

DC-DC CONVERTER APPLICATION HIGH VOLTAGE SWITCHING APPLICATIONS

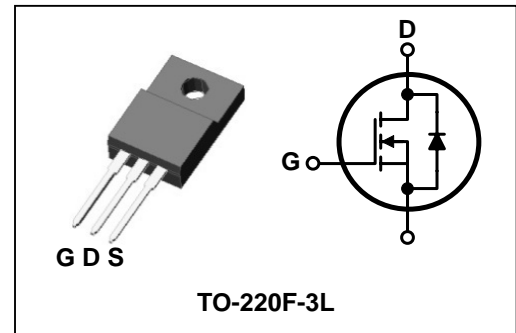
Features

- High Voltage: $BV_{DSS}=200V(\text{Min.})$
- Low C_{rss} : $C_{rss}=55pF(\text{Typ.})$
- Low gate charge : $Q_g=22nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.17\Omega(\text{Max.})$

Ordering Information

Type No.	Marking	Package Code
SMK1820F	SMK1820	TO-220F-3L

PIN Connection



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	($T_C=25^\circ\text{C}$)	18	A
		($T_C=100^\circ\text{C}$)	9.1	A
Drain current (Pulsed) *	I_{DM}	72	A	
Drain power dissipation	P_D	35	W	
Avalanche current (Single) ②	I_{AS}	18	A	
Single pulsed avalanche energy ②	E_{AS}	453	mJ	
Avalanche current (Repetitive) ①	I_{AR}	18	A	
Repetitive avalanche energy ①	E_{AR}	13.9	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	$R_{th(J-C)}$	-	3.57	$^\circ\text{C}/\text{W}$
	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	200	-	-	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} =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 =9.0A	-	0.14	0.17	Ω
Forward transfer conductance ④	g _{fs}	V _{DS} =10V, I _D =9.0A	-	10.5	-	S
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	942	1240	pF
Output capacitance	C _{oss}		-	227	310	
Reverse transfer capacitance	C _{rss}		-	55	71	
Turn-on delay time	t _{d(on)}	V _{DD} =125V, I _D =18A R _G =25Ω	-	15	-	ns
Rise time	t _r		-	130	-	
Turn-off delay time	t _{d(off)}		-	135	-	
Fall time	t _f		-	105	-	
Total gate charge	Q _g	V _{DS} =160V, V _{GS} =10V I _D =18A	-	22	28	nC
Gate-source charge	Q _{gs}		-	6.6	-	
Gate-drain charge	Q _{gd}		-	7.2	-	

Source-Drain Diode Ratings and Characteristics (T_c=25°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Source current	I _S	Integral reverse diode in the MOSFET	-	-	18	A
Source current(Plused) ①	I _{SM}		-	-	72	
Forward voltage ④	V _{SD}	V _{GS} =0V, I _S =18A	-	-	1.4	V
Reverse recovery time	t _{rr}	I _S =18A, V _{GS} =0, di _S /dt=100A/us	-	208	-	ns
Reverse recovery charge	Q _{rr}		-	1.63	-	uC

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=2.1mH, I_{AS}=18A, V_{DD}=50V, R_G=27Ω
- ③ Pulse Test : Pulse Width < 300us, Duty cycle ≤ 2%
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

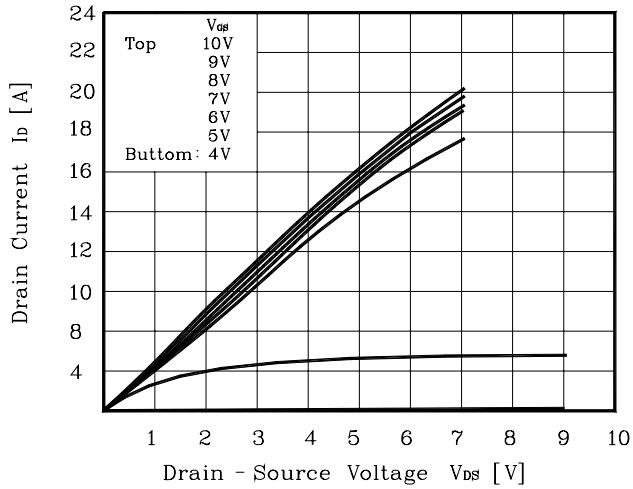


Fig. 2 $I_D - V_{GS}$

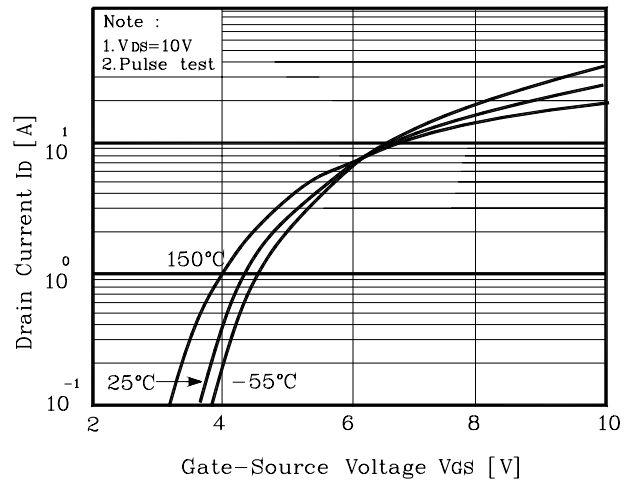


Fig. 3 $R_{DS(on)} - I_D$

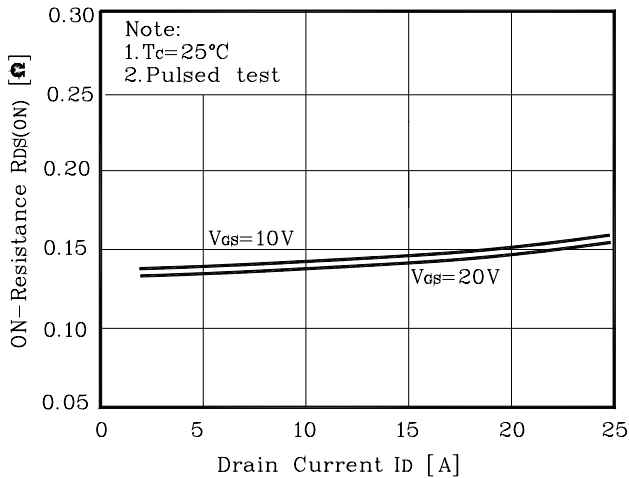


Fig. 4 $I_S - V_{SD}$

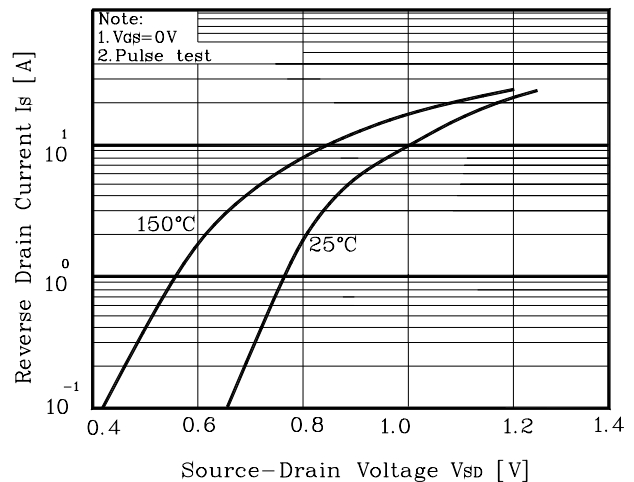


Fig. 5 Capacitance - V_{DS}

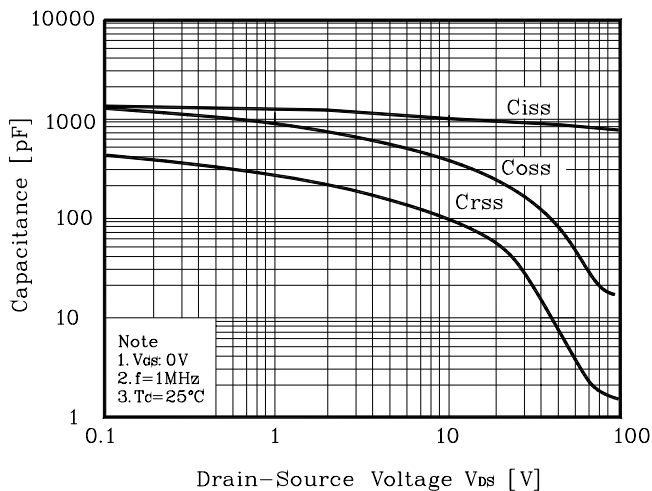


Fig. 6 $V_{GS} - Q_G$

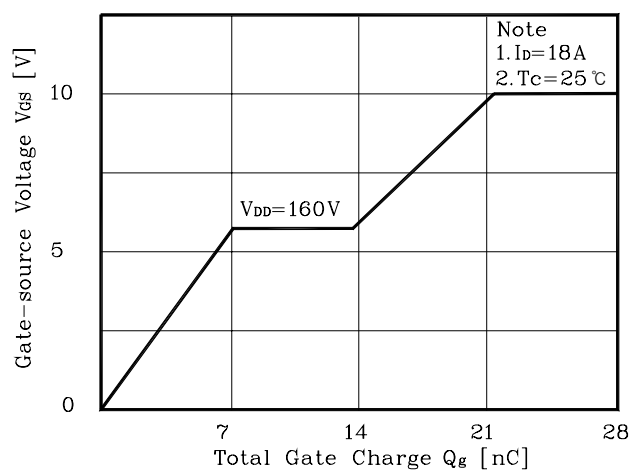


Fig. 7 $V_{DS} - T_J$

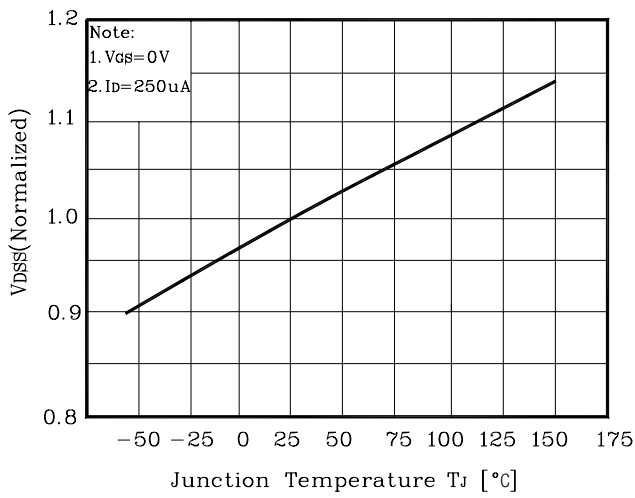


Fig. 8 $R_{DS(on)} - T_J$

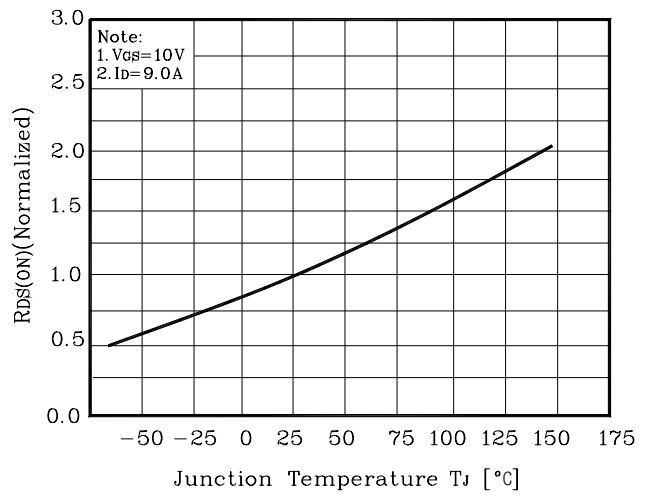


Fig. 9 $I_D - T_C$

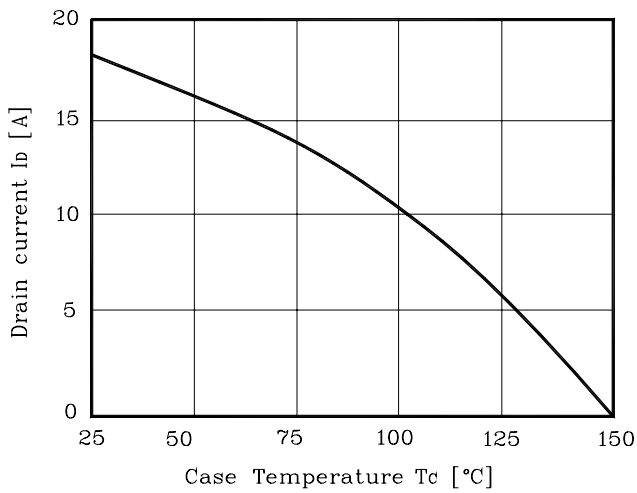


Fig. 10 Safe Operating Area

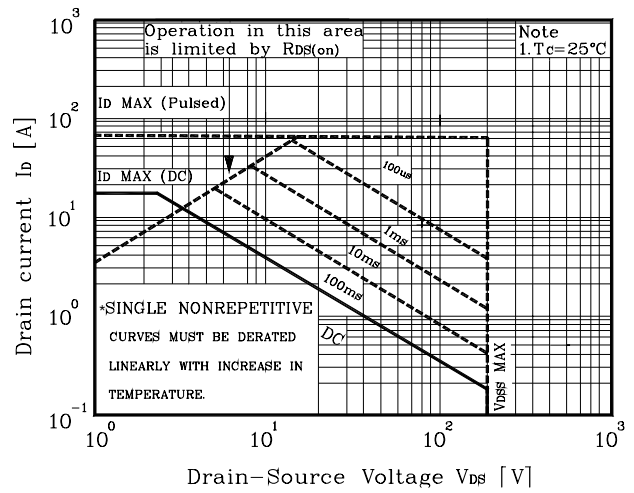


Fig. 11 Gate Charge Test Circuit & Waveform

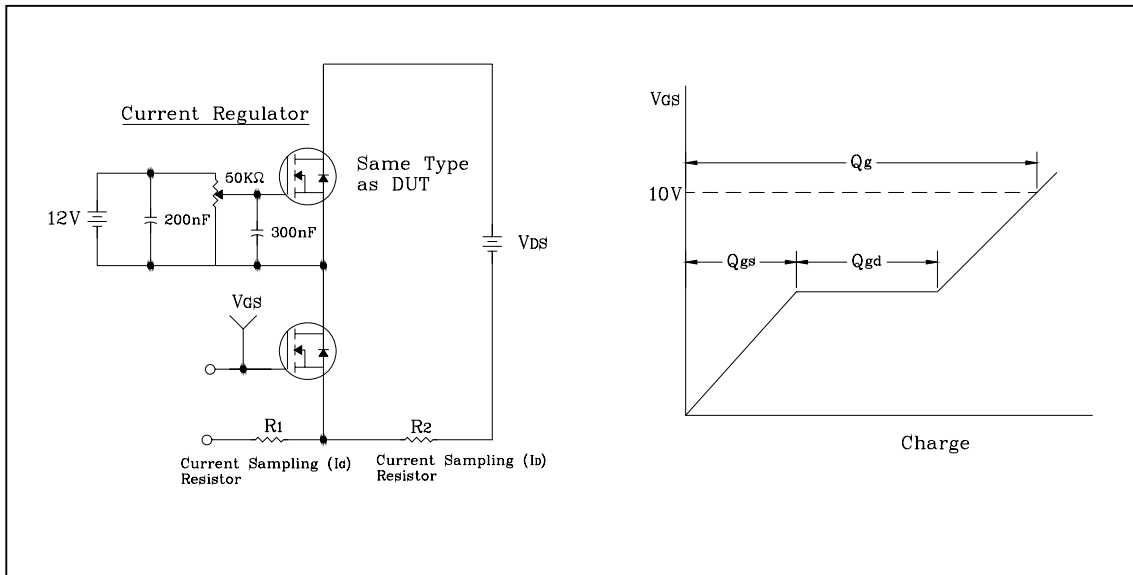


Fig. 12 Resistive Switching Test Circuit & Waveform

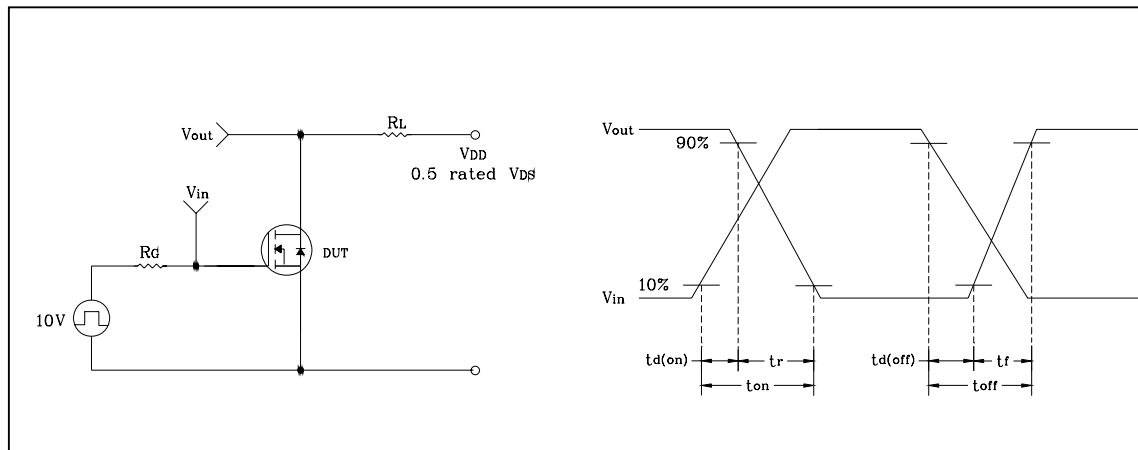


Fig. 13 EAS Test Circuit & Waveform

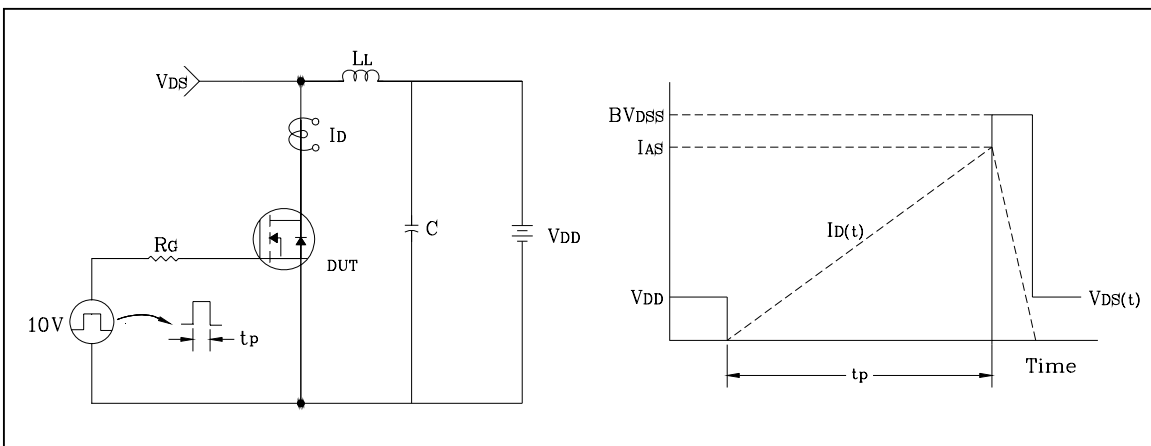
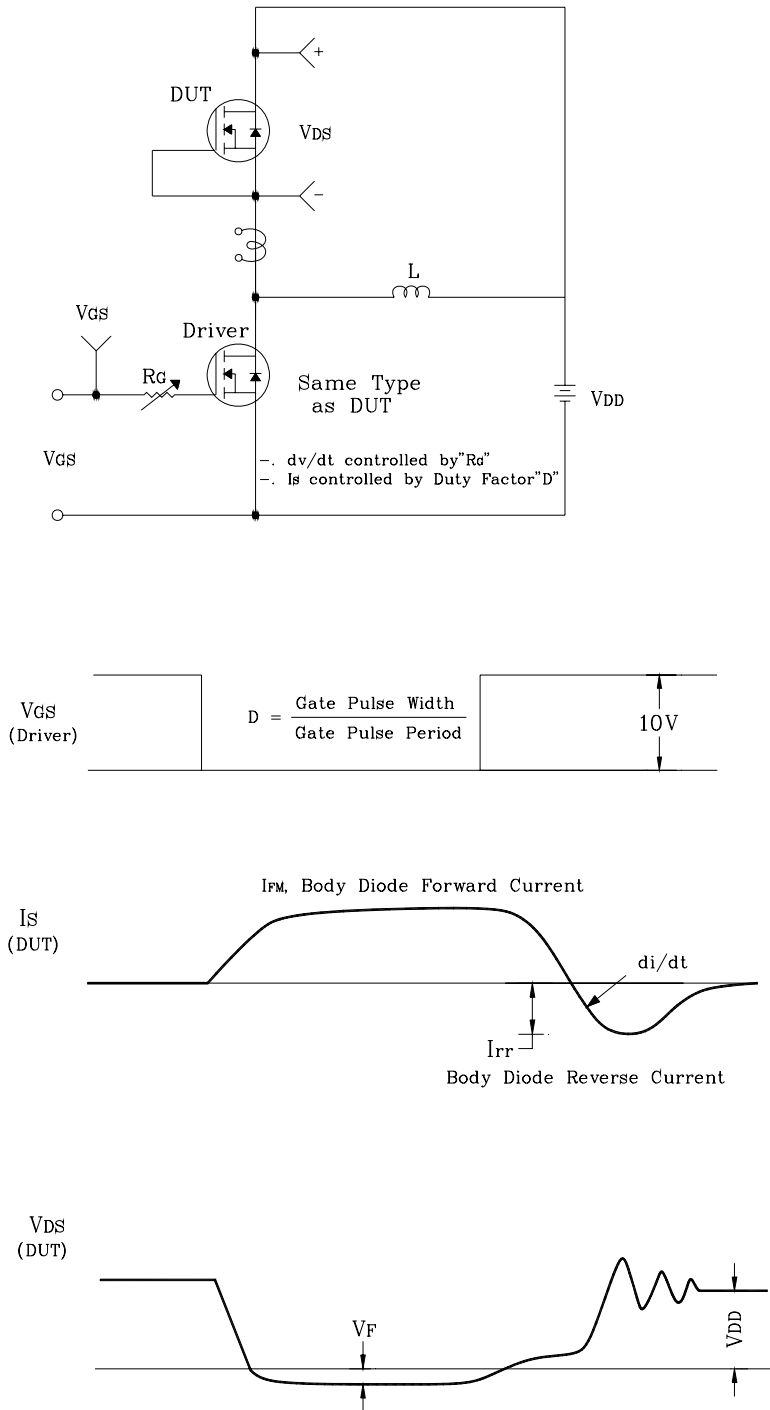
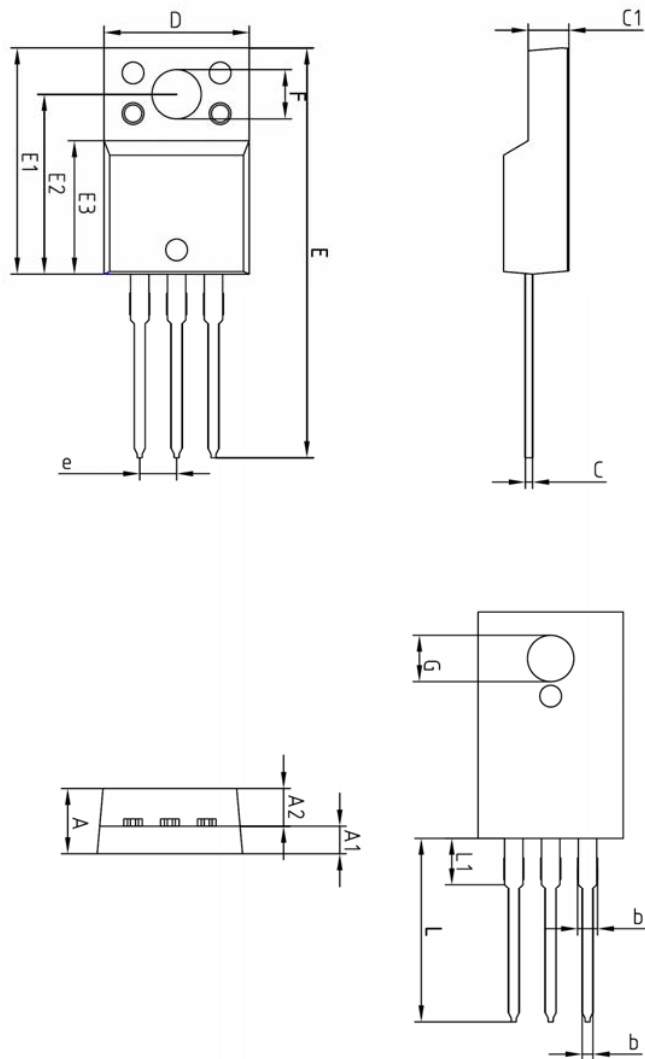


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension



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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