

SWITCHING REGULATOR APPLICATIONS

Features

- High Voltage : $BV_{DSS}=700V(\text{Min.})$
- Low C_{RSS} : $C_{RSS}=13.7pF(\text{Typ.})$
- Low gate charge : $Q_g=32nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.9\Omega(\text{Max.})$

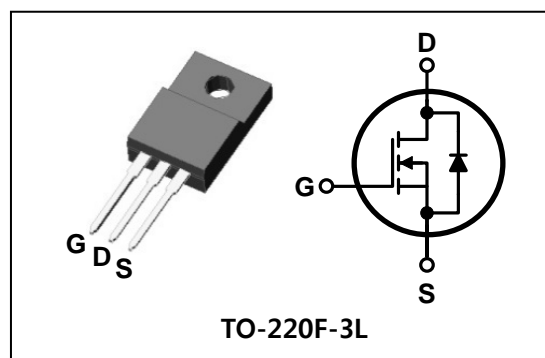
Ordering Information

Type No.	Marking	Package Code
SMK0870F	SMK0870	TO-220F-3L
SMK0870F (HF)	SMK0870	TO-220F-3L

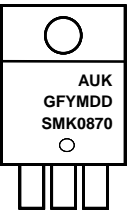
* SMK0870F : Pb Free Product

* SMK0870F (HF) : Halogen Free Product

PIN Connection



Marking Diagram

	Column 1 : Manufacturer
	Column 2 : Production Information e.g.) GFYMDD
	- . G : Option Code (H : Halogen Free) - . F : Factory Management Code - . YMDD : Date Code (Year, Month, Date)
	Column 3 : Device Code

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

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	700	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current (DC) *	I_D	$T_C=25^\circ\text{C}$	8
		$T_C=100^\circ\text{C}$	4.8
Drain current (Pulsed) *	I_{DM}	32	A
Power dissipation	P_D	40	W
Avalanche current (Single) ②	I_{AS}	8	A
Single pulsed avalanche energy ②	E_{AS}	266	mJ
Avalanche current (Repetitive) ①	I_{AR}	8	A
Repetitive avalanche energy ①	E_{AR}	11.6	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	$R_{th(J-C)}$	-	3.1
	Junction-ambient	$R_{th(J-A)}$	-	62.5

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}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	700	-	-	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}	$V_{DS}=700\text{V}$, $V_{GS}=0\text{V}$	-	-	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	$R_{DS(on)}$	$V_{GS}=10\text{V}$, $I_D=4.0\text{A}$	-	0.77	0.90	Ω
Forward transfer conductance ④	g_{fs}	$V_{DS}=10\text{V}$, $I_D=4.0\text{A}$	-	11	-	S
Input capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$ $f=1\text{ MHz}$	-	2006	2507	pF
Output capacitance	C_{oss}		-	148	185	
Reverse transfer capacitance	C_{rss}		-	13.7	17.1	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=300\text{V}$, $I_D=8\text{A}$ $R_G=25\Omega$	-	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	$V_{DS}=560\text{V}$, $V_{GS}=10\text{V}$ $I_D=8\text{A}$	-	32	40	nC
Gate-source charge	Q_{gs}		-	9	-	
Gate-drain charge	Q_{gd}		-	8	-	

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	-	-	8	A
Source current (Pulsed) ①	I_{SM}		-	-	32	
Forward voltage ④	V_{SD}	$V_{GS}=0\text{V}$, $I_S=8\text{A}$	-	-	1.4	V
Reverse recovery time	t_{rr}	$I_S=8\text{A}$, $V_{GS}=0\text{V}$ $dI_F/dt=100\text{A}/\mu\text{s}$	-	420	-	ns
Reverse recovery charge	Q_{rr}		-	4.2	-	μC

Note ;

- ① Repetitive rating : Pulse width limited by maximum junction temperature
- ② $L=7.74\text{mH}$, $I_{AS}=8\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, 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 $I_D - V_{DS}$

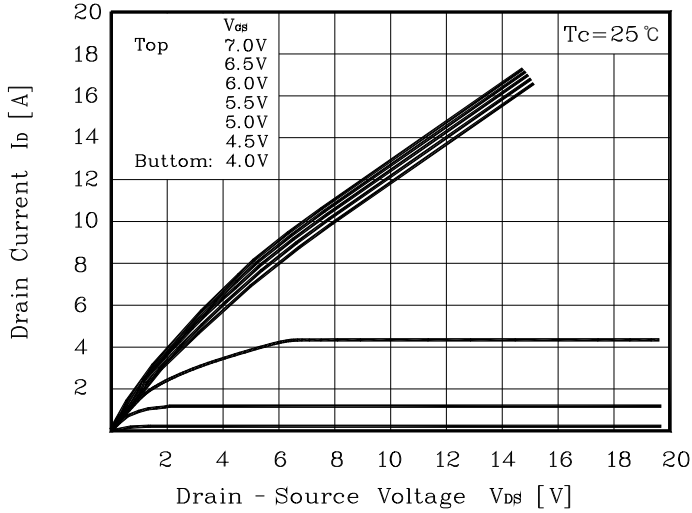


Fig. 2 $I_D - V_{GS}$

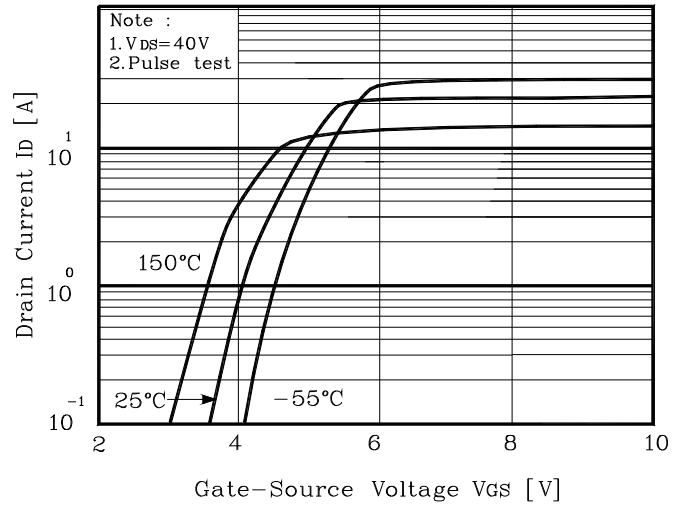


Fig. 3 $R_{DS(on)} - I_D$

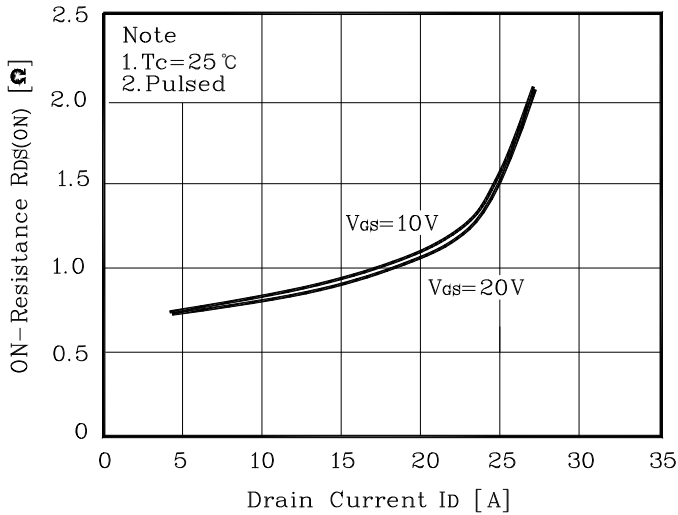


Fig. 4 $I_S - V_{SD}$

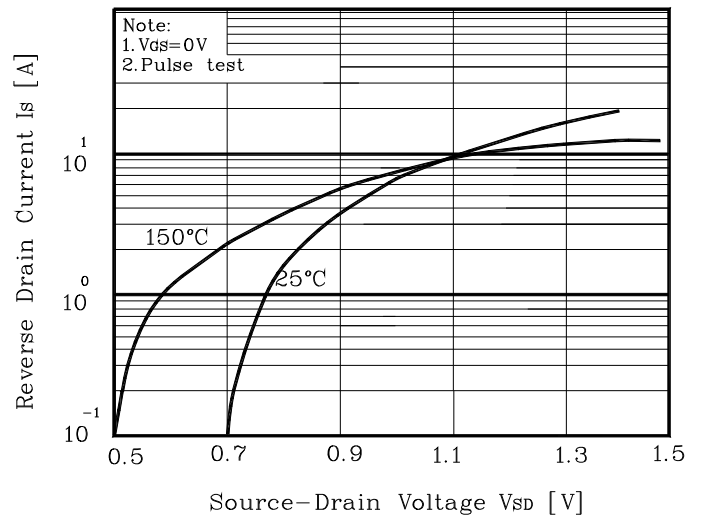


Fig. 5 Capacitance - V_{DS}

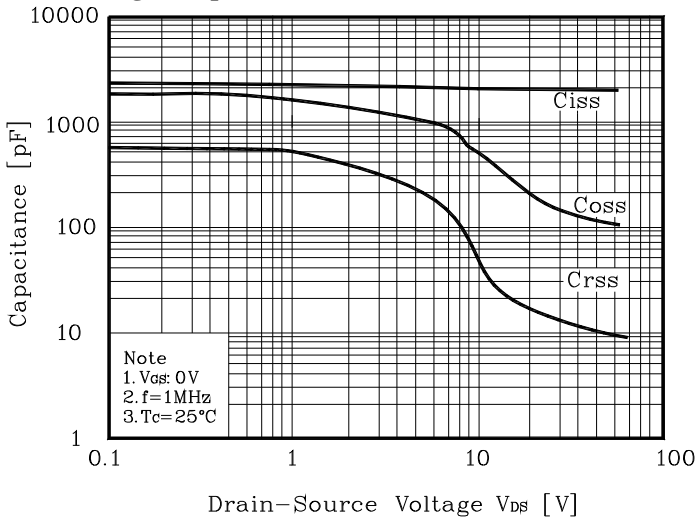
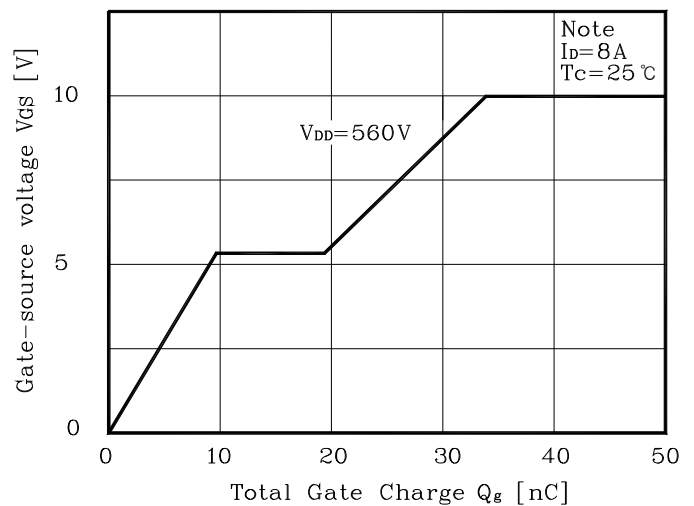


Fig. 6 $V_{GS} - Q_g$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

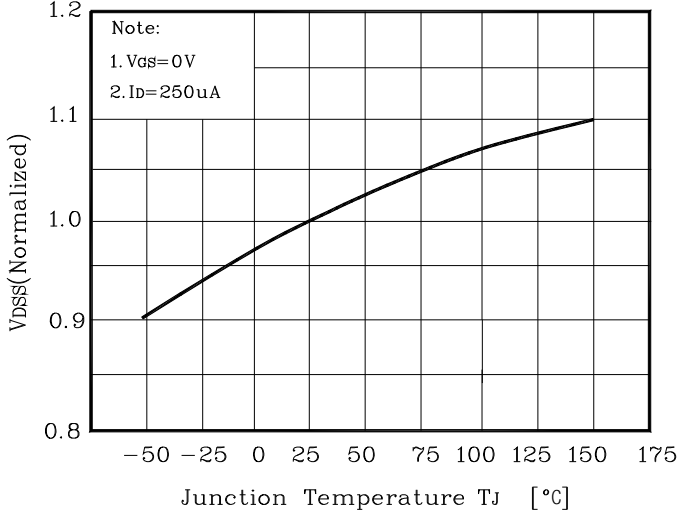


Fig.8 $R_{DS(on)} - T_J$

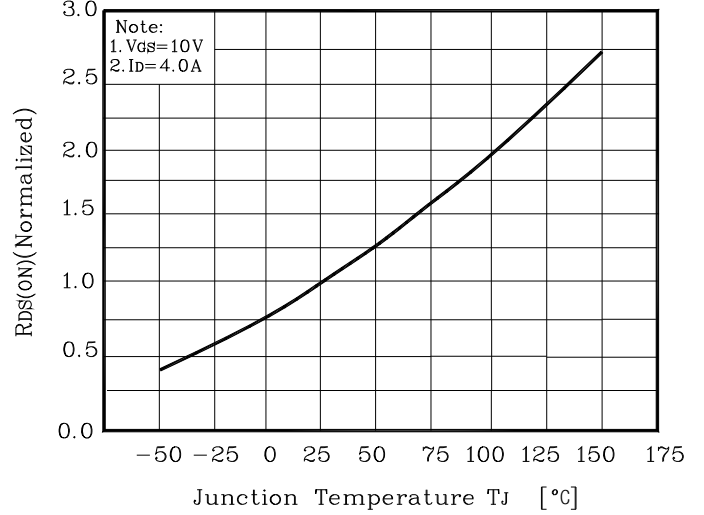


Fig. 9 $I_D - T_C$

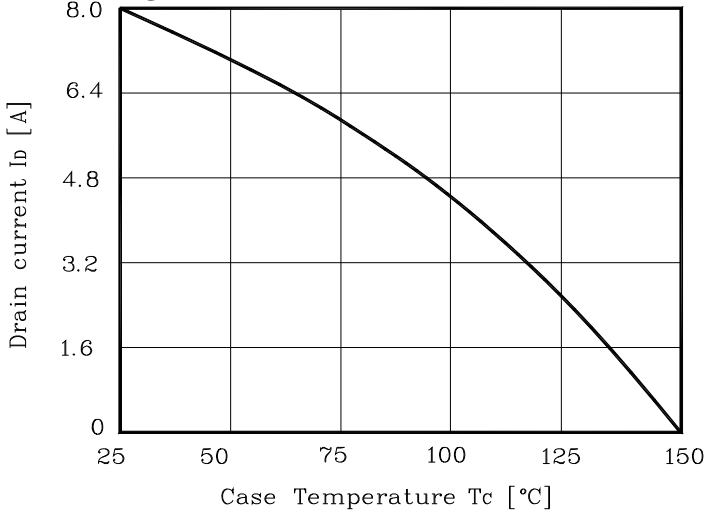


Fig. 10 Safe Operating Area

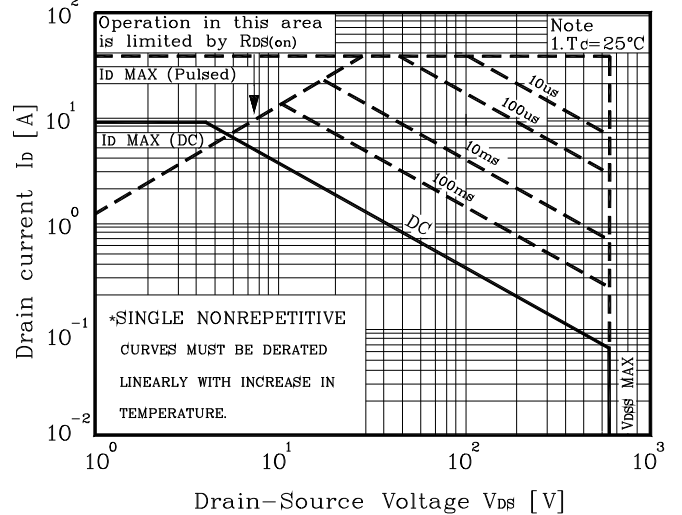


Fig. 11 Gate Charge Test Circuit & Waveform

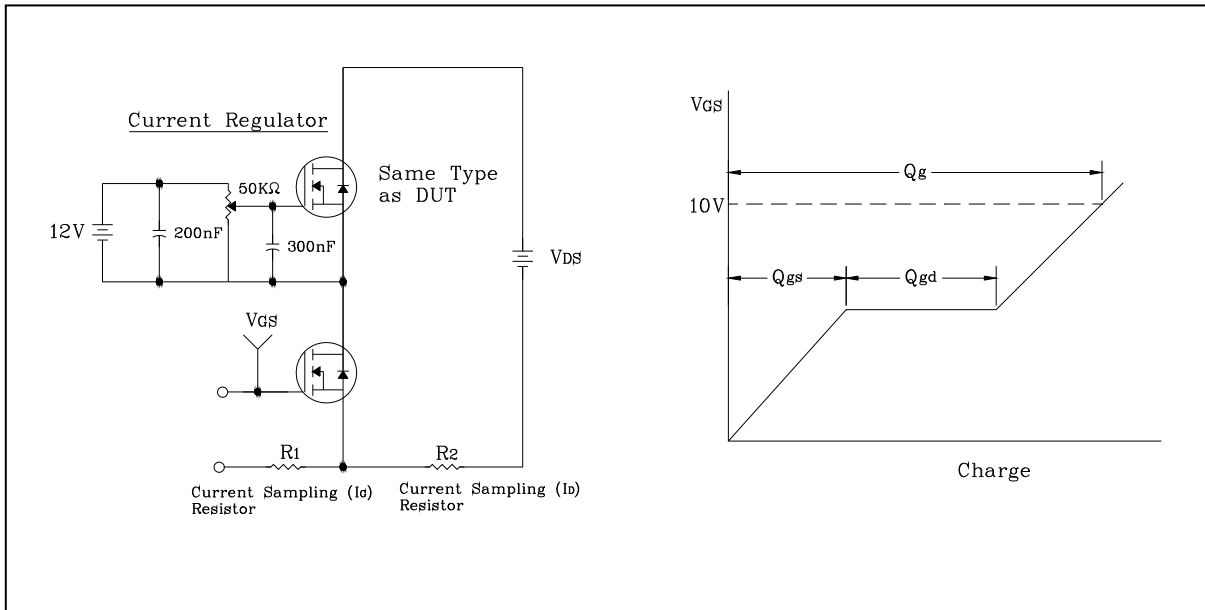


Fig. 12 Resistive Switching Test Circuit & Waveform

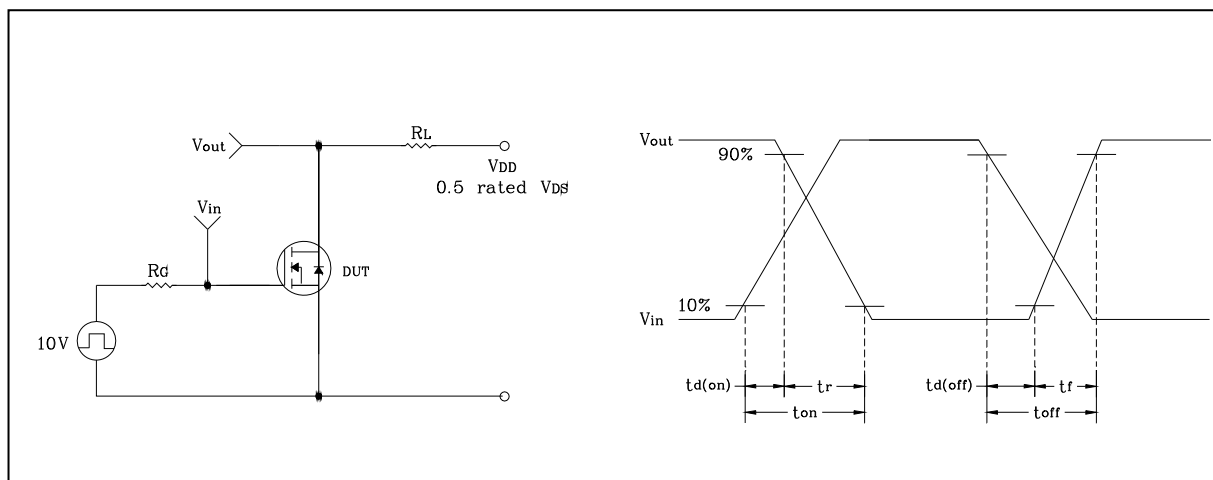


Fig. 13 E_{AS} Test Circuit & Waveform

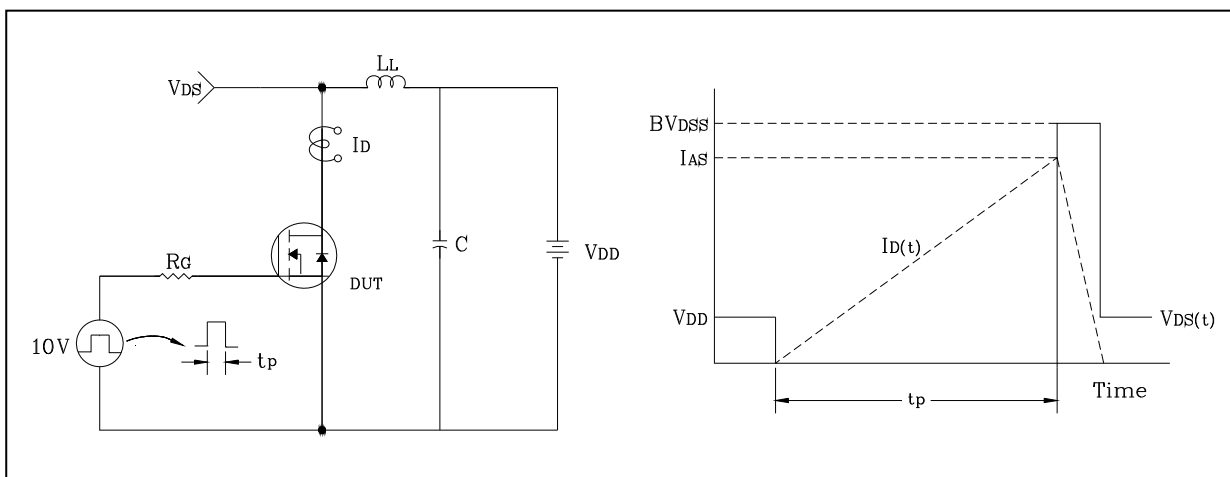
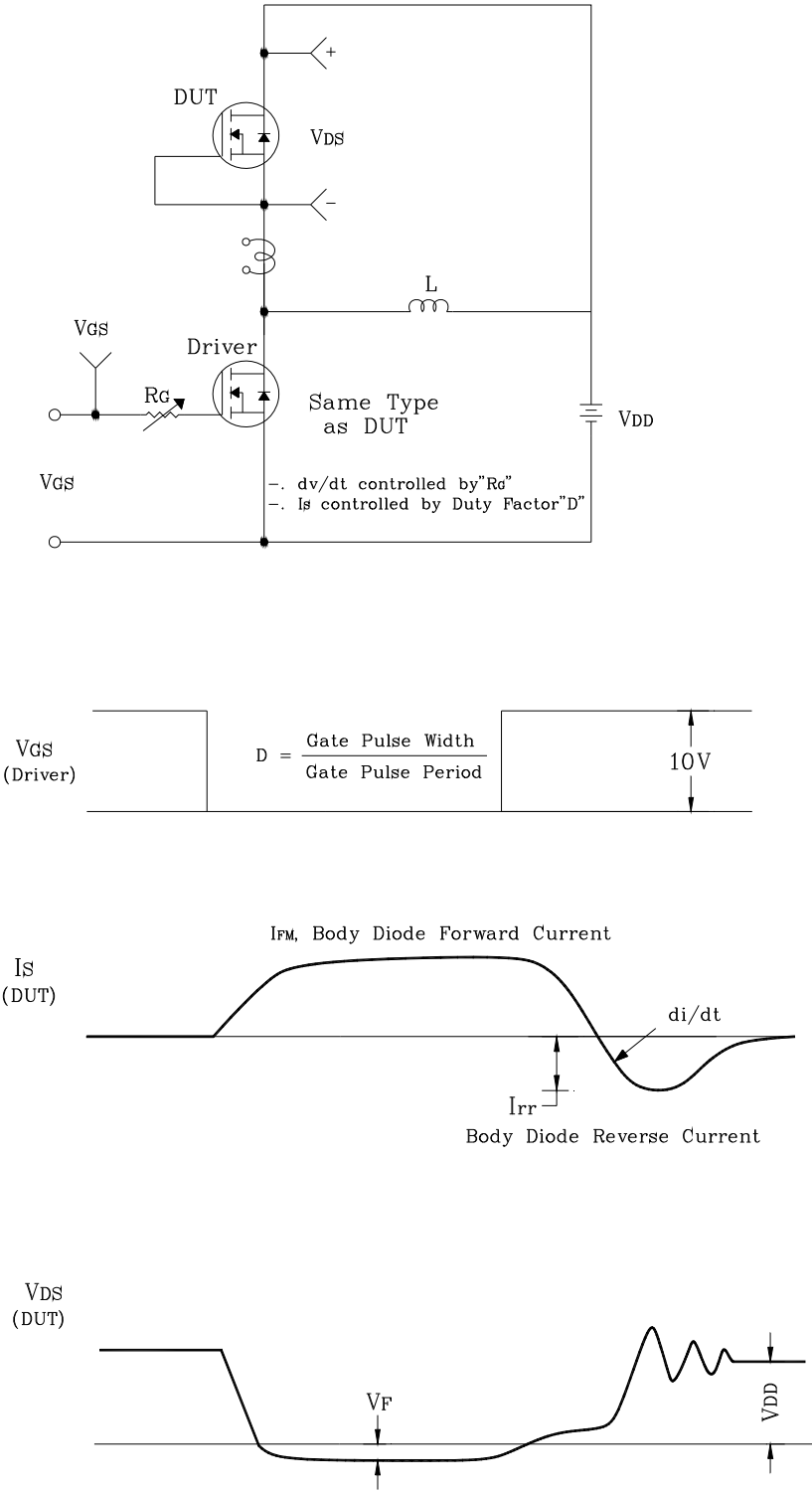
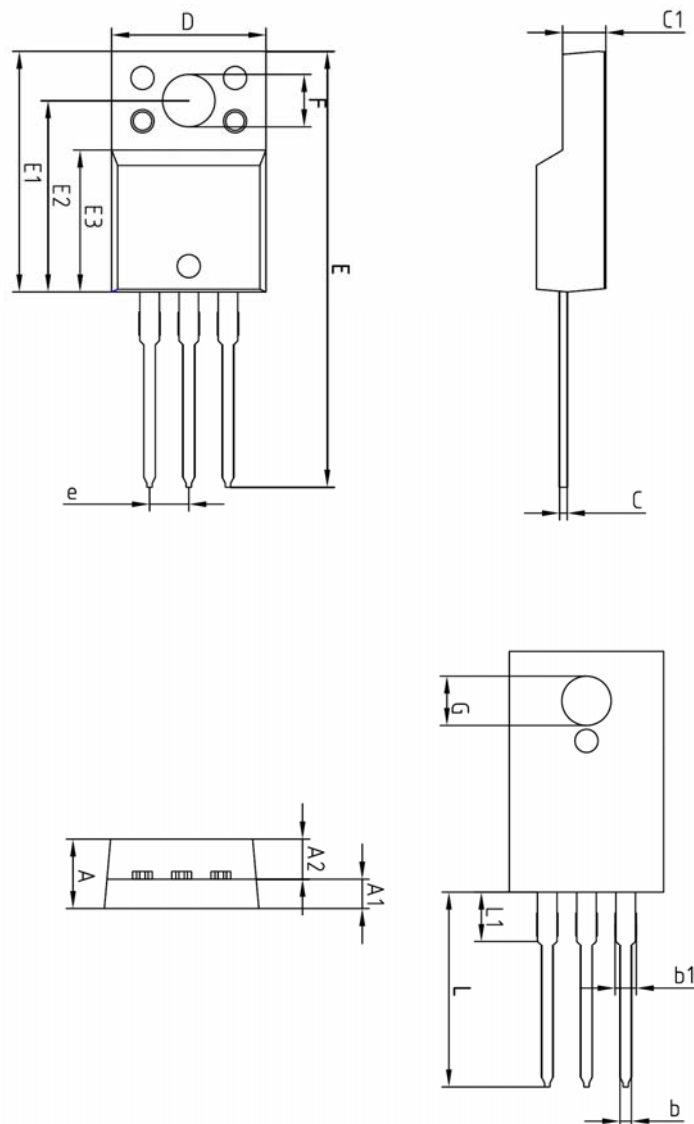


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension

unit: mm



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			

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