

SWITCHING REGULATOR APPLICATIONS

Features

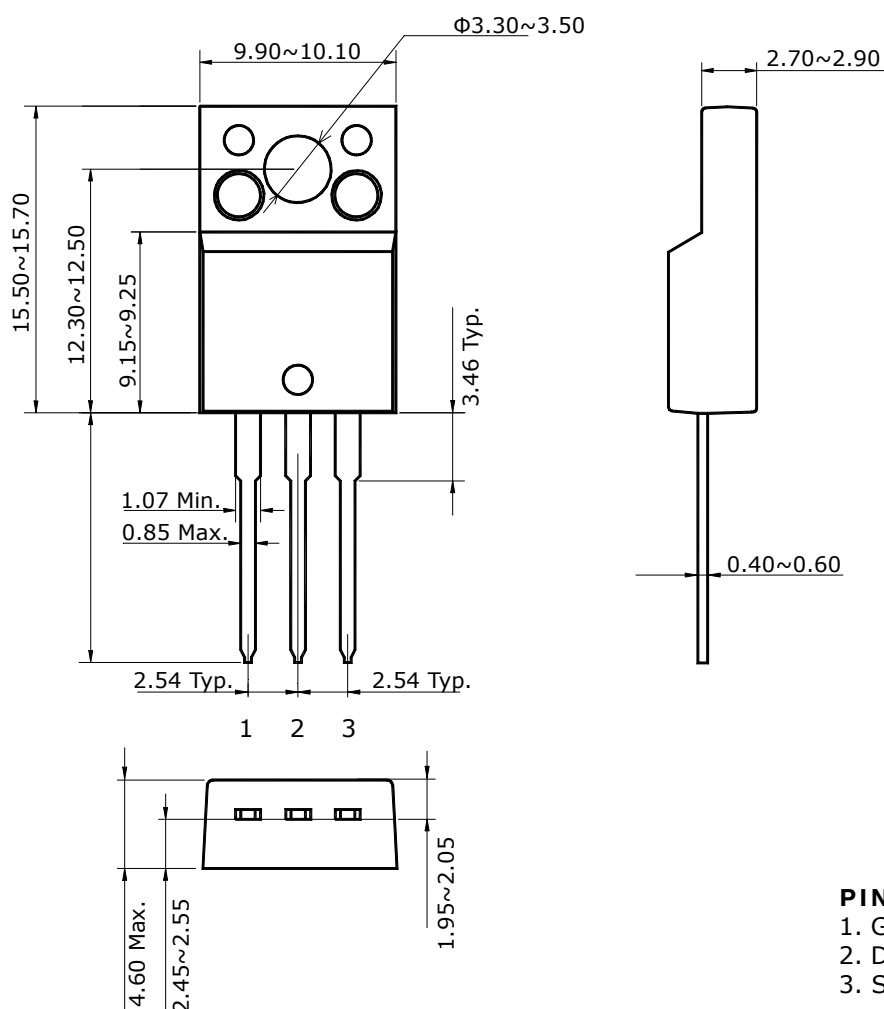
- High Voltage: $BV_{DSS}=600V(\text{Min.})$
- Low C_{rss} : $C_{rss}=5.8pF(\text{Typ.})$
- Low gate charge : $Q_g=13nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=2.5\Omega(\text{Max.})$

Ordering Information

Type NO.	Marking	Package Code
SMK0460F	SMK0460	TO-220F-3L

Outline Dimensions

unit : mm



Absolute maximum ratings

(Tc=25°C)

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°C)	4
		(Tc=100°C)	2.53
Drain current (Pulsed) *	I_{DM}	16	A
Drain Power dissipation	P_D	30	W
Avalanche current (Single) ②	I_{AS}	4	A
Single pulsed avalanche energy ②	E_{AS}	225	mJ
Avalanche current (Repetitive) ①	I_{AR}	4	A
Repetitive avalanche energy ①	E_{AR}	10	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	$R_{th(J-C)}$	-	4.16	°C/W
	Junction-ambient	$R_{th(J-a)}$	-	62.5	

Electrical Characteristics

(Tc=25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0$	600	-	-	V
Gate-threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	2.0	-	4.0	V
Drain-source leakage current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$	-	-	1	μA
Gate-source leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 30V$	-	-	± 100	nA
Drain-Source on-resistance ④	$R_{DS(on)}$	$V_{GS}=10V, I_D=2.0A$	-	2.1	2.5	Ω
Forward transfer admittance ④	g_{fs}	$V_{DS}=10V, I_D=2.0A$	-	4.0	-	S
Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=25V, f=1MHz$	-	592	789	pF
Output capacitance	C_{oss}		-	54	72	
Reverse transfer capacitance	C_{rss}		-	5.8	7.7	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=300V, I_D=4A$ $R_G=25\Omega$ ③④	-	10	-	ns
Rise time	t_r		-	42	-	
Turn-off delay time	$t_{d(off)}$		-	38	-	
Fall time	t_f		-	46	-	
Total gate charge	Q_g	$V_{DS}=480V, V_{GS}=10V$ $I_D=4A$ ③④	-	13	17	nC
Gate-source charge	Q_{gs}		-	4	-	
Gate-drain charge	Q_{gd}		-	3	-	

Source-Drain Diode Ratings and Characteristics

(Tc=25°C)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Continuous source current	I_S	Integral reverse diode in the MOSFET	-	-	4	A
Source current (Pulsed) ①	I_{SM}		-	-	16	
Forward voltage ④	V_{SD}	$V_{GS}=0V, I_S=4A$	-	-	1.4	V
Reverse recovery time	t_{rr}	$I_S=4A$ $di_s/dt=100A/\mu s$	-	300	-	ns
Reverse recovery charge	Q_{rr}		-	2.2	-	μC

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② $L=25.9mH, I_{AS}=4A, V_{DD}=50V, R_G=27\Omega$, Starting $T_J = 25^\circ C$
- ③ Pulse Test : Pulse Width < 300 μs , Duty cycle $\leq 2\%$
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

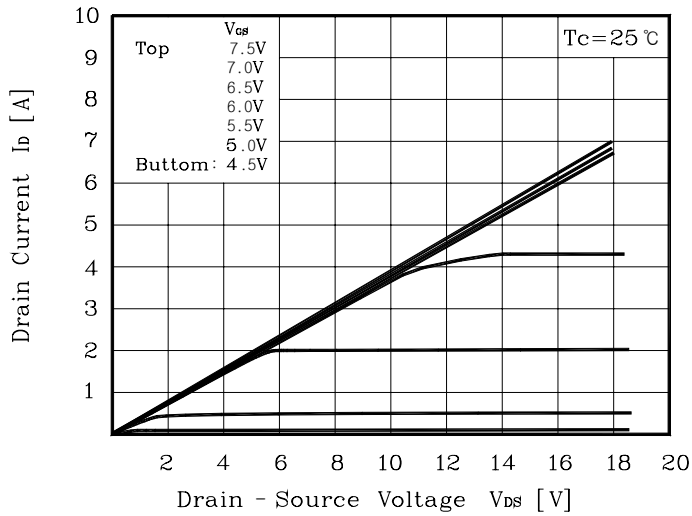


Fig. 2 $I_D - V_{GS}$

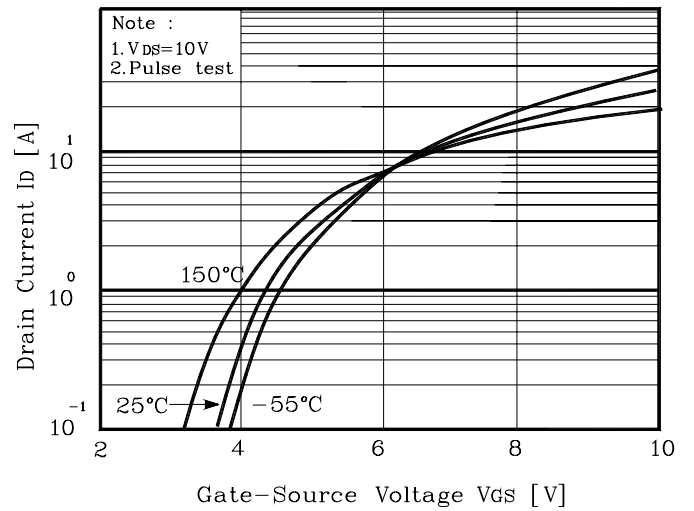


Fig. 3 $R_{DS(on)} - I_D$

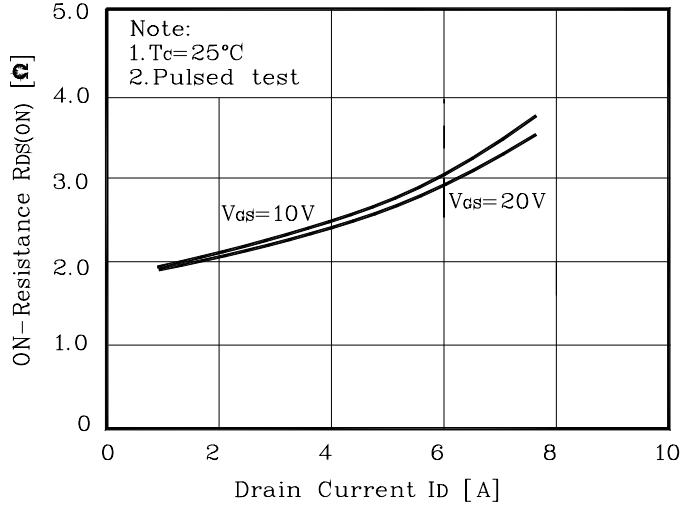


Fig. 4 $I_S - V_{SD}$

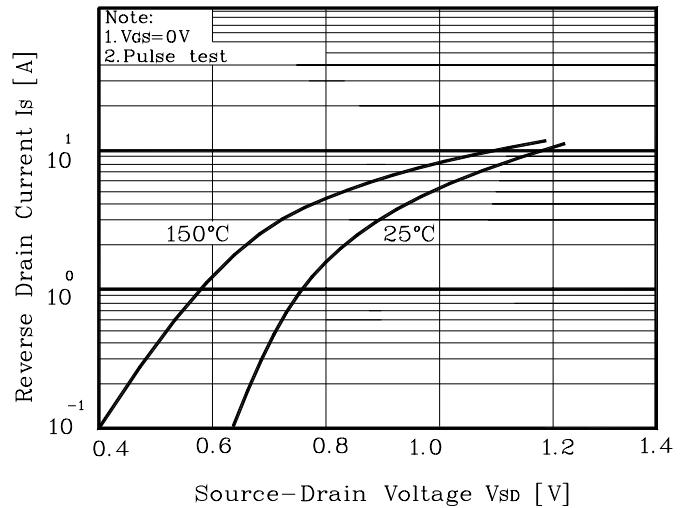


Fig. 5 Capacitance - V_{DS}

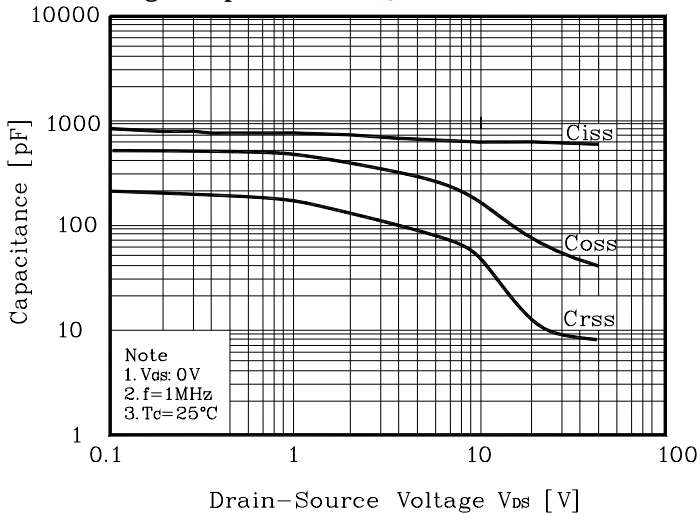
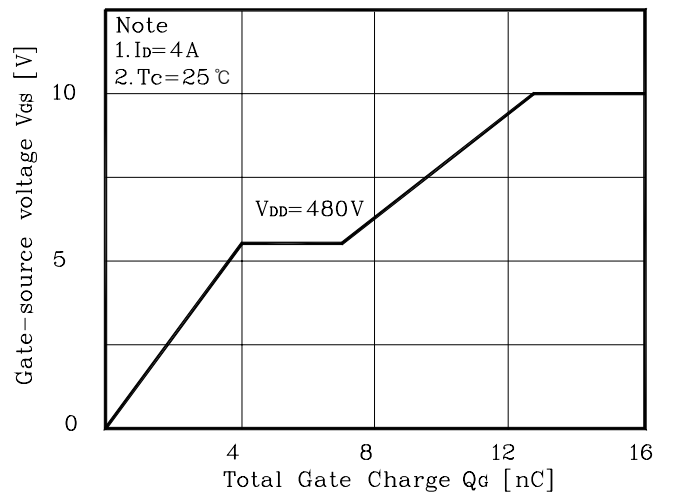


Fig. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

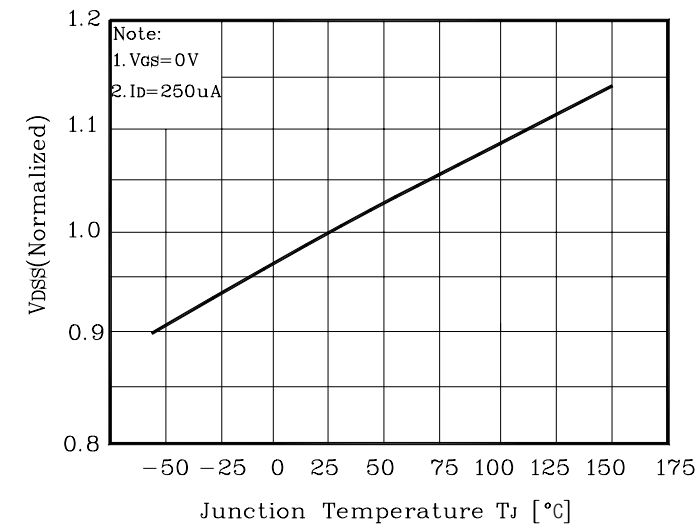


Fig. 8 $R_{DS(on)} - T_J$

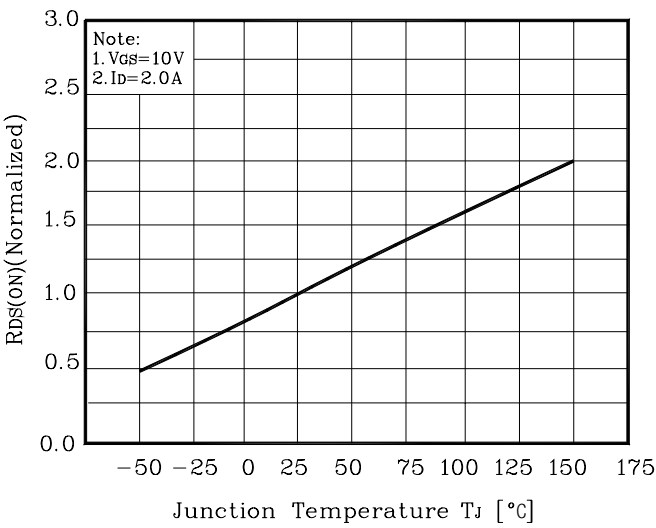


Fig. 9 $I_D - T_C$

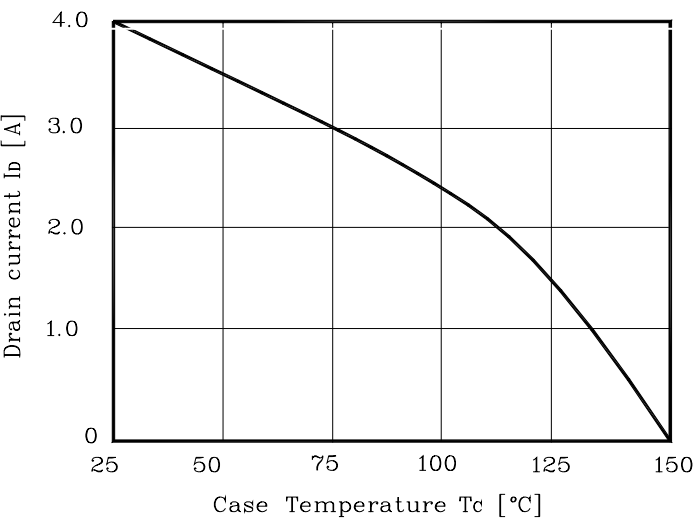


Fig. 10 Safe Operating Area

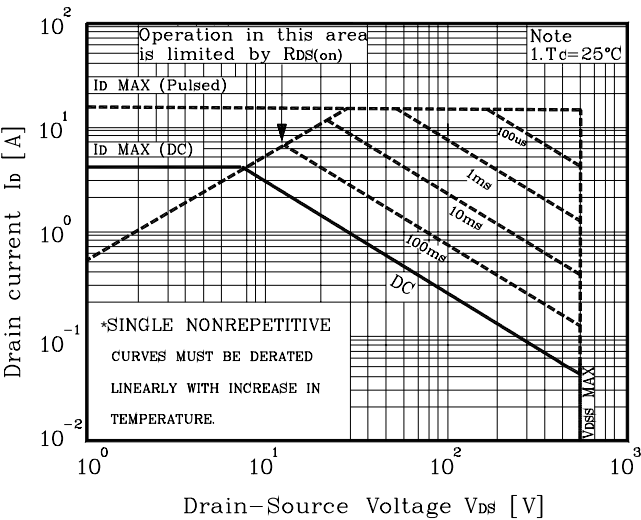


Fig. 11 Gate Charge Test Circuit & Waveform

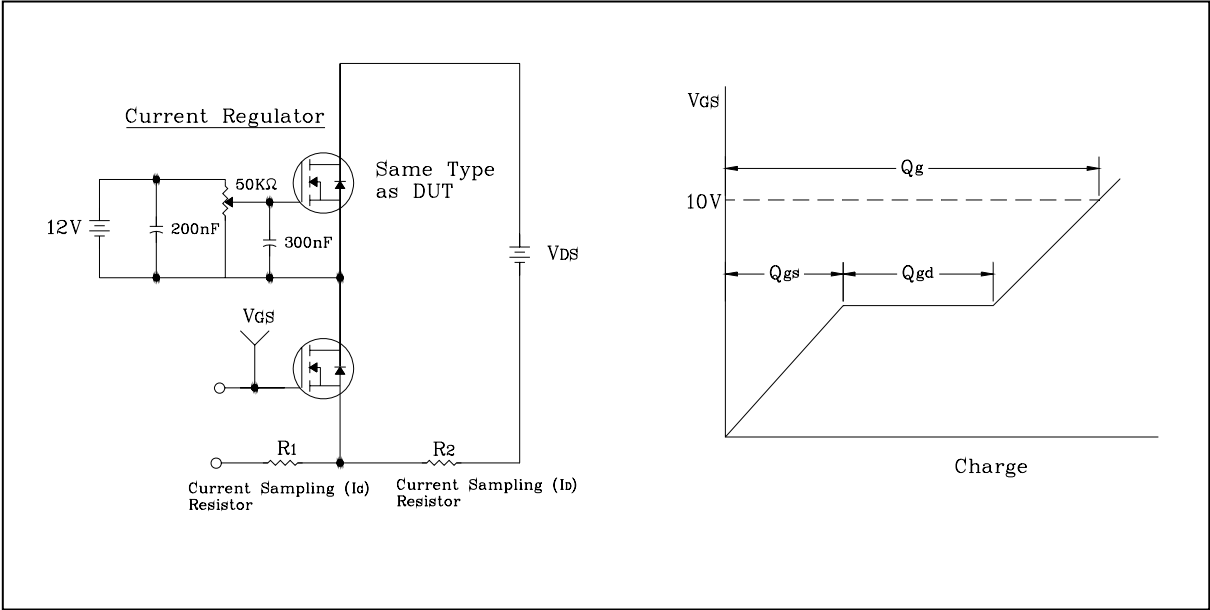


Fig. 12 Resistive Switching Test Circuit & Waveform

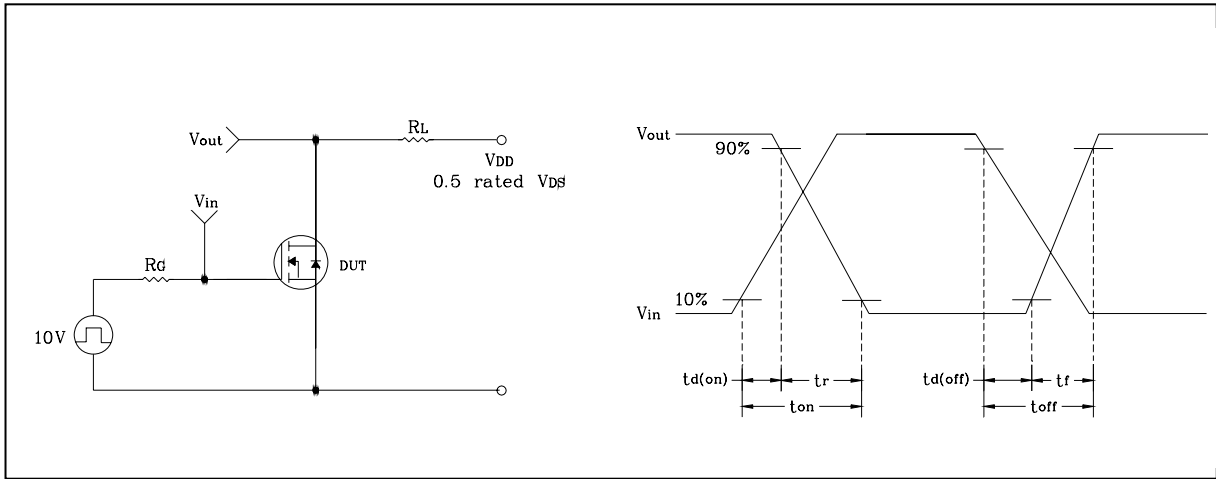


Fig. 13 E_{AS} Test Circuit & Waveform

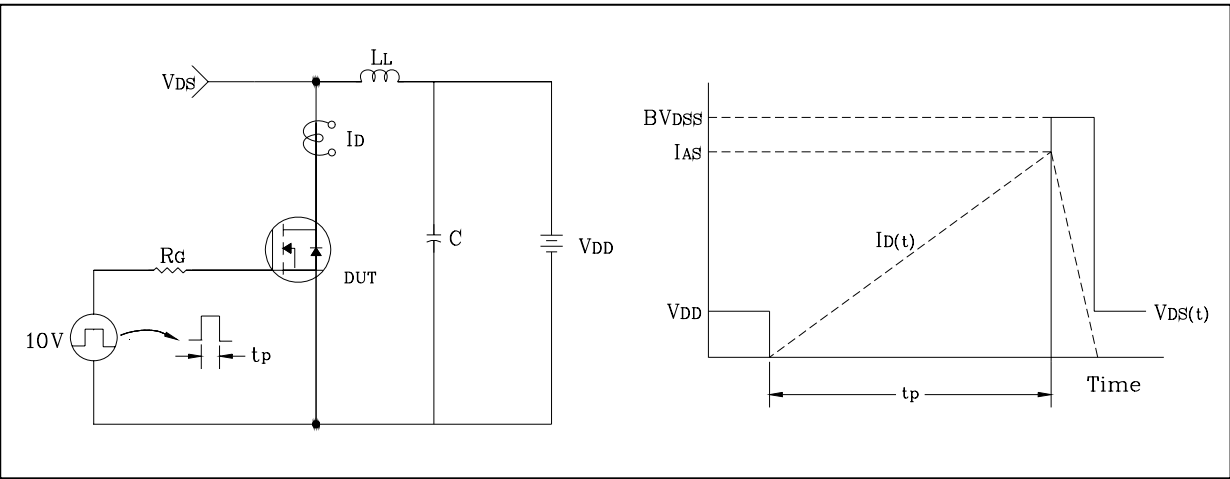
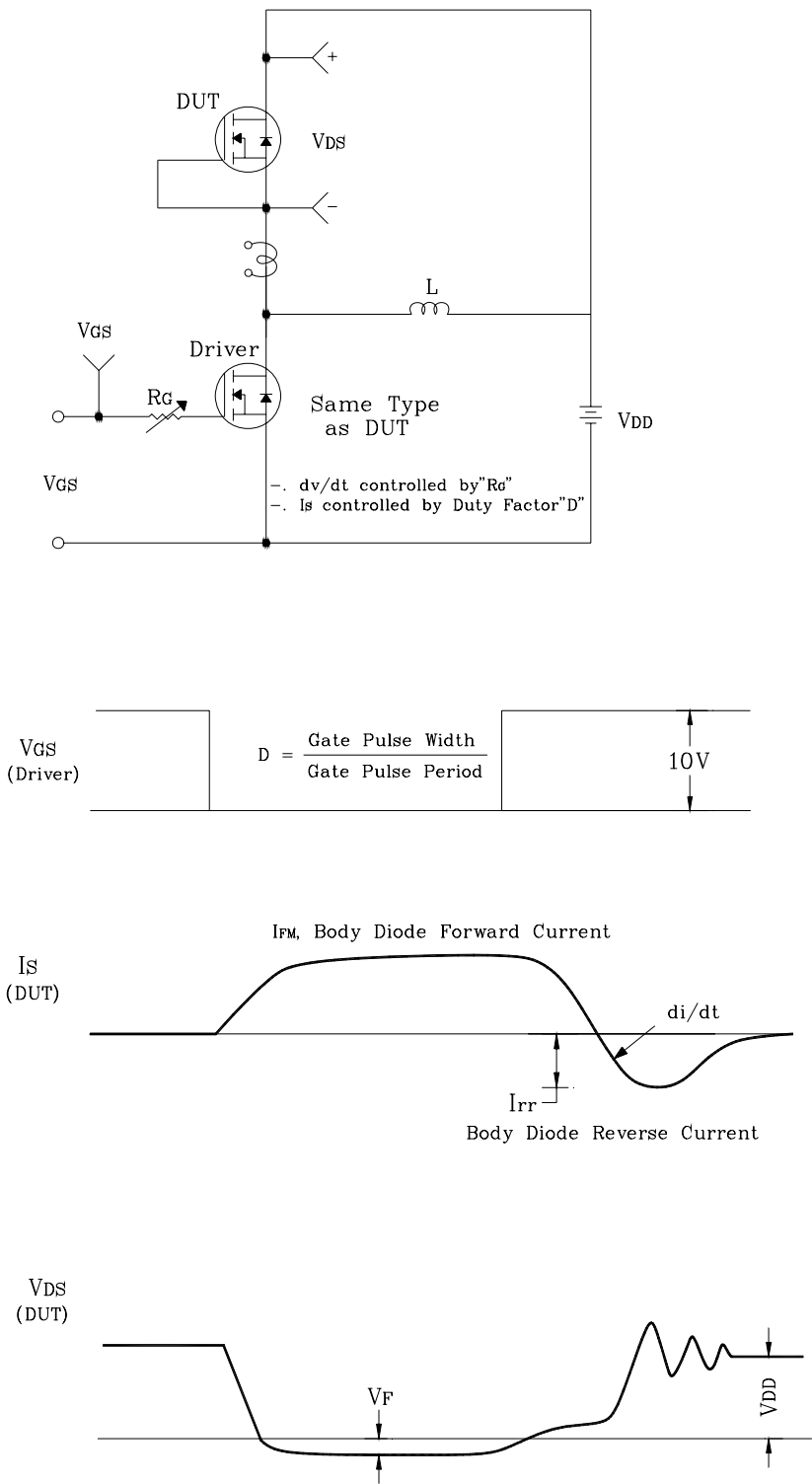


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



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