

DC-DC CONVERTER APPLICATION

HIGH VOLTAGE SWITCHING APPLICATIONS

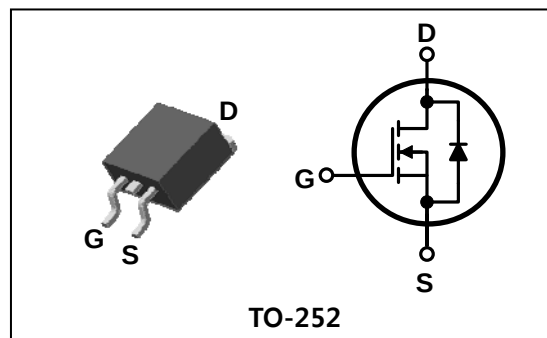
Features

- High Voltage : $BV_{DSS}=200V(\text{Min.})$
- Low C_{RSS} : $C_{RSS}=17pF(\text{Typ.})$
- Low gate charge : $Q_g=9nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.4\Omega(\text{Max.})$

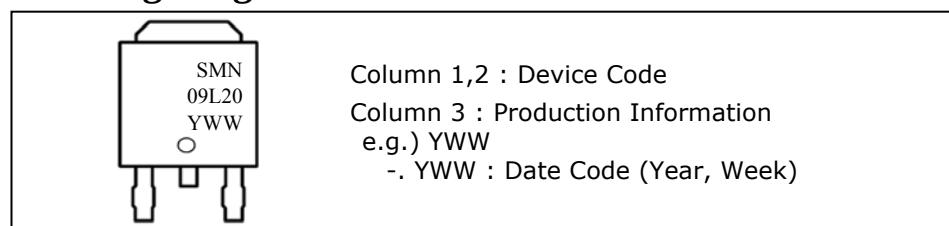
Ordering Information

Type No.	Marking	Package Code
SMN09L20D	SMN09L20	TO-252

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}		200	V
Gate-source voltage	V _{GSS}		±30	V
Drain current (DC) *	I _D	T _C =25°C	9	A
		T _C =100°C	5.7	A
Drain current (Pulsed) *	I _{DM}		36	A
Power dissipation	P _D		45	W
Avalanche current (Single) ②	I _{AS}		9	A
Single pulsed avalanche energy ②	E _{AS}		232	mJ
Avalanche current (Repetitive) ①	I _{AR}		9	A
Repetitive avalanche energy ①	E _{AR}		9.5	mJ
Junction temperature	T _J		150	°C
Storage temperature range	T _{sta}		-55~150	

* Limited by maximum junction temperature

Characteristic		Symbol	Typ.	Max.	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	-	2.77	$^{\circ}\text{C/W}$
	Junction-ambient **	$R_{th(J-A)}$	-	50	

** When mounted on the minimum pad size recommended (PCB Mount)

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}	$I_D=250\mu\text{A}$, $V_{GS}=0$	200	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu\text{A}$, $V_{DS}=V_{GS}$	1.0	-	2.25	V
Drain-source cut-off current	I_{DSS}	$V_{DS}=200\text{V}$, $V_{GS}=0\text{V}$	-	-	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	$R_{DS(on)}$	$V_{GS}=10\text{V}$, $I_D=4.5\text{A}$	-	0.34	0.40	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=10\text{V}$, $I_D=4.5\text{A}$	-	5.5	-	S
Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1\text{MHz}$	-	556	600	pF
Output capacitance	C_{oss}		-	100	150	
Reverse transfer capacitance	C_{rss}		-	17	30	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=100\text{V}$, $I_D=9\text{A}$ $R_G=25\Omega$ ③④	-	18	-	ns
Rise time	t_r		-	36	-	
Turn-off delay time	$t_{d(off)}$		-	133	-	
Fall time	t_f		-	45	-	
Total gate charge	Q_g	$V_{DS}=160\text{V}$, $V_{GS}=5\text{V}$ $I_D=9\text{A}$ ③④	-	9	15	nC
Gate-source charge	Q_{gs}		-	4	-	
Gate-drain charge	Q_{gd}		-	3	-	

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	-	-	9	A
Source current (Pulsed) ①	I_{SM}		-	-	36	
Forward voltage ④	V_{SD}	$V_{GS}=0\text{V}$, $I_S=9\text{A}$	-	-	1.5	V
Reverse recovery time	t_{rr}	$I_S=9\text{A}$, $V_{GS}=0\text{V}$ $dI_F/dt=100\text{A}/\mu\text{s}$	-	158	-	ns
Reverse recovery charge	Q_{rr}		-	0.97	-	μC

Note ;

- ① Repetitive rating : Pulse width limited by maximum junction temperature
- ② $L=4.3\text{mH}$, $I_{AS}=9\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, 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 $I_D - V_{DS}$

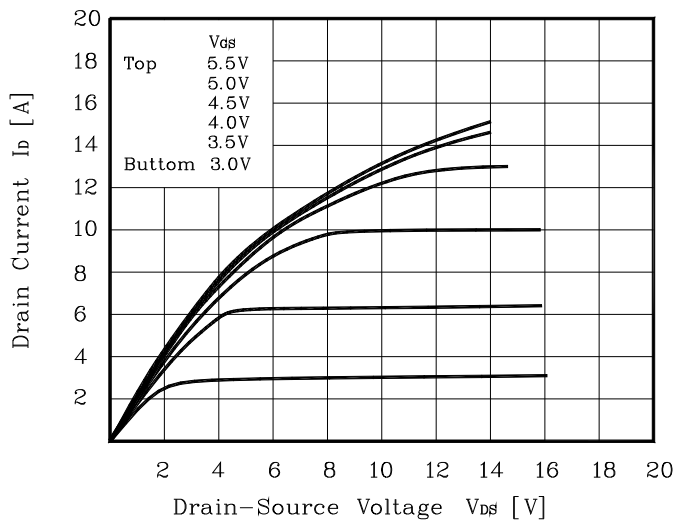


Fig. 2 $I_D - V_{GS}$

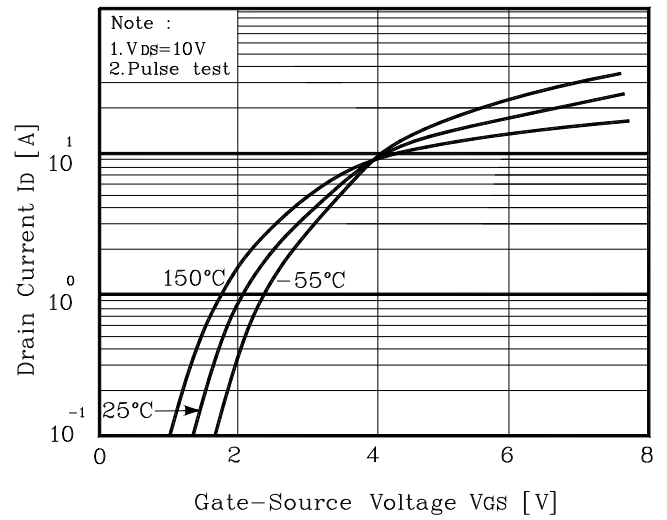


Fig. 3 $R_{DS(on)} - I_D$

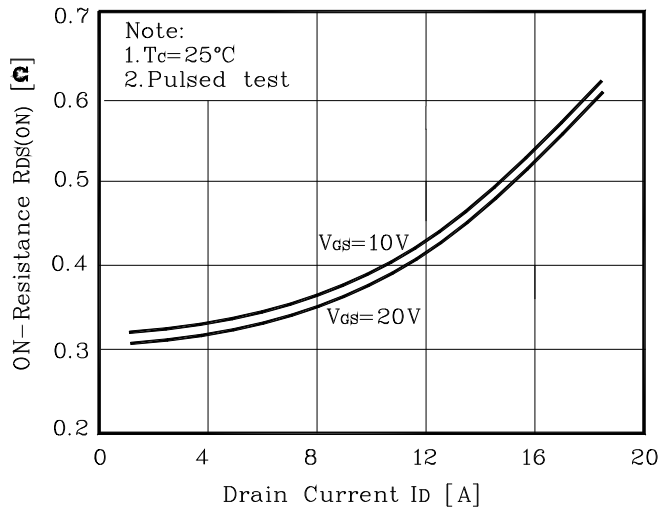


Fig. 4 $I_S - V_{SD}$

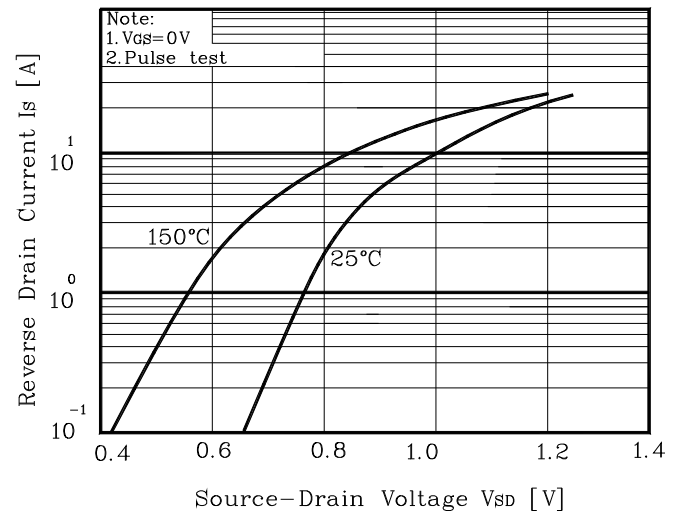


Fig. 5 Capacitance - V_{DS}

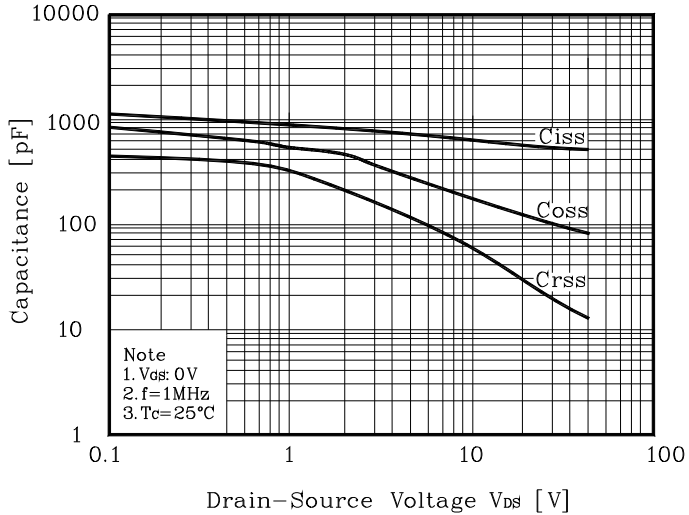


Fig. 6 $V_{GS} - Q_G$

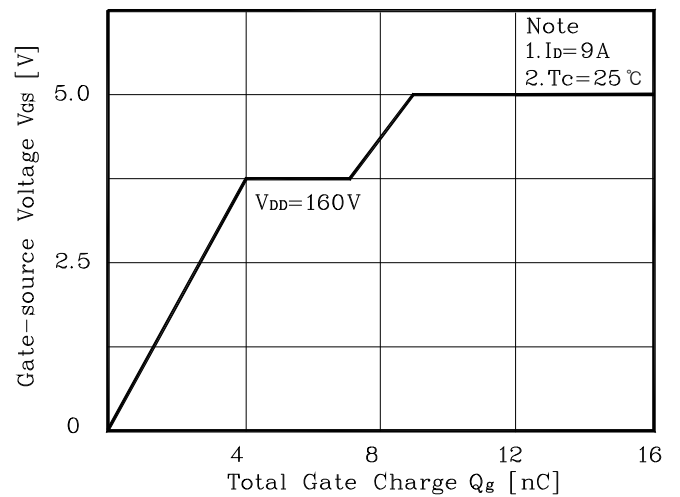


Fig. 7 $V_{DSS} - T_J$

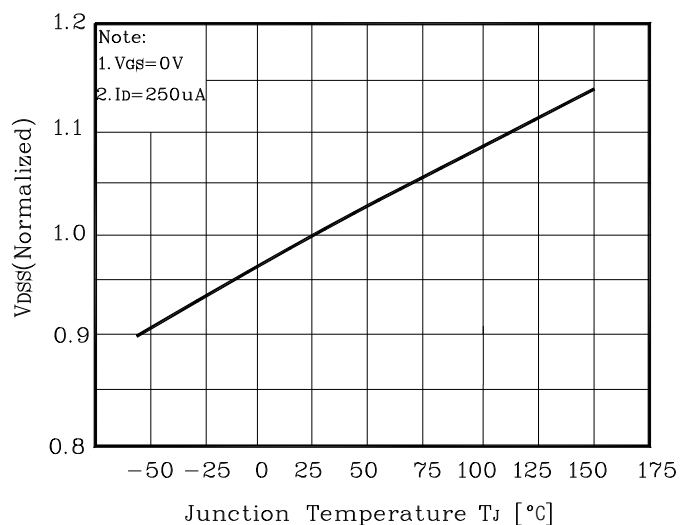


Fig. 8 $R_{DS(on)} - T_J$

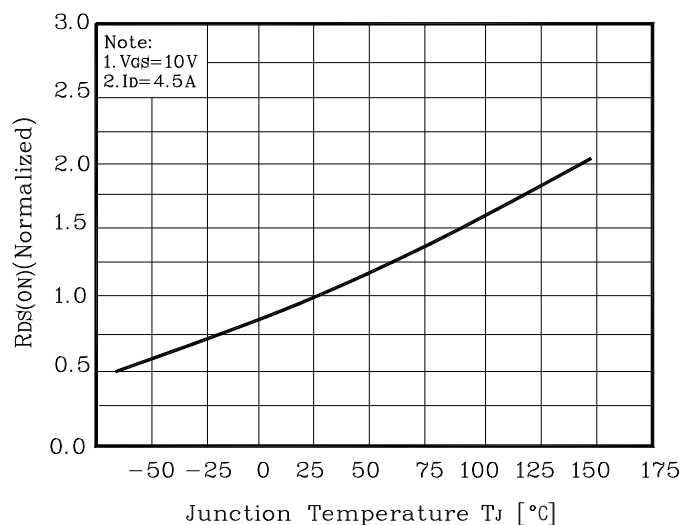


Fig. 9 $I_D - T_C$

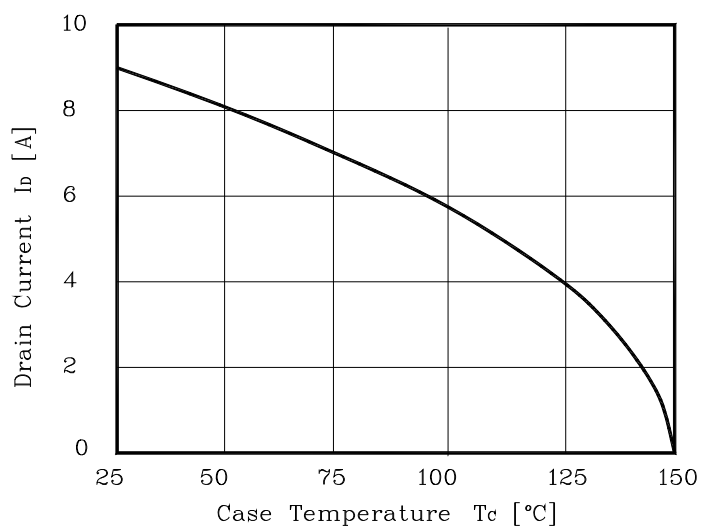


Fig. 10 Safe Operating Area

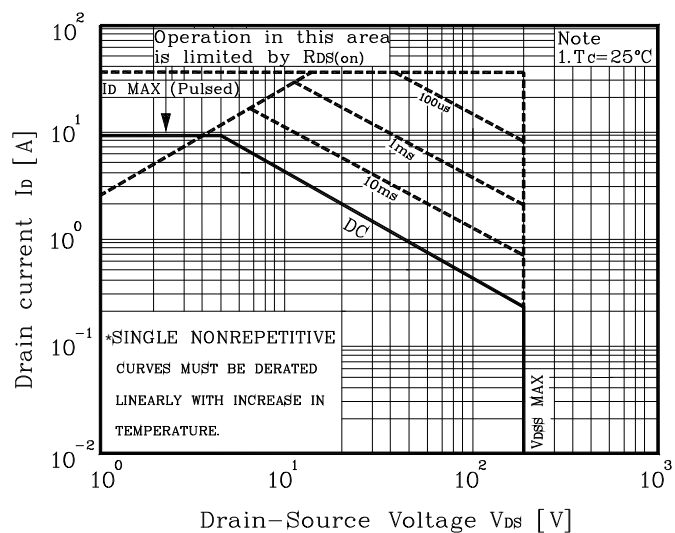


Fig. 11 Gate Charge Test Circuit & Waveform

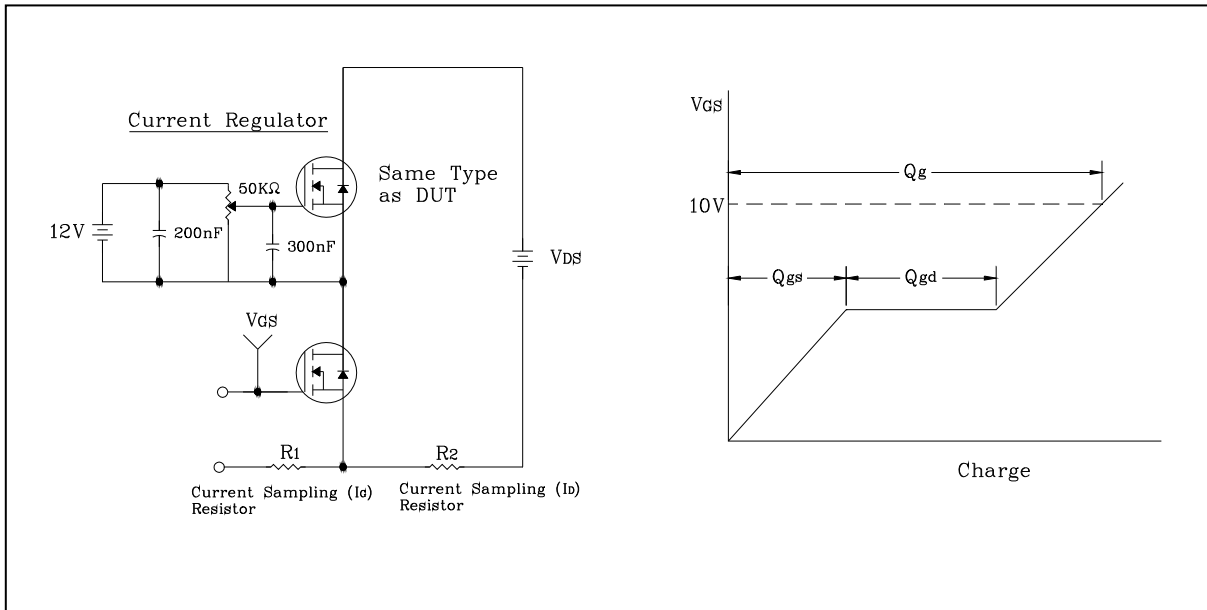


Fig. 12 Resistive Switching Test Circuit & Waveform

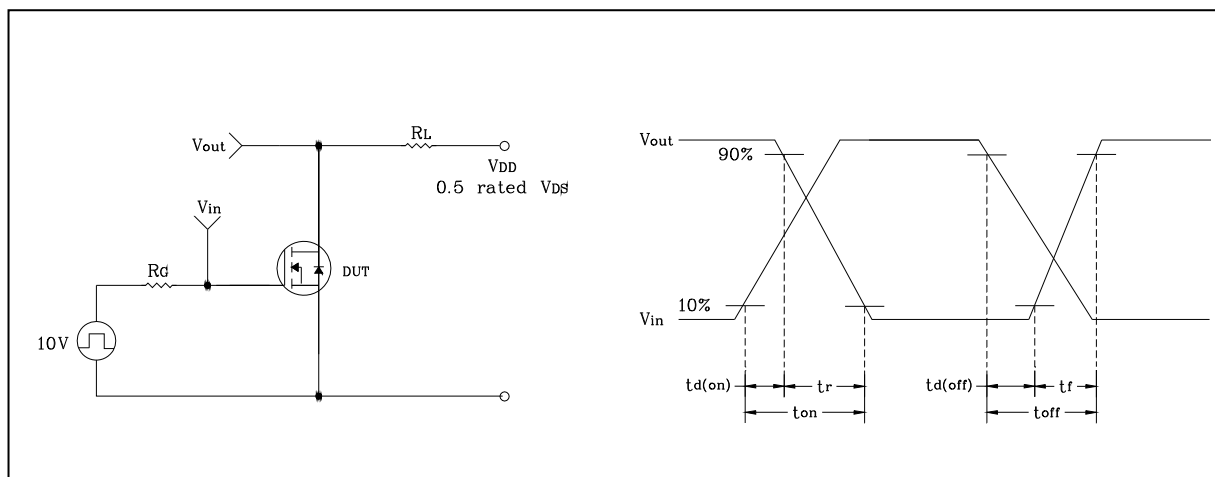


Fig. 13 E_{AS} Test Circuit & Waveform

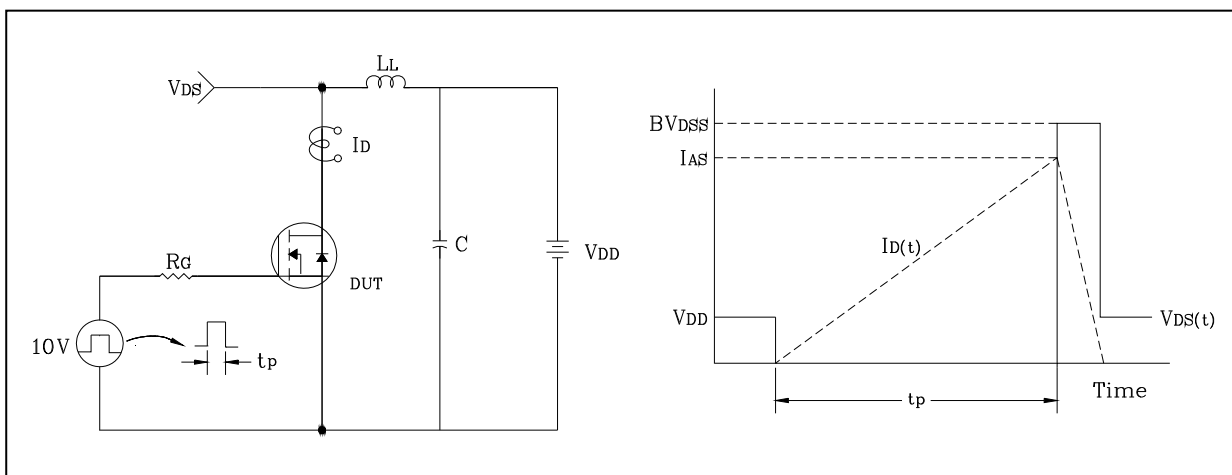
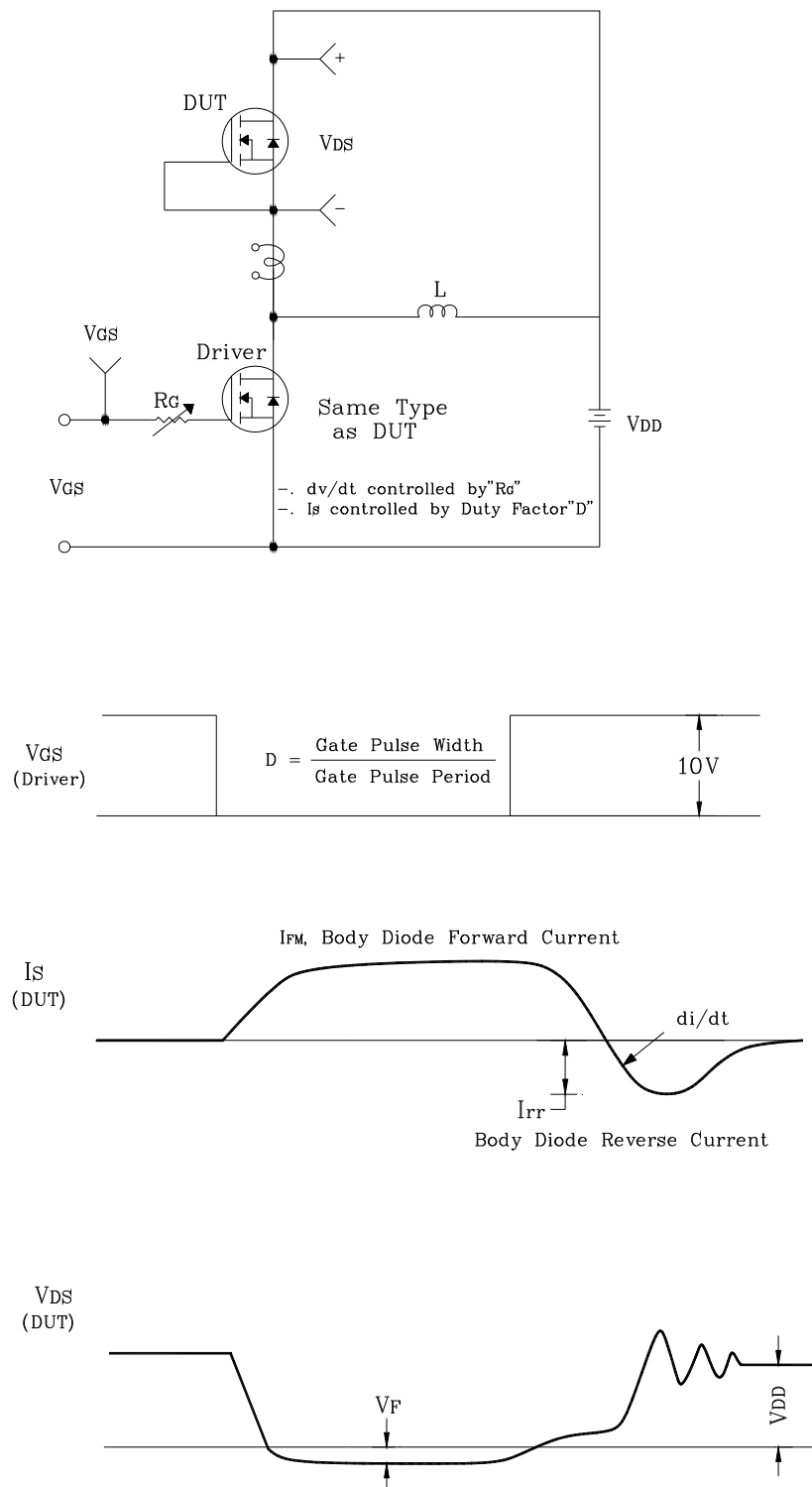
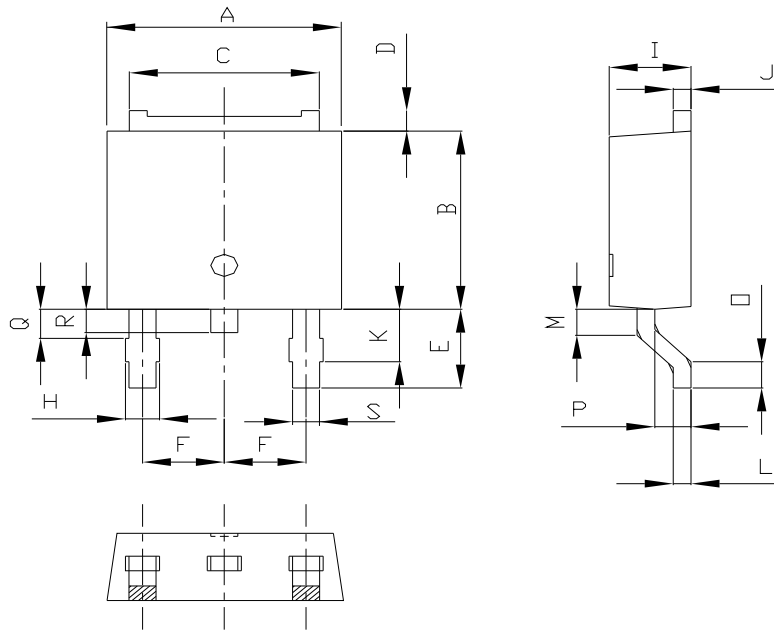


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



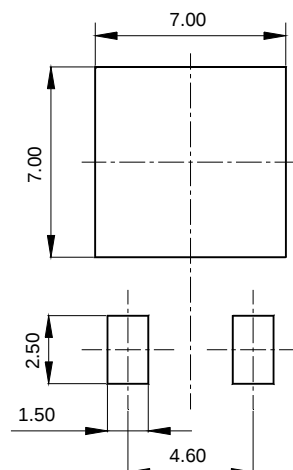
Outline Dimension

unit: mm



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	6.40	6.60	6.80	
B	5.90	6.10	6.30	
C	5.04	5.34	5.64	
D	0.50	0.70	0.90	
E	2.50	2.70	2.90	
F	2.10	2.30	2.50	
H	0.96 MAX			
I	2.20	2.30	2.40	
J	0.40	0.50	0.60	
K	1.60	1.80	2.00	
L	0.40	0.50	0.60	
M	0.81	0.91	1.01	
O	0.80	0.90	1.00	
P	0.90	1.00	1.10	
Q	0.95 MAX			
R	0.60	0.80	1.00	
S	0.66	0.76	0.86	

※ Recommended Land Pattern [unit: mm]



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