

SWITCHING REGULATOR APPLICATIONS
Features

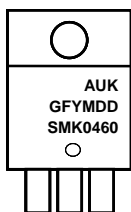
- High Voltage : $BV_{DSS}=600V(\text{Min.})$
- Low C_{rss} : $C_{rss}=9.8pF(\text{Typ.})$
- Low gate charge : $Q_g=12nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=2.5\Omega(\text{Max.})$

Ordering Information

Type No.	Marking	Package Code
SMK0460F	SMK0460	TO-220F-3L
SMK0460F (HF)	SMK0460	TO-220F-3L

* SMK0460F: Pb-Free Product

* SMK0460F (HF) : Halogen Free Product

Marking Diagram


Column 1 : Manufacturer

Column 2 : Production Information

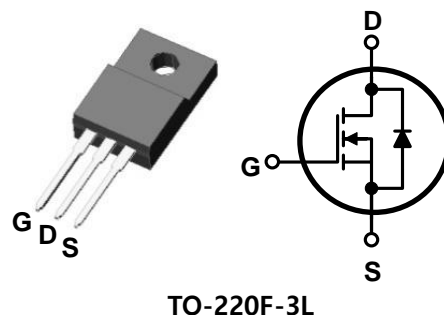
e.g.) GFYMDD

- . G : Option Code (H : Halogen Free)

- . F : Factory Management Code

- . YMDD : Date Code (Year, Month, Date)

Column 3 : Device Code

PIN Connection


TO-220F-3L

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

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	600	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current (DC) *	I_D	($T_c=25^\circ\text{C}$)	4
		($T_c=100^\circ\text{C}$)	2.53
Drain current (Pulsed) *	I_{DM}	16	A
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	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55~150	

* Limited by maximum junction temperature

Characteristic	Symbol	Typ.	Max.	Unit
Thermal resistance	Junction-case	$R_{th(J-C)}$	-	4.16
	Junction-ambient	$R_{th(J-A)}$	-	62.5

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	600	-	-	V	
Gate threshold voltage	V _{GS(th)}	I _D =250μA, V _{DS} =V _{GS}	2.0	-	4.0	V	
Drain-source cut-off current	I _{DSS}	V _{DS} =600V, 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 =2.0A	-	2.1	2.5	Ω	
Forward transfer conductance 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	-	670	848	pF	
Output capacitance	C _{oss}		-	57	71		
Reverse transfer capacitance	C _{rss}		-	9.8	12.2		
Turn-on delay time	t _{d(on)}	V _{DD} =300V, I _D =4.0A R _G =25Ω	-	10	-	ns	
Rise time	t _r		-	42	-		
Turn-off delay time	t _{d(off)}		③④	-	38		-
Fall time	t _f		-	46	-		
Total gate charge	Q _g	V _{DS} =480V, V _{GS} =10V I _D =4.0A	-	12	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	-	-	4	A
Source current (Pulsed) ①	I _{SM}		-	-	16	
Forward voltage ④	V _{SD}	V _{GS} =0V, I _S =4.0A	-	-	1.4	V
Reverse recovery time	t _{rr}	I _S =4.0A, V _{GS} =0V dI _F /dt=100A/μs	-	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}=4.0A, V_{DD}=50V, R_G=25Ω, Starting T_J=25 °C
- ③ Pulse Test : Pulse width≤300us, Duty cycle≤2%
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

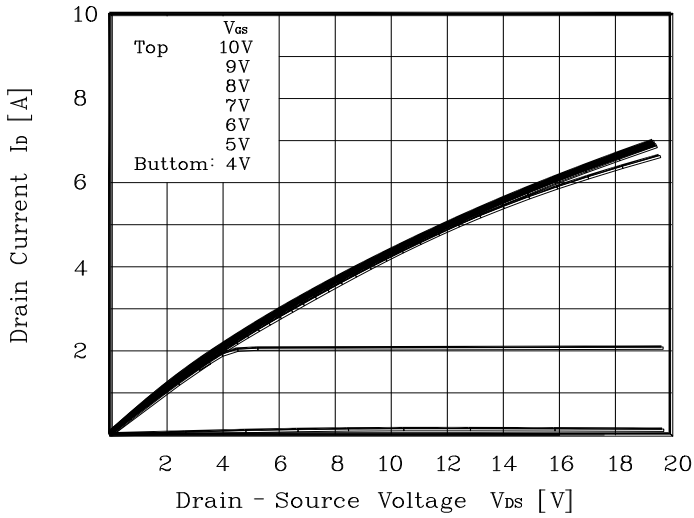


Fig. 2 $I_D - V_{GS}$

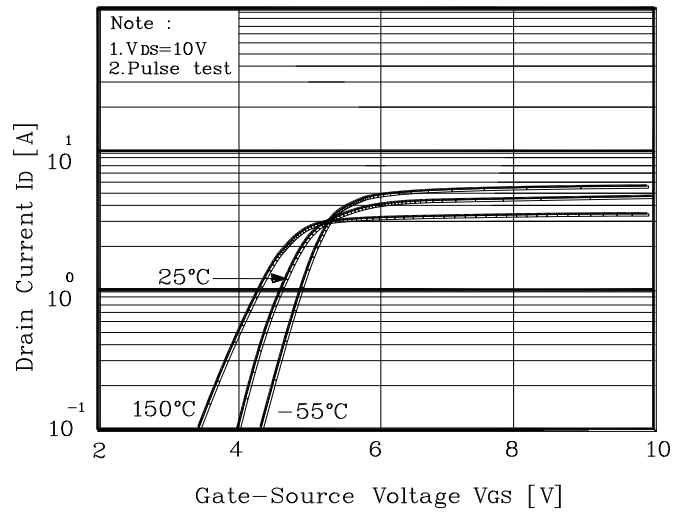


Fig. 3 $R_{DS(on)} - I_D$

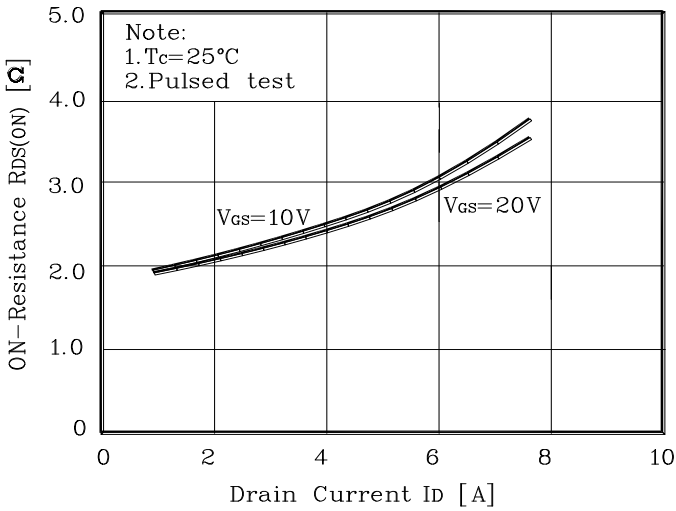


Fig. 4 $I_S - V_{SD}$

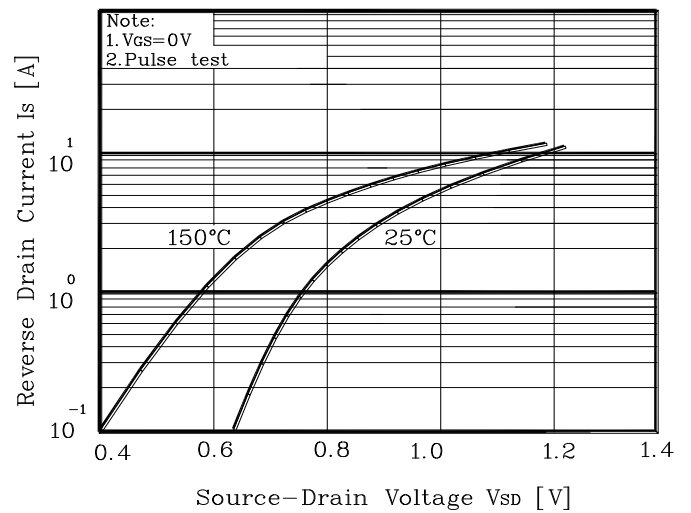


Fig. 5 Capacitance - V_{DS}

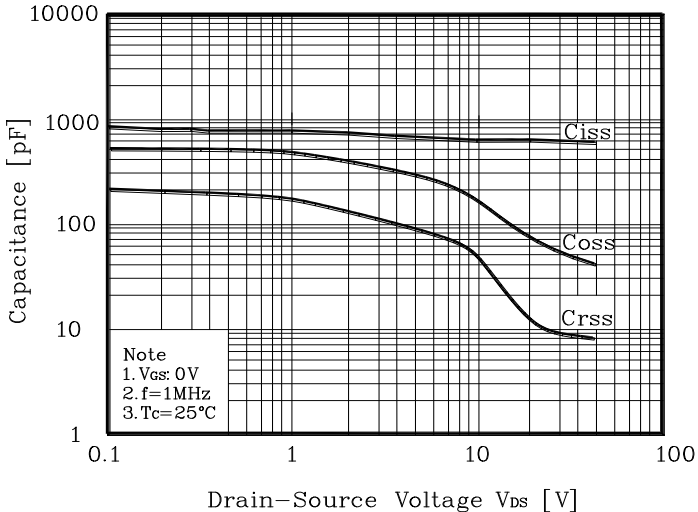
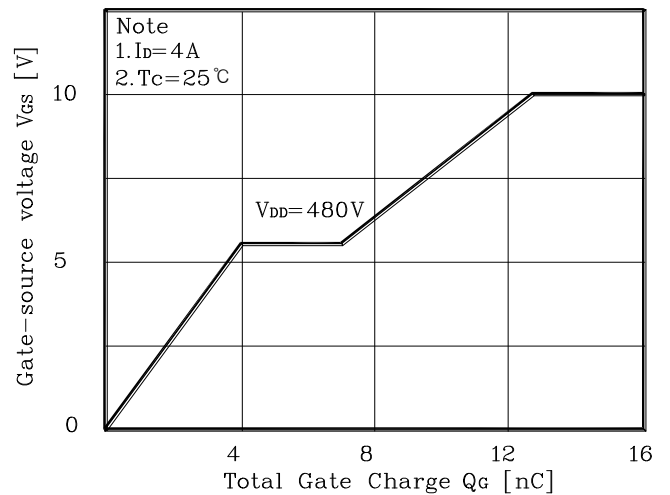


Fig. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

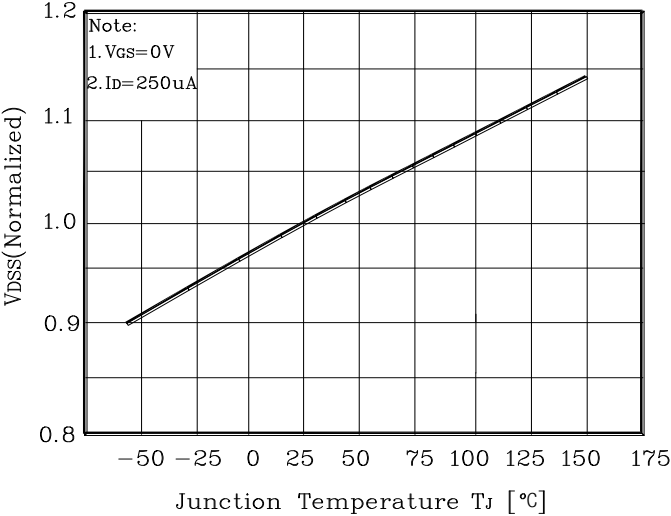


Fig. 8 $R_{DS(on)} - T_J$

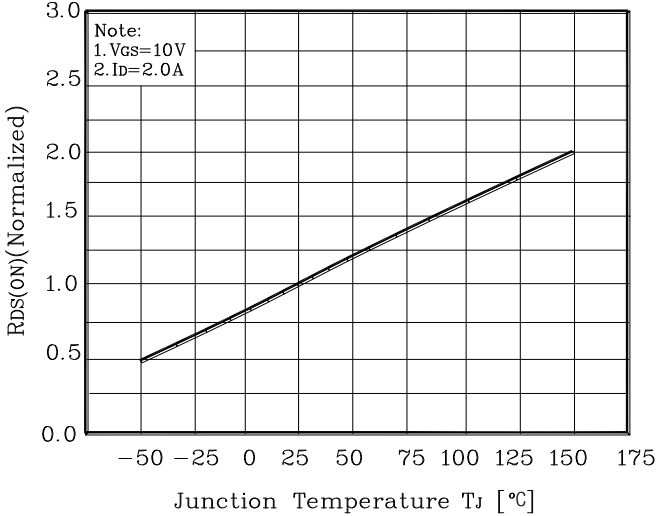


Fig. 9 $I_D - T_C$

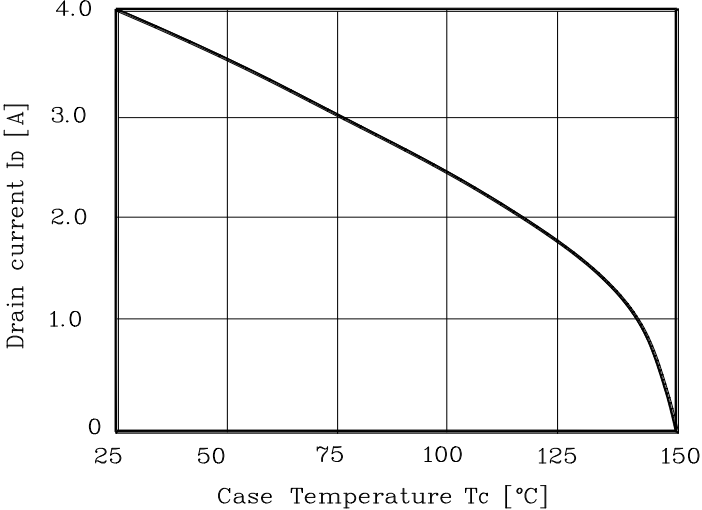


Fig. 10 Safe Operating Area

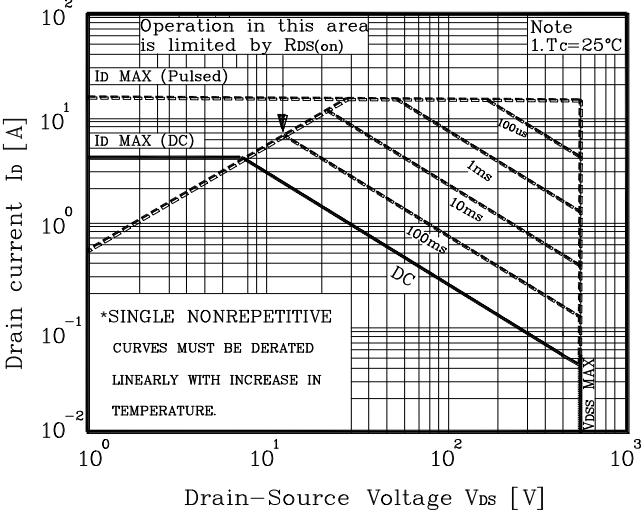


Fig. 11 Gate Charge Test Circuit & Waveform

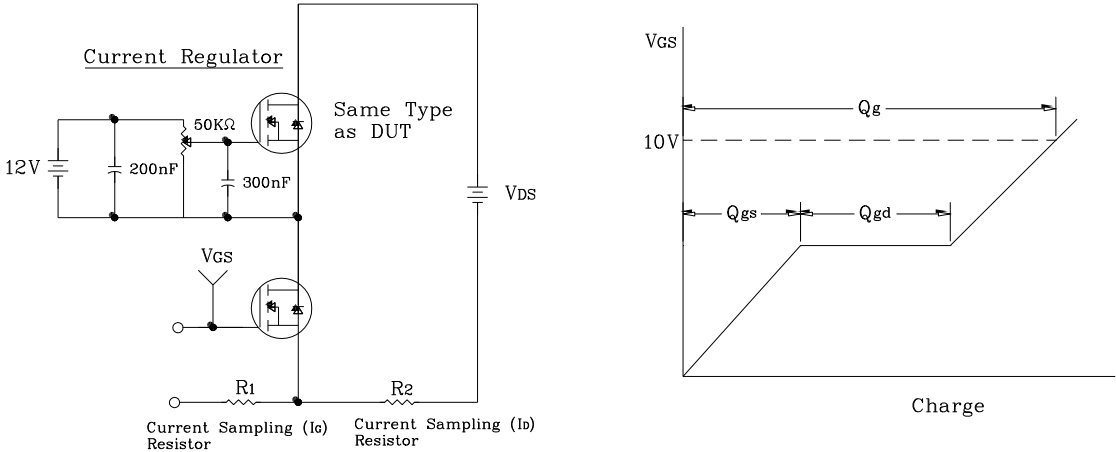


Fig. 12 Resistive Switching Test Circuit & Waveform

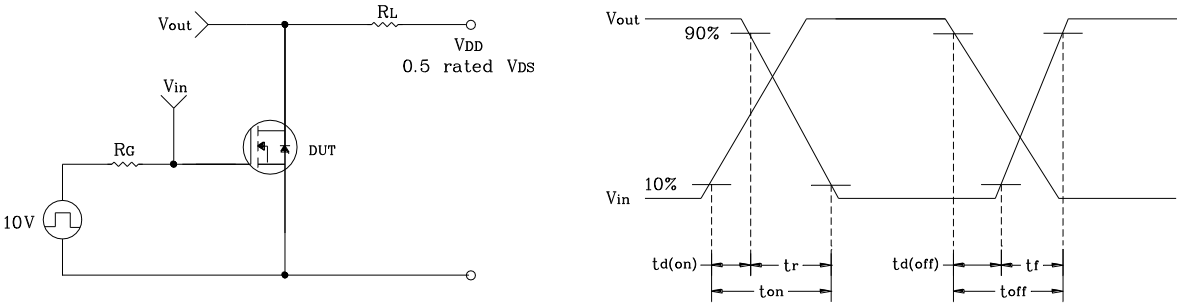


Fig. 13 E_{AS} Test Circuit & Waveform

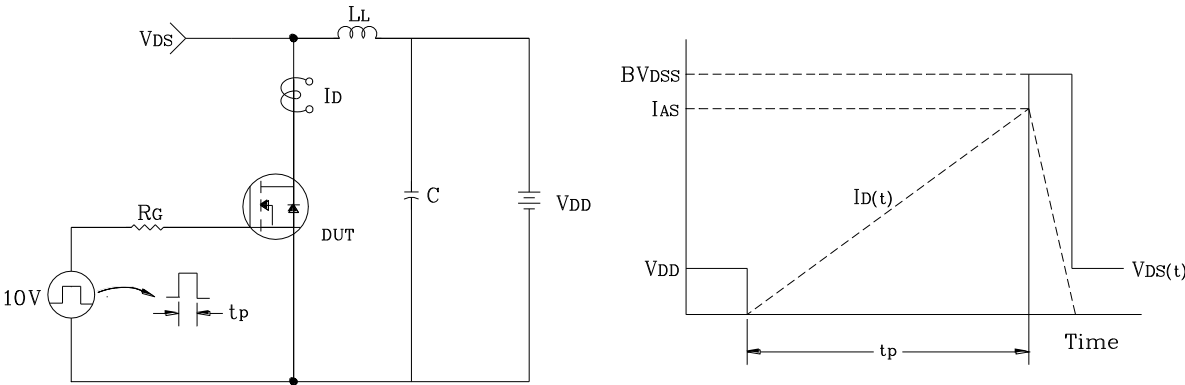
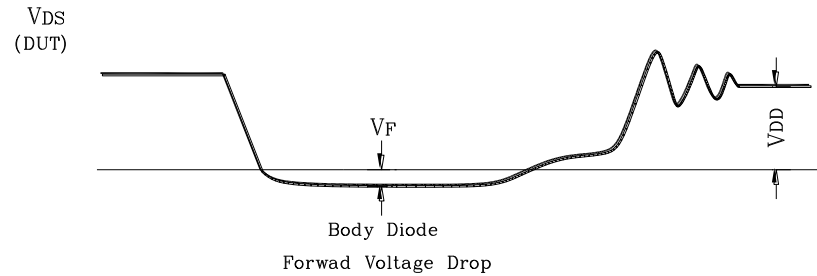
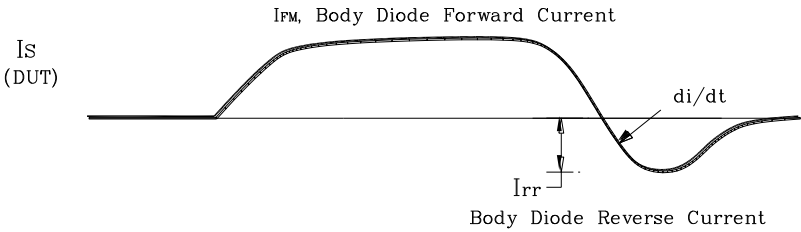
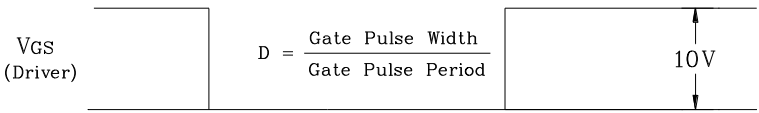
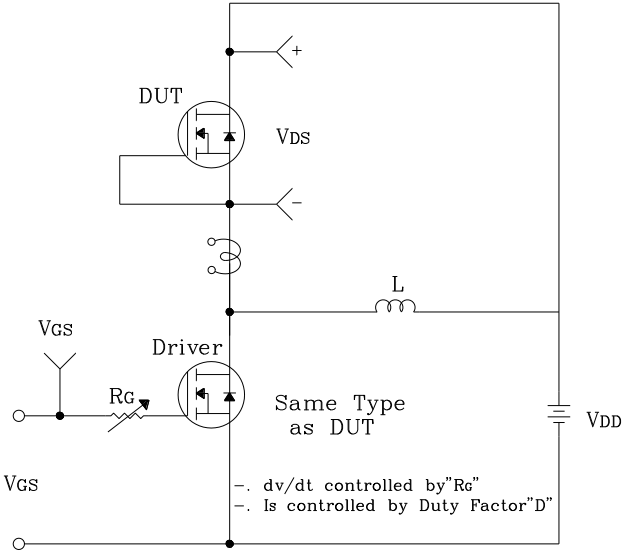
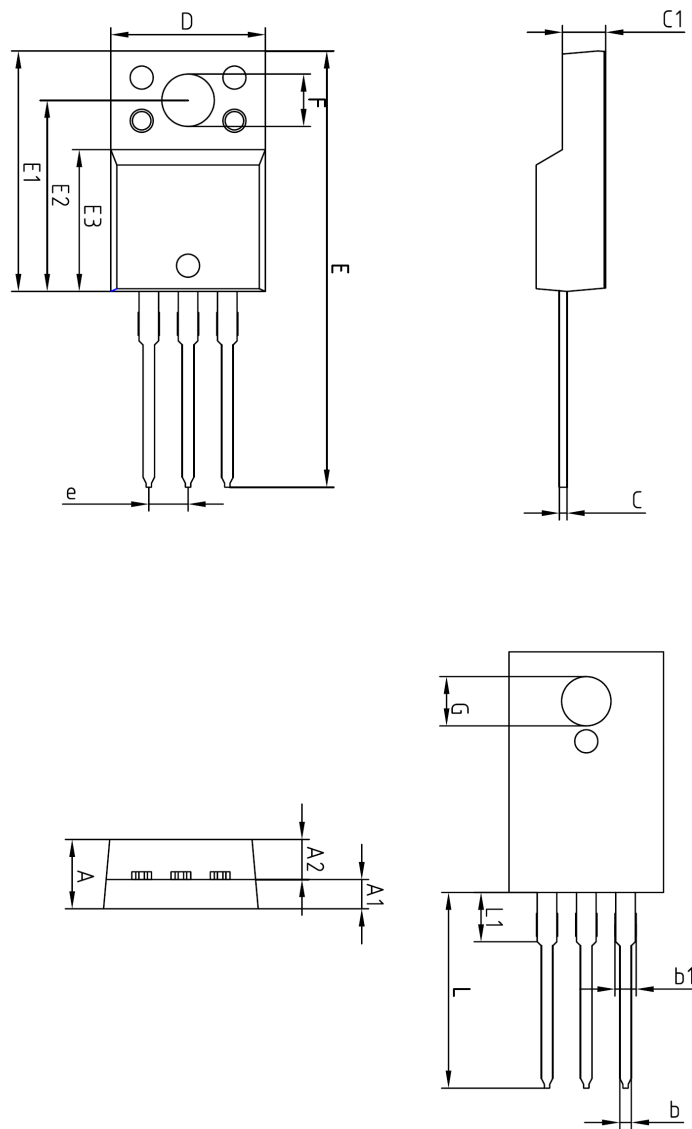


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



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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