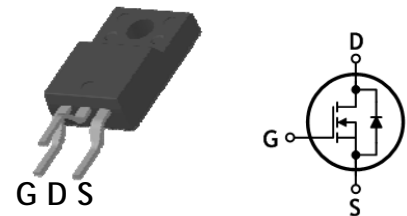


## SWITCHING REGULATOR APPLICATION

### Features

- High voltage:  $BV_{DSS}=250V$  (Min.)
- Low gate charge:  $Q_g=14.5nC$  (Typ.)
- Low drain-source On resistance:  $R_{DS(on)}=0.43\Omega$  (Max.)
- 100% avalanche tested
- RoHS compliant device

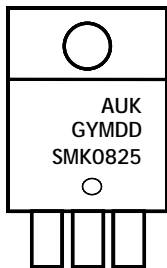


### Ordering Information

Part Number	Marking	Package
SMK0825FZ	SMK0825	TO-220F-3L (Z-Forming)

TO-220F-3L

### Marking Information



Column 1 : Manufacturer  
 Column 2 : Production Information  
 e.g.) GYMDD  
 -. G : Factory Management Code  
 -. YMDD : Date Code (Year, Month, Date)  
 Column 3 : Device Code

### Absolute maximum ratings ( $T_c=25^\circ C$ unless otherwise noted)

Characteristic	Symbol	Rating	Unit	
Drain-source voltage	$V_{DSS}$	250	V	
Repetitive Avalanche Voltage <sup>(Note 1, 2)</sup>	$V_{DS(Avalanche)}$	300	V	
Gate-source voltage	$V_{GSS}$	$\pm 30$	V	
Drain current (DC) *	$I_D$	$T_c=25^\circ C$	8	A
		$T_c=100^\circ C$	5.2	A
Drain current (Pulsed) *	$I_{DM}$	32	A	
Single pulsed avalanche energy <sup>(Note 2)</sup>	$E_{AS}$	356	mJ	
Repetitive avalanche current <sup>(Note 1)</sup>	$I_{AR}$	8	A	
Repetitive avalanche energy <sup>(Note 1)</sup>	$E_{AR}$	7.4	mJ	
Power dissipation	$P_D$	29	W	
Junction temperature	$T_J$	150	$^\circ C$	
Storage temperature range	$T_{stg}$	-55~150	$^\circ C$	

\* Limited only maximum junction temperature

## Thermal Characteristics

Characteristic	Symbol	Rating	Unit
Thermal resistance, junction to case	$R_{th(j-c)}$	Max. 4.31	°C/W
Thermal resistance, junction to ambient	$R_{th(j-a)}$	Max. 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	$BV_{DSS}$	$I_D=250\mu\text{A}$ , $V_{GS}=0$	250	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu\text{A}$ , $V_{DS}=V_{GS}$	2	-	4	V
Drain-source cut-off current	$I_{DSS}$	$V_{DS}=250\text{V}$ , $V_{GS}=0\text{V}$	-	-	1	$\mu\text{A}$
Gate leakage current	$I_{GSS}$	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 30\text{V}$	-	-	$\pm 100$	nA
Drain-source on-resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$ , $I_D=4\text{A}$	-	0.35	0.43	$\Omega$
Internal gate resistance	$R_G$	$f=1\text{MHz}$ , $V_{DS}=0\text{V}$	-	4	10	$\Omega$
Forward transfer conductance (Note 3)	$g_{fs}$	$V_{DS}=10\text{V}$ , $I_D=4\text{A}$	-	7	-	S
Input capacitance	$C_{iss}$	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1\text{MHz}$	-	619	773	pF
Output capacitance	$C_{oss}$		-	141	176	
Reverse transfer capacitance	$C_{rss}$		-	33	41	
Turn-on delay time (Note 3,4)	$t_{d(on)}$	$V_{DD}=125\text{V}$ , $I_D=8\text{A}$ $R_G=25\Omega$	11	15	35	ns
Rise time (Note 3,4)	$t_r$		32	85	115	
Turn-off delay time (Note 3,4)	$t_{d(off)}$		62	90	135	
Fall time (Note 3,4)	$t_f$		41	65	98	
Total gate charge (Note 3,4)	$Q_g$	$V_{DS}=200\text{V}$ , $V_{GS}=10\text{V}$ $I_D=8\text{A}$	-	14.5	18.2	nC
Gate-source charge (Note 3,4)	$Q_{gs}$		-	4	-	
Gate-drain charge (Note 3,4)	$Q_{gd}$		-	4.5	-	

## Source-Drain Diode Ratings and Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise noted)

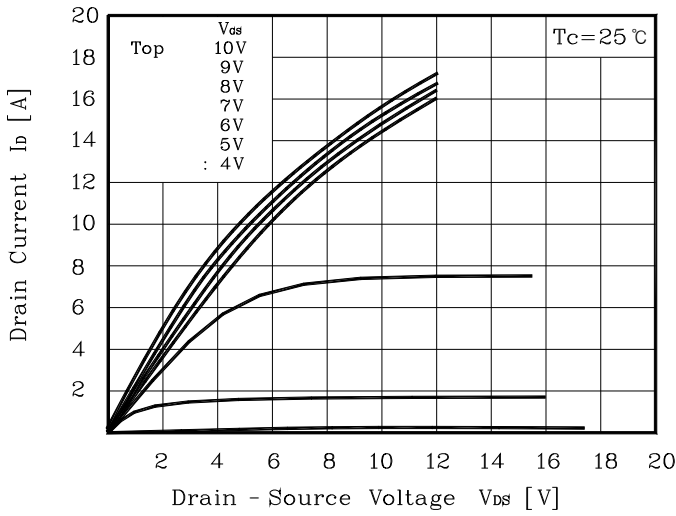
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Source current (DC)	$I_S$	Integral reverse diode in the MOSFET	-	-	8	A
Source current (Pulsed)	$I_{SM}$		-	-	32	A
Forward voltage	$V_{SD}$	$V_{GS}=0\text{V}$ , $I_S=8\text{A}$	-	-	1.4	V
Reverse recovery time (Note 3,4)	$t_{rr}$	$I_S=8\text{A}$ , $V_{GS}=0\text{V}$ $di_F/dt=100\text{A}/\mu\text{s}$	-	178	-	ns
Reverse recovery charge (Note 3,4)	$Q_{rr}$		-	1.16	-	$\mu\text{C}$

Note:

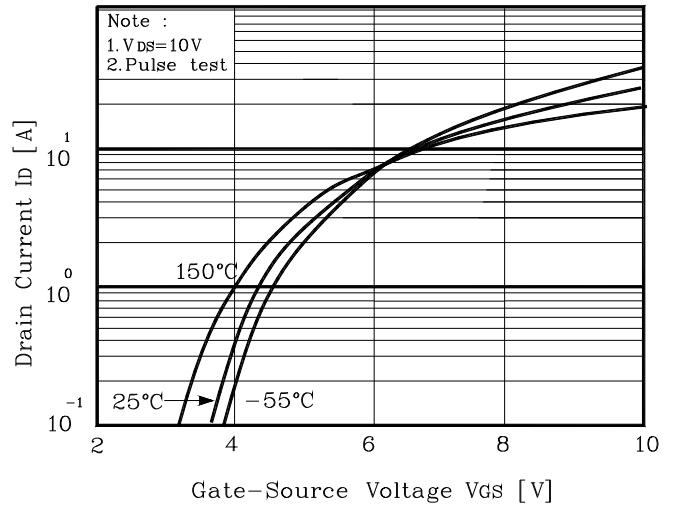
1. Repeated rating: Pulse width limited by maximum junction temperature
2.  $L=8.9\text{mH}$ ,  $I_{AS}=8\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
3. Pulse test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$
4. Essentially independent of operating temperature typical characteristics

## Electrical Characteristic Curves

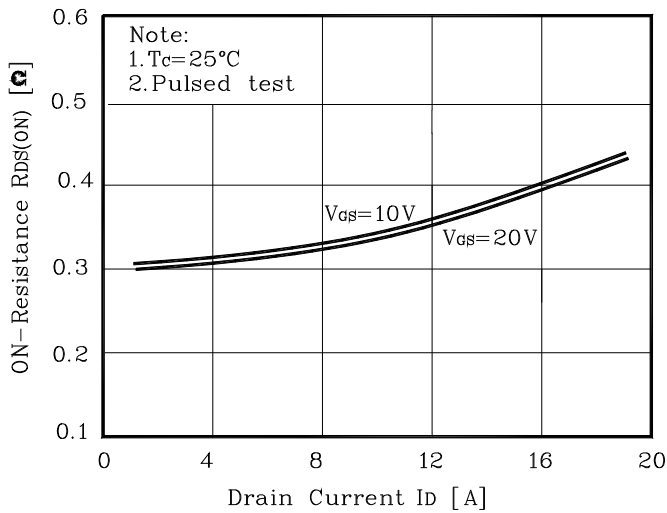
**Fig. 1  $I_D - V_{DS}$**



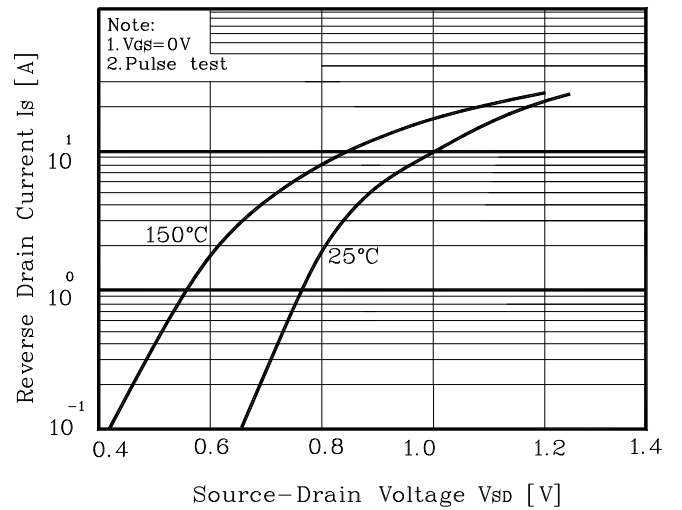
**Fig. 2  $I_D - V_{GS}$**



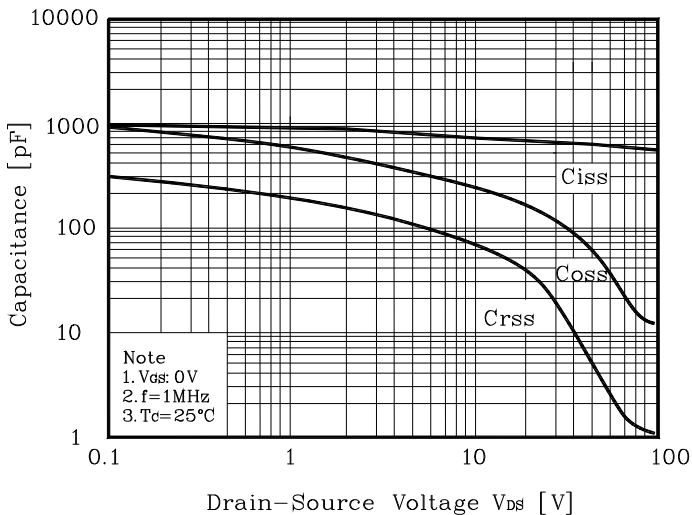
**Fig. 3  $R_{DS(ON)} - I_D$**



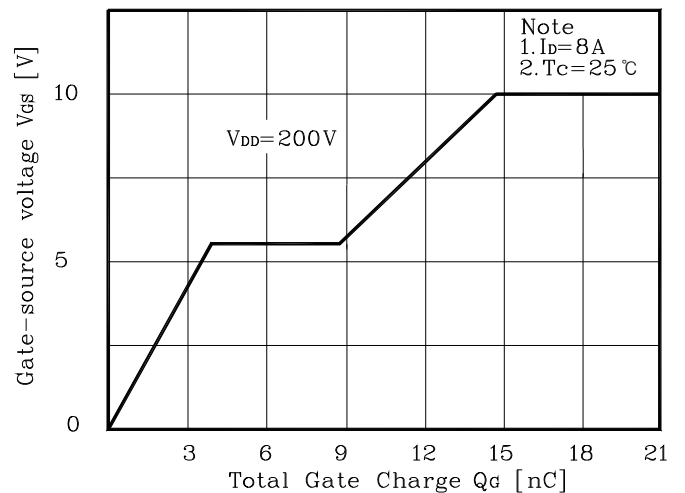
**Fig. 4  $I_S - V_{SD}$**



**Fig. 5 Capacitance -  $V_{DS}$**



**Fig. 6  $V_{GS} - Q_G$**



Electrical Characteristic Curves (Continue)

Fig. 7  $V_{DSS} - T_J$

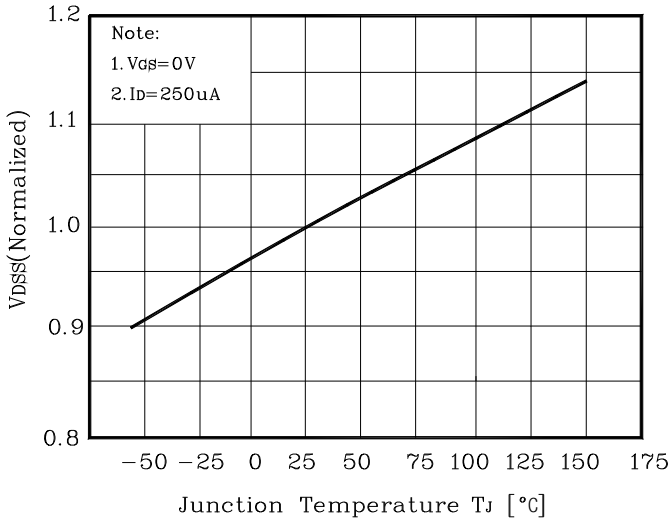


Fig. 8  $R_{DS(ON)} - T_J$

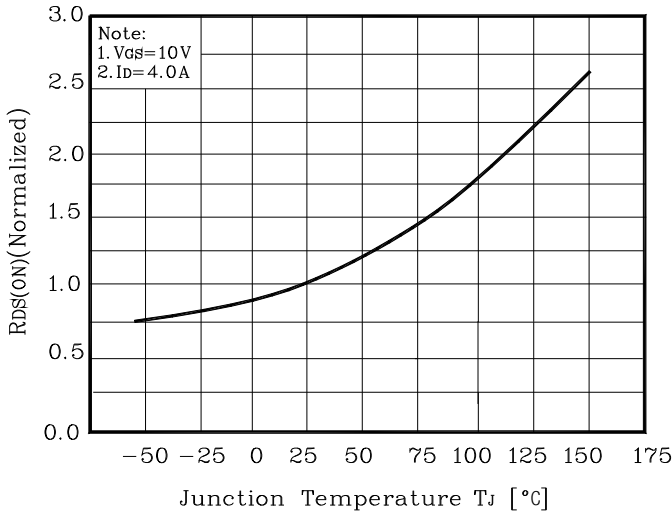


Fig. 9  $I_D - T_C$

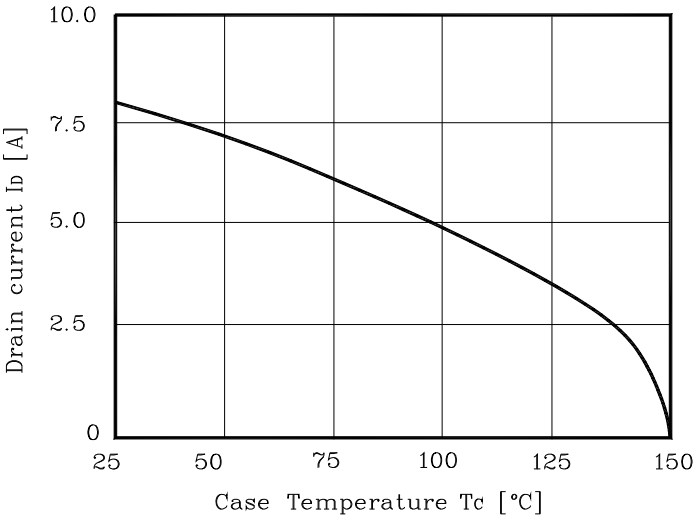


Fig. 10 Safe Operating Area

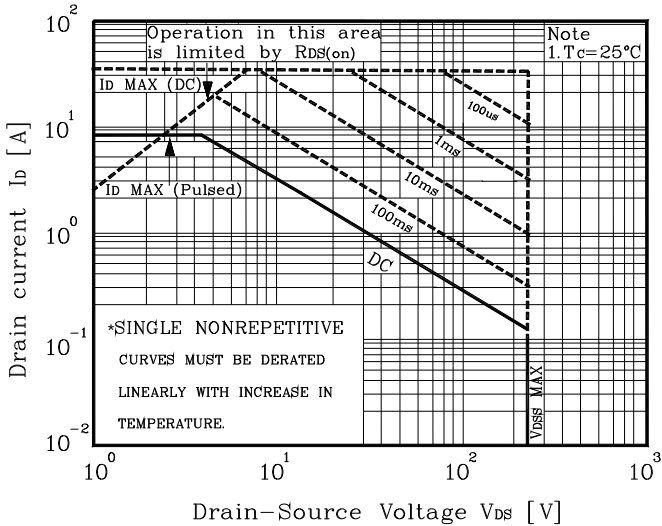


Fig. 11 Gate Charge Test Circuit & Waveform

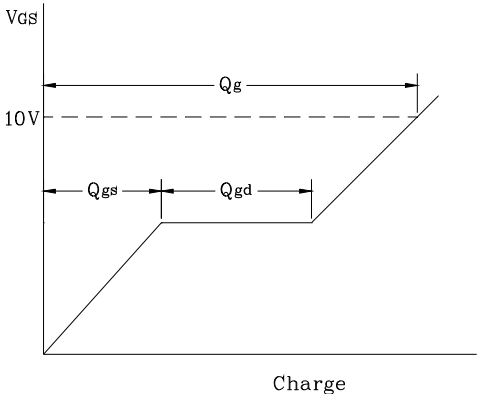
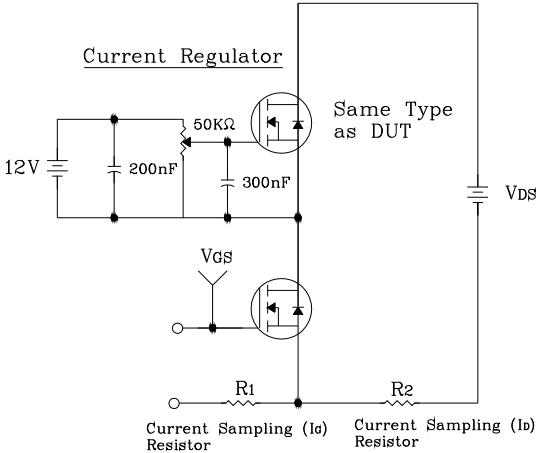


Fig. 12 Resistive Switching Test Circuit & Waveform

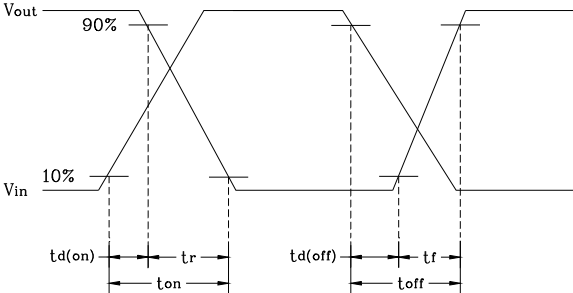
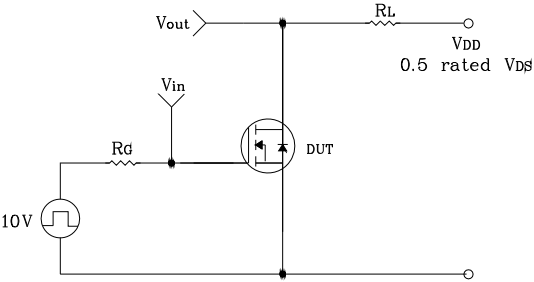


Fig. 13 EAS Test Circuit & Waveform

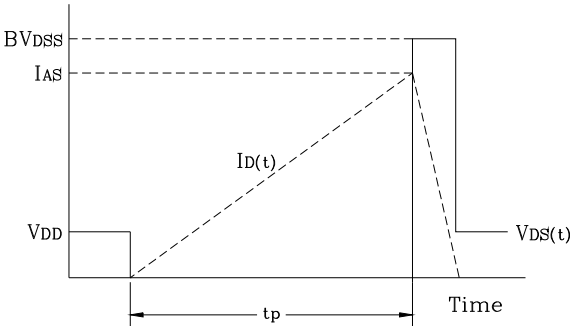
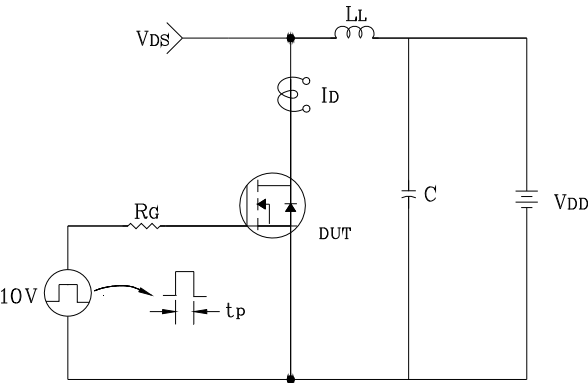
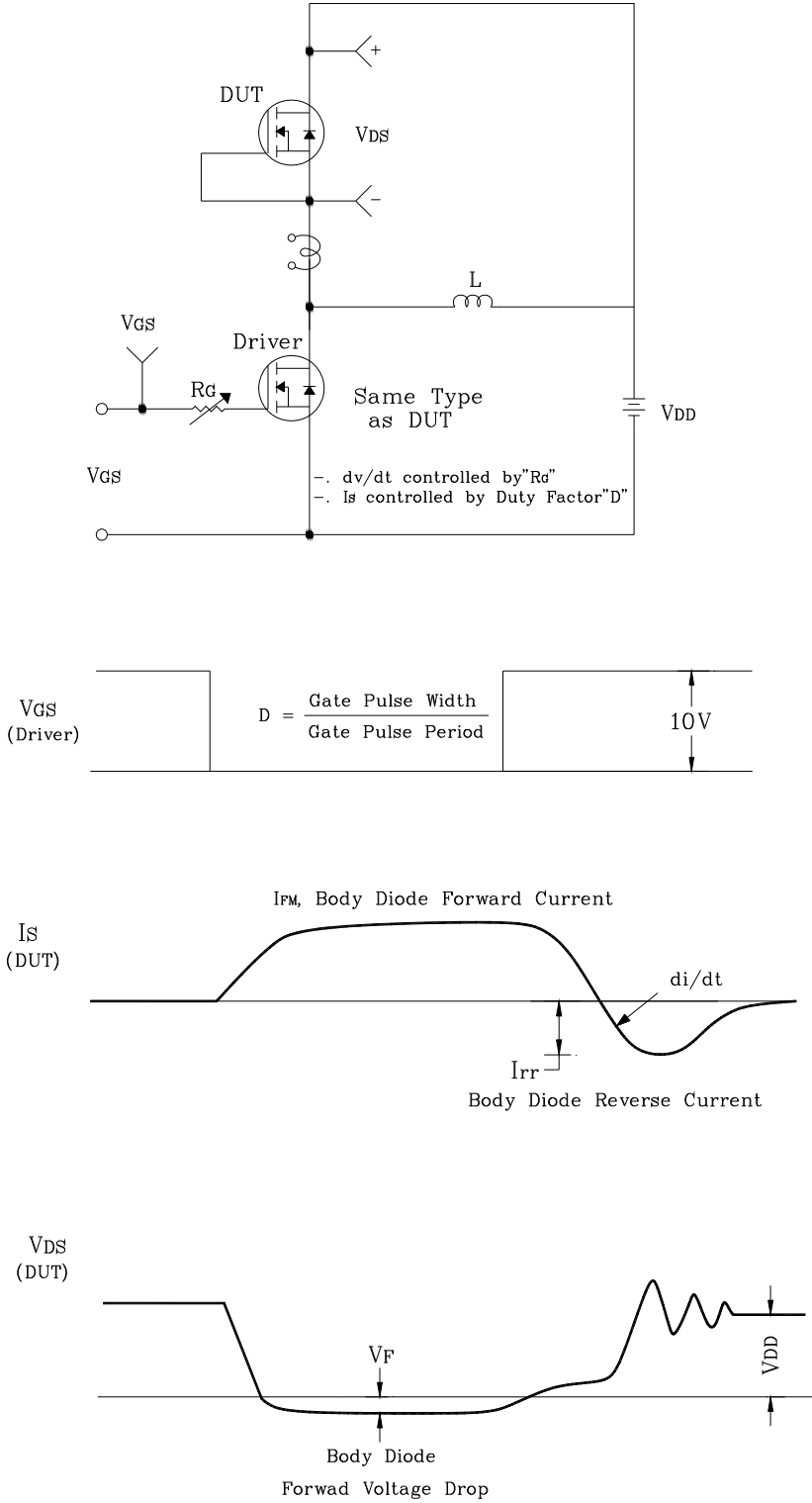
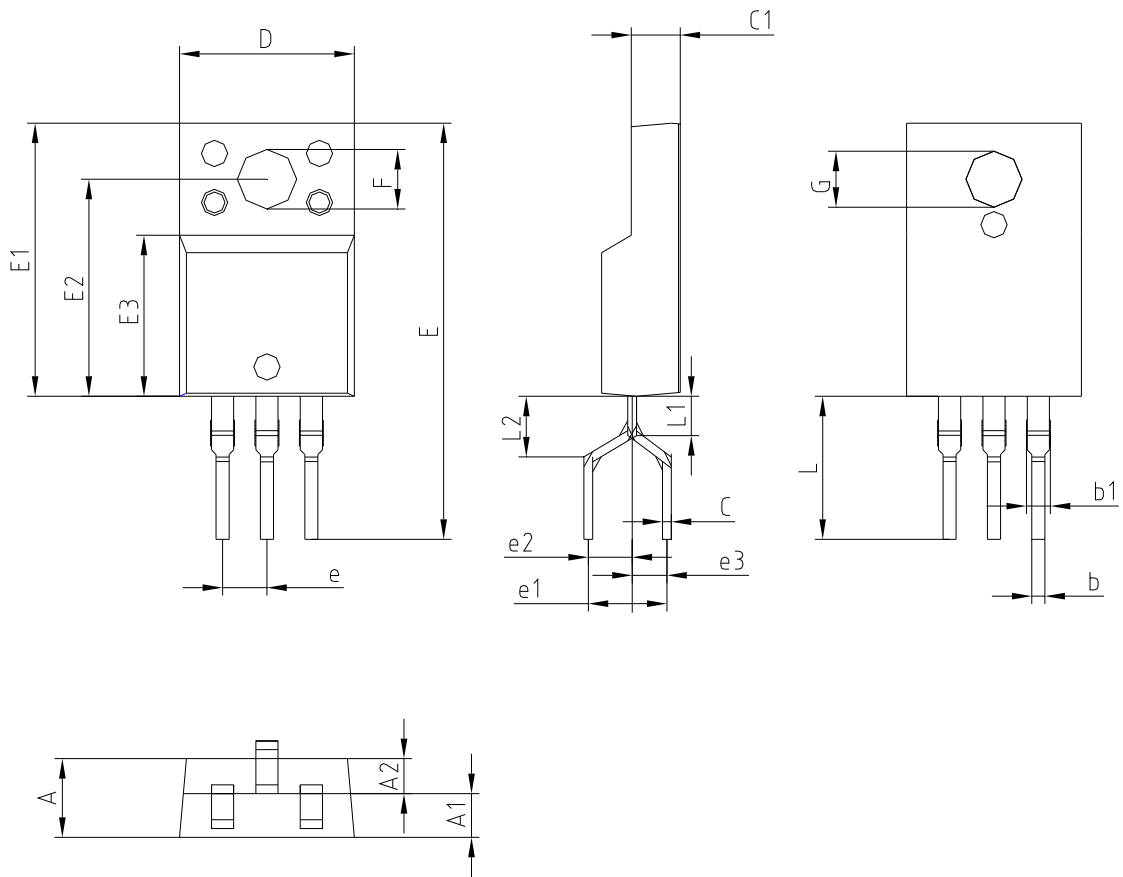


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



## Package Outline Dimensions



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	22.77	-	24.77	
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			
e1	4.20	4.50	4.80	
e2	2.51 BSC			
e3	1.99 BSC			
L	7.17	-	9.17	
L1	2.25 BSC			
L2	3.46 BSC			

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