

DC-DC CONVERTER APPLICATION

HIGH VOLTAGE SWITCHING APPLICATIONS

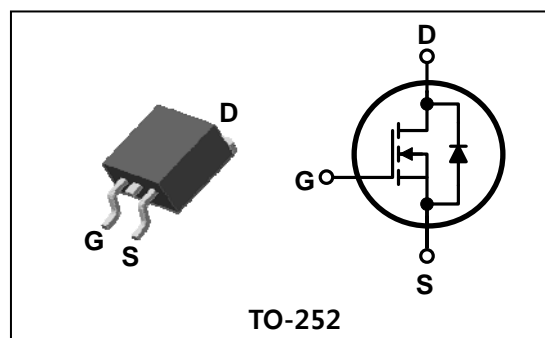
Features

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

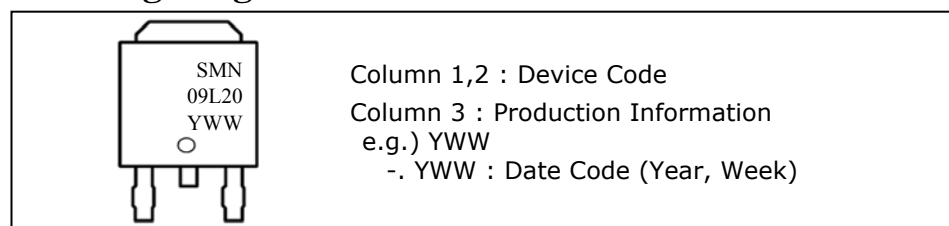
Ordering Information

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	$T_C=25^\circ\text{C}$	9	A
		$T_C=100^\circ\text{C}$	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	$^\circ\text{C}$	
Storage temperature range	T_{stg}	-55~150		

* Limited by maximum junction temperature

Characteristic	Symbol	Typ.	Max.	Unit	
Thermal resistance	Junction-case	$R_{th(J-C)}$	-	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°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Drain-source breakdown voltage	BV _{DSS}	I _D =250μA, V _{GS} =0	200	-	-	V	
Gate threshold voltage	V _{GS(th)}	I _D =250μA, V _{DS} =V _{GS}	1.0	-	2.25	V	
Drain-source cut-off current	I _{DSS}	V _{DS} =200V, V _{GS} =0V	-	-	1	μA	
Gate leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±30V	-	-	±100	nA	
Drain-source on-resistance ④	R _{DS(ON)}	V _{GS} =10V, I _D =4.5A	-	0.34	0.40	Ω	
Forward transfer conductance ④	g _{fs}	V _{DS} =10V, I _D =4.5A	-	5.5	-	S	
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	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} =100V, I _D =9A R _G =25Ω	-	18	-	ns	
Rise time	t _r		-	36	-		
Turn-off delay time	t _{d(off)}		③④	-	133		-
Fall time	t _f		-	45	-		
Total gate charge	Q _g	V _{DS} =160V, V _{GS} =5V I _D =9A	-	9	15	nC	
Gate-source charge	Q _{gs}		-	4	-		
Gate-drain charge	Q _{gd}		③④	-	3		-

Source-Drain Diode Ratings and Characteristics (T_C=25°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} =0V, I _S =9A	-	-	1.5	V
Reverse recovery time	t _{rr}	I _S =9A, V _{GS} =0V dI _F /dt=100A/μs	-	158	-	ns
Reverse recovery charge	Q _{rr}		-	0.97	-	μC

Note ;

- ① Repetitive rating : Pulse width limited by maximum junction temperature
- ② L=4.3mH, I_{AS}=9A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C
- ③ Pulse Test : Pulse width≤300μs, Duty cycle≤2%
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

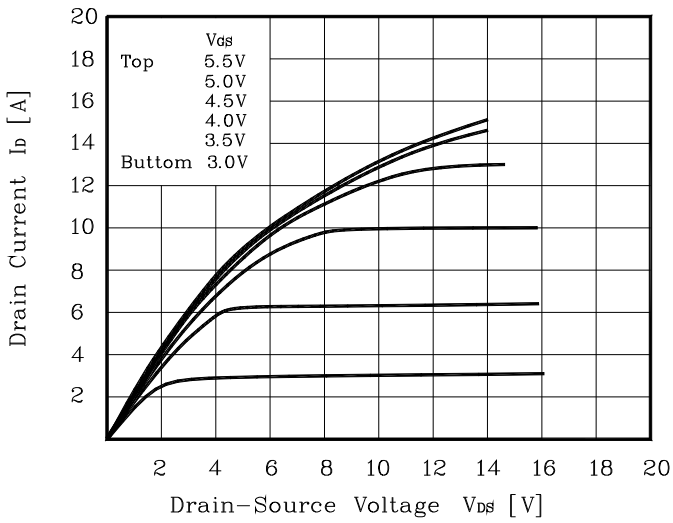


Fig. 2 $I_D - V_{GS}$

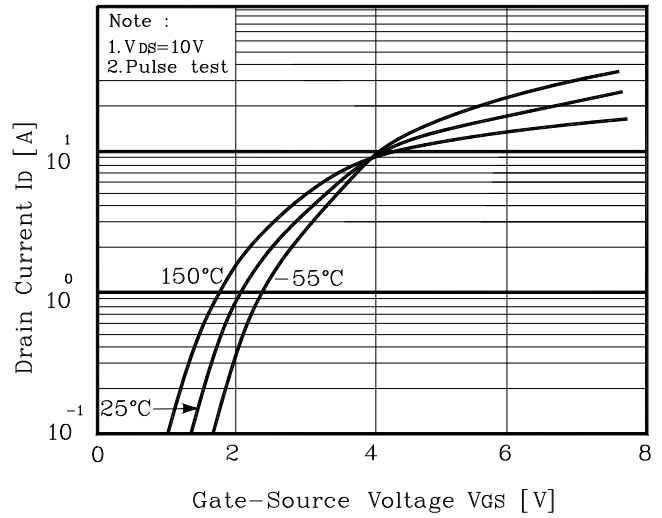


Fig. 3 $R_{DS(on)} - I_D$

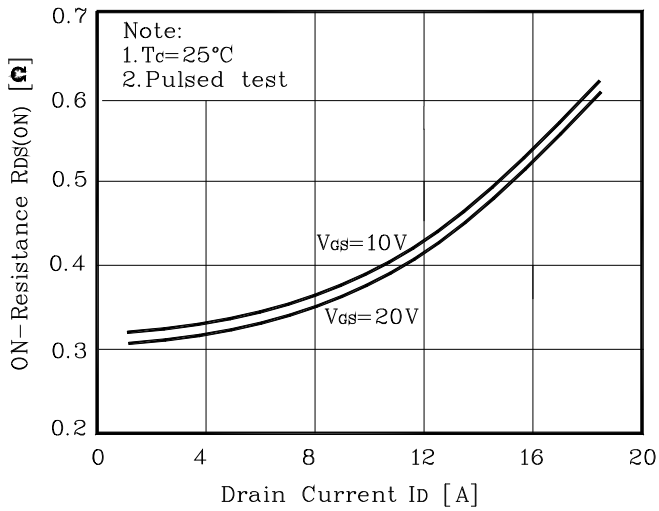


Fig. 4 $I_S - V_{SD}$

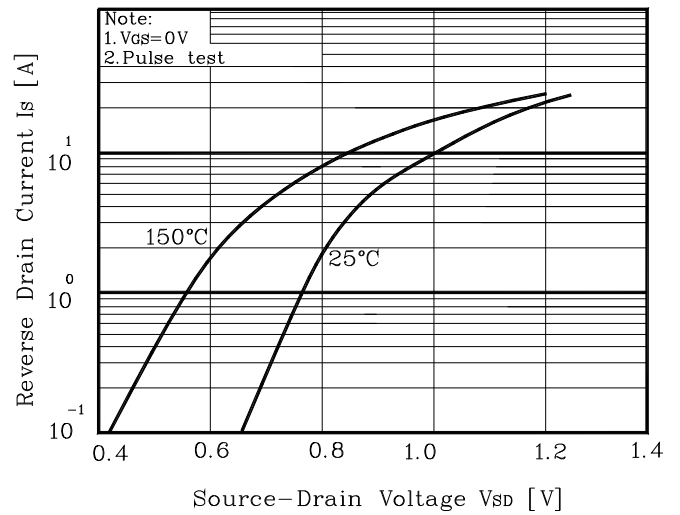


Fig. 5 Capacitance - V_{DS}

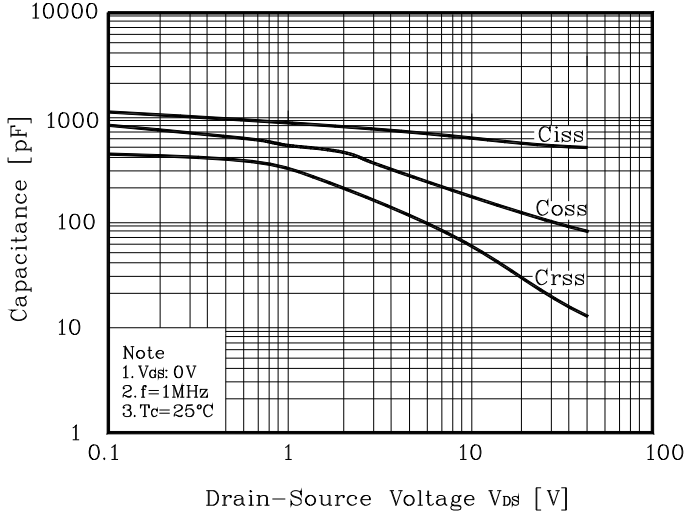


Fig. 6 $V_{GS} - Q_g$

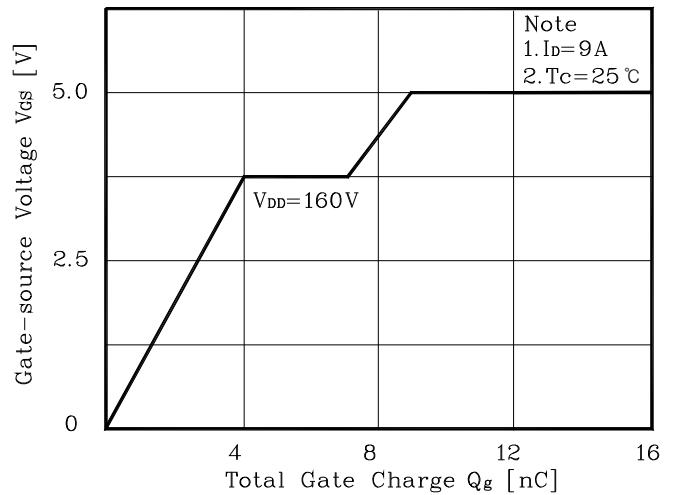


Fig. 7 $V_{DSS} - T_J$

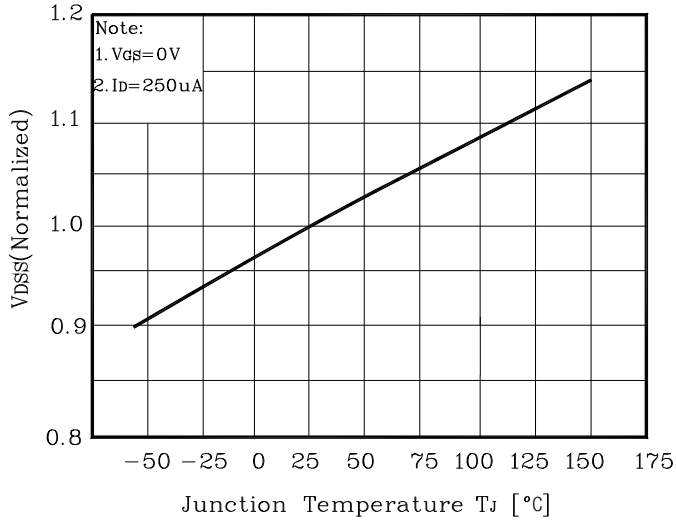


Fig. 8 $R_{DS(on)} - T_J$

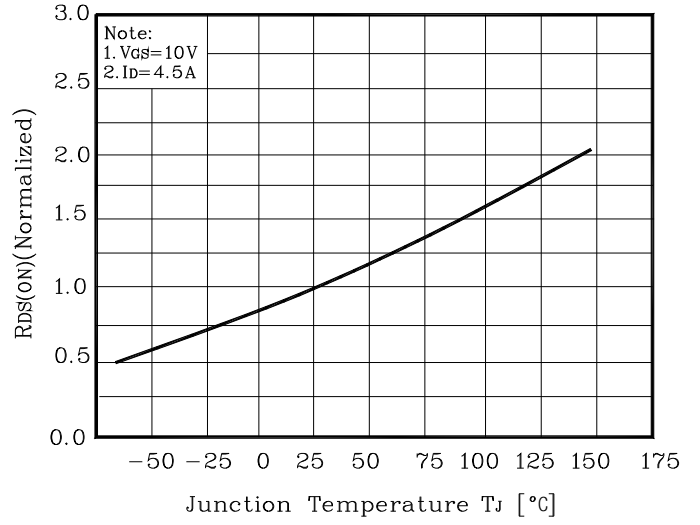


Fig. 9 $I_D - T_C$

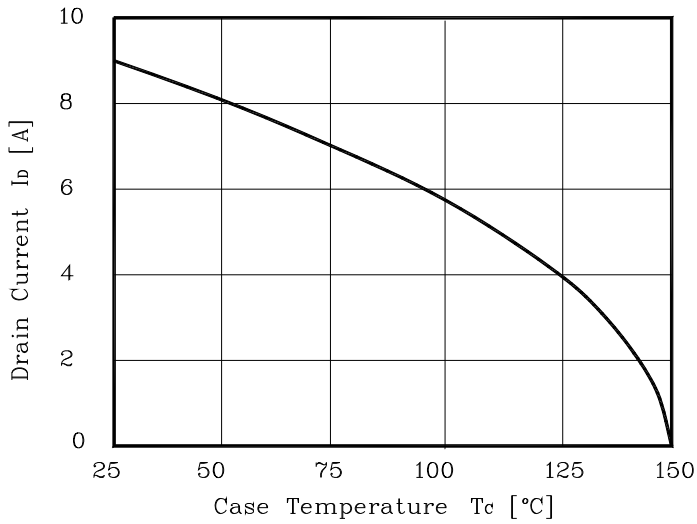


Fig. 10 Safe Operating Area

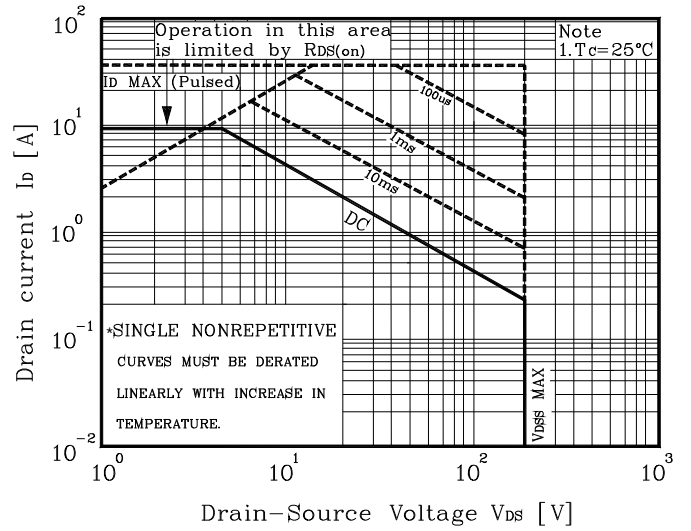


Fig. 11 Gate Charge Test Circuit & Waveform

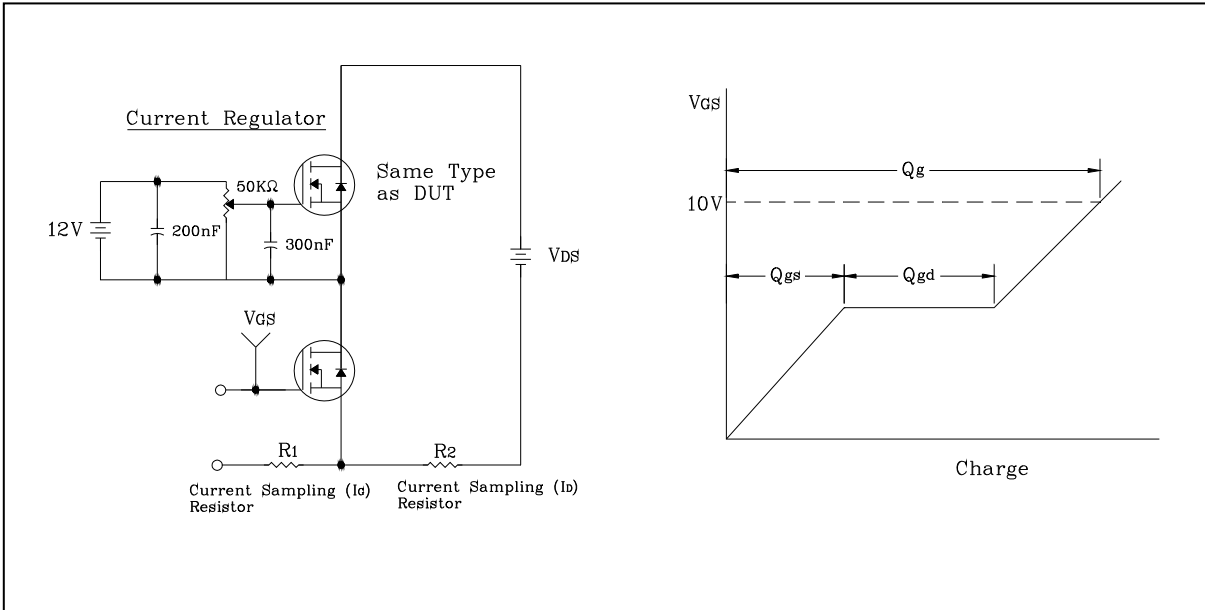


Fig. 12 Resistive Switching Test Circuit & Waveform

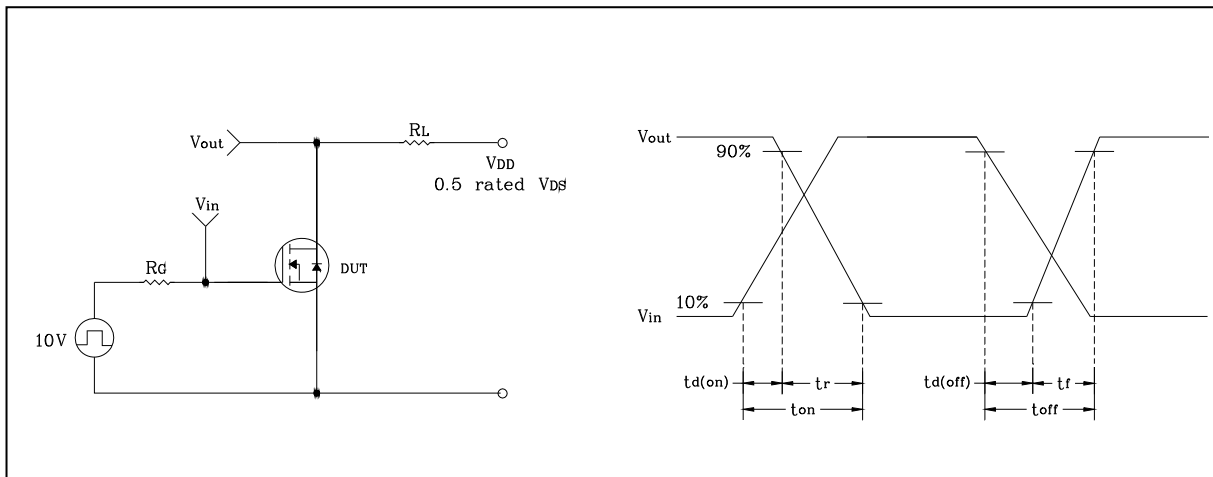
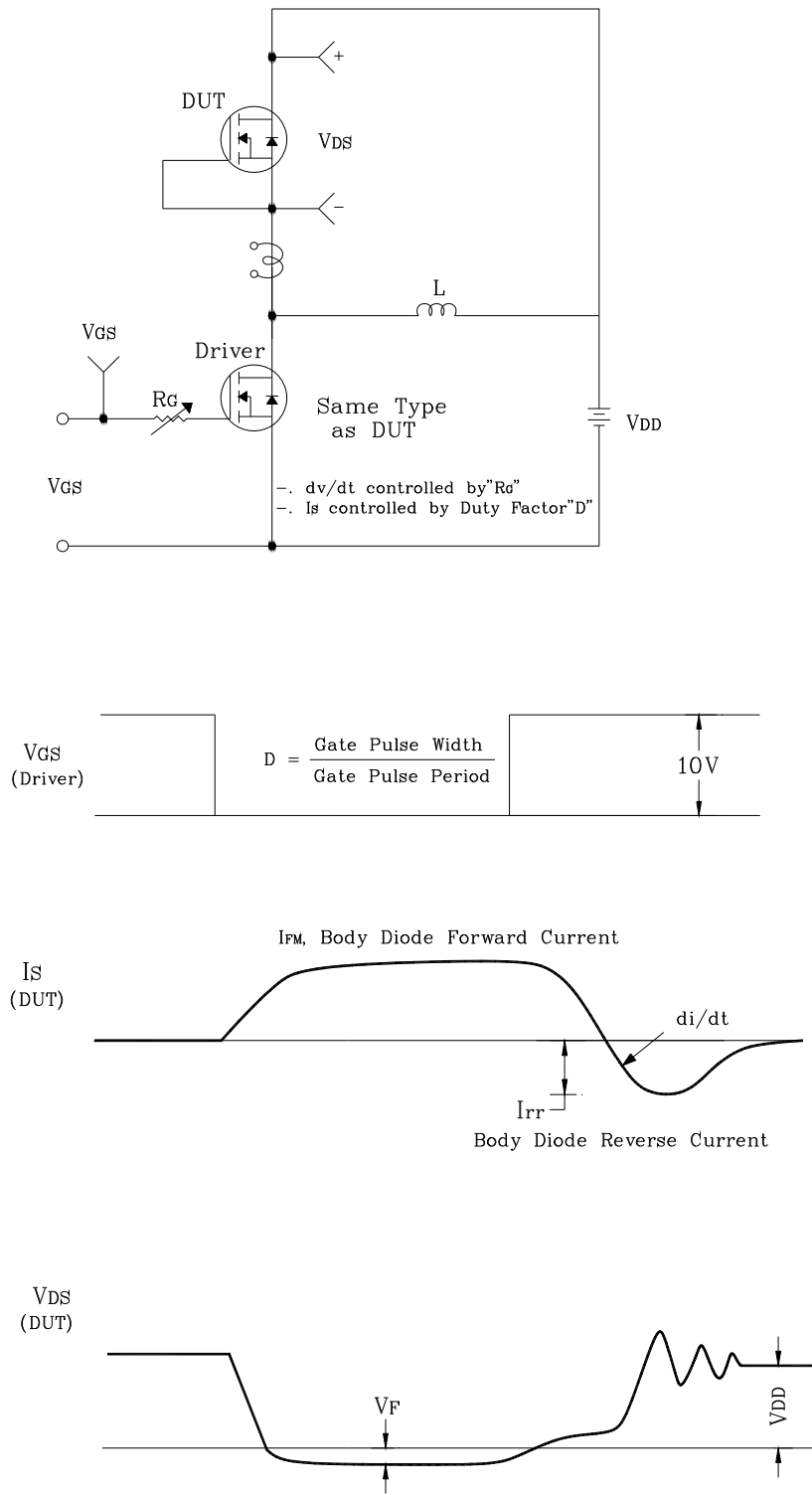


Fig. 13 E_{AS} Test Circuit & Waveform

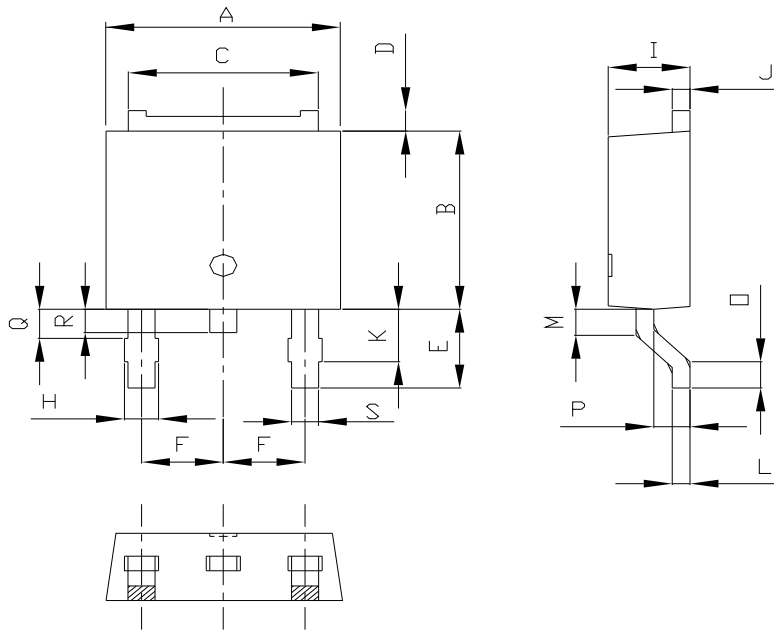


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



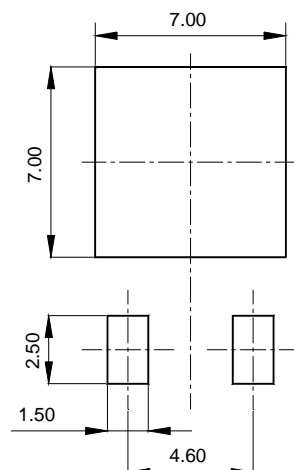
Outline Dimension

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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