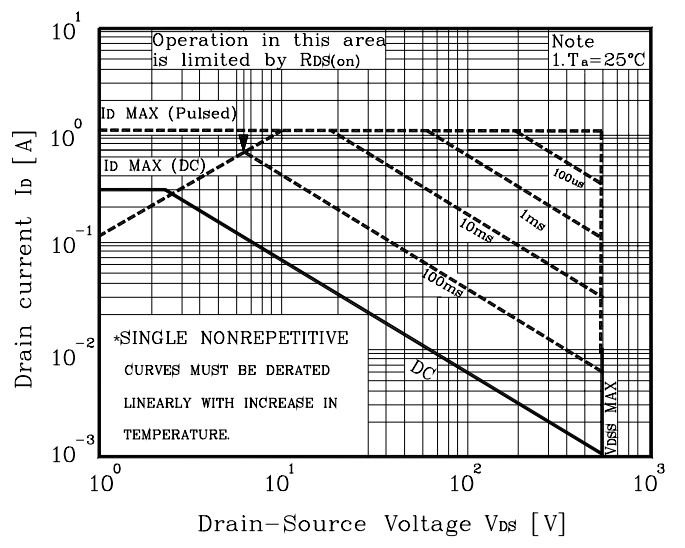


Fig. 11 Gate Charge Test Circuit & Waveform

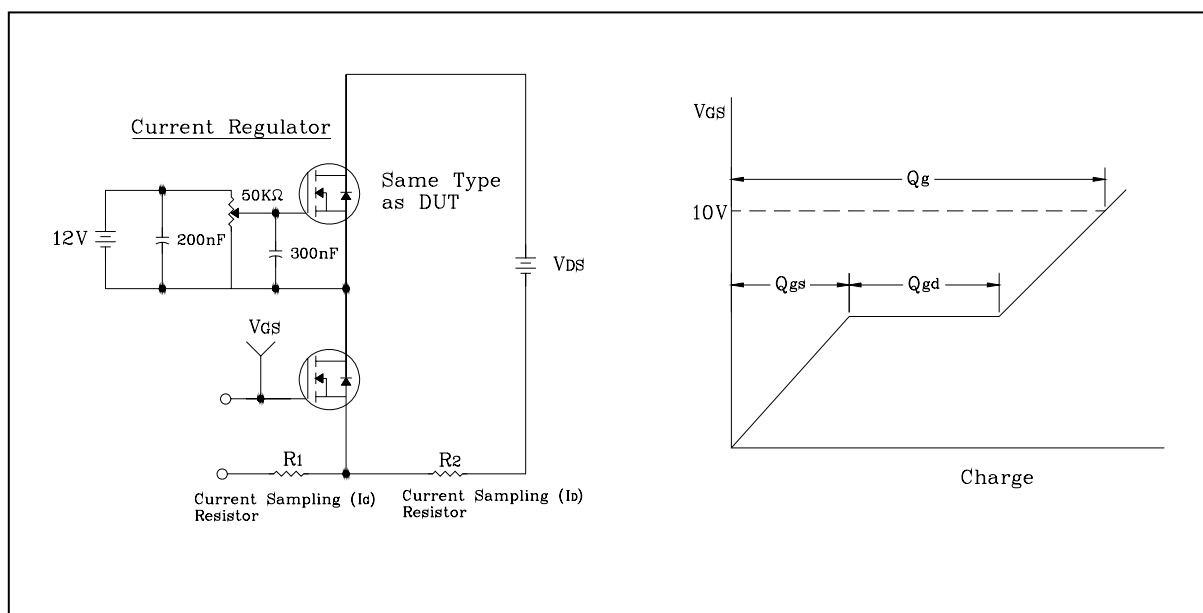


Fig. 12 Resistive Switching Test Circuit & Waveform

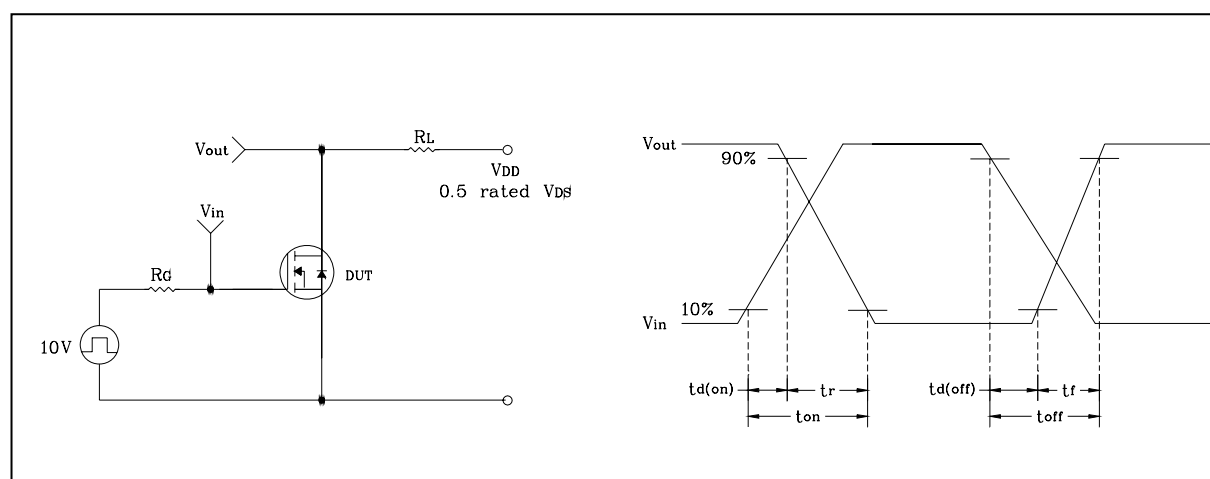


Fig. 13 E_{AS} Test Circuit & Waveform

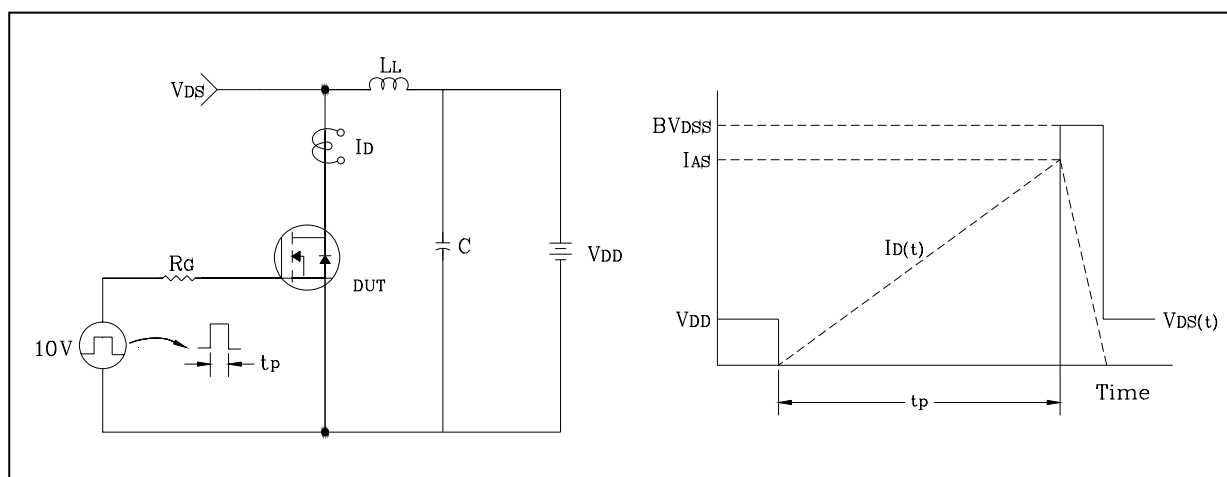
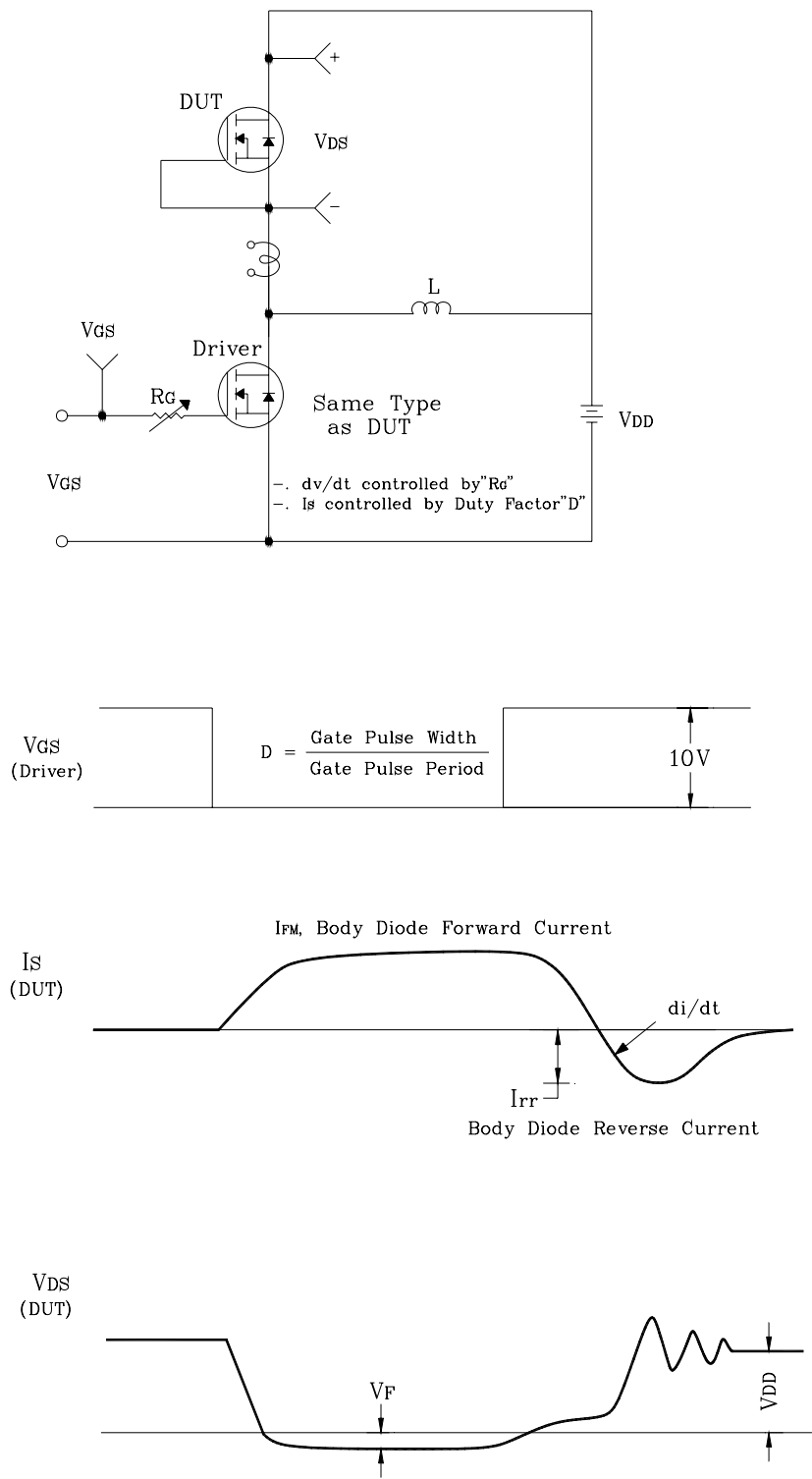
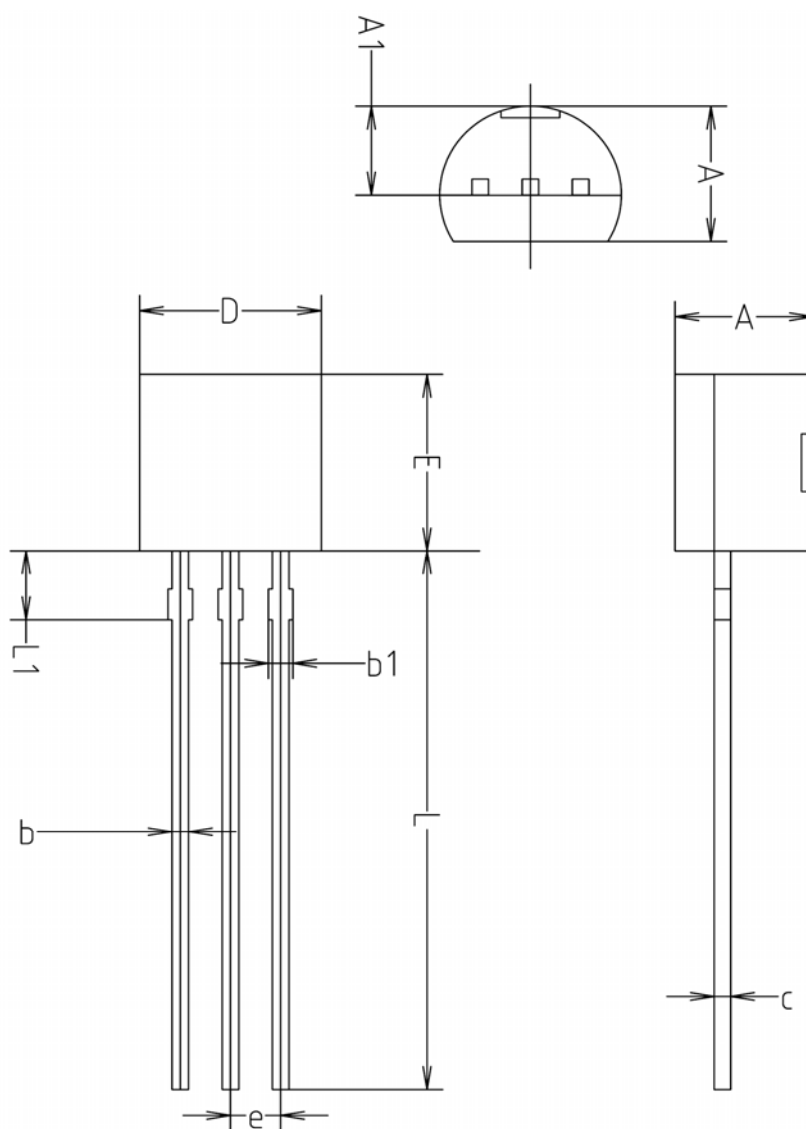


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension

unit: mm



SYMBOL	MILLIMETERS(mm)		
	MINIMUM	NOMINAL	MAXIMUM
A	3.40	3.50	3.66
A1	2.46	2.51	2.59
b	0.39	0.44	0.53
b1	0.39	—	0.63
c	0.35	0.42	0.47
D	4.48	4.60	4.70
E	4.48	4.60	4.70
e	1.17	1.27	1.37
L	13.70	14.00	14.77
L1	1.55	1.70	2.15

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