

SWITCHING REGULATOR APPLICATIONS

Features

- High Voltage : $BV_{DSS}=650V(\text{Min.})$
- Low C_{RSS} : $C_{RSS}=16pF(\text{Typ.})$
- Low gate charge : $Qg=35nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.85\Omega(\text{Max.})$

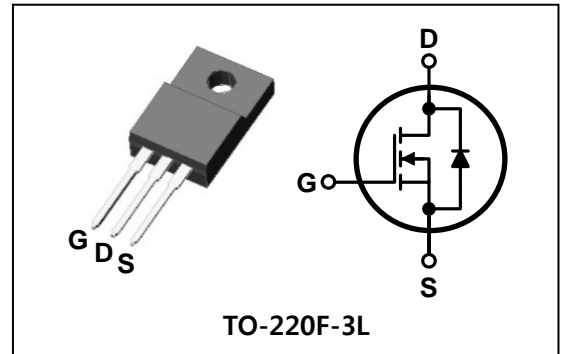
Ordering Information

Type No.	Marking	Package Code
SMK0965F	SMK0965	TO-220F-3L
SMK0965F (HF)	SMK0965	TO-220F-3L

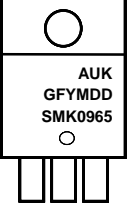
* SMK0965F : Pb Free Product

* SMK0965F (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}	650	V	
Gate-source voltage	V_{GSS}	± 30	V	
Drain current (DC) *	I_D	$T_C=25^\circ\text{C}$	9	A
		$T_C=100^\circ\text{C}$	5.5	A
Drain current (Pulsed) *	I_{DM}	36	A	
Power dissipation	P_D	40	W	
Avalanche current (Single) ②	I_{AS}	9	A	
Single pulsed avalanche energy ②	E_{AS}	250	mJ	
Avalanche current (Repetitive) ①	I_{AR}	9	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	$^\circ\text{C/W}$
	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} =0V	650	-	-	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} =650V, 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 =4.5A	-	0.72	0.85	Ω	
Forward transfer conductance ④	g _{fs}	V _{DS} =10V, I _D =4.5A	-	11	-	S	
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V f=1 MHz	-	2040	2550	pF	
Output capacitance	C _{oss}		-	153	192		
Reverse transfer capacitance	C _{rss}		-	16	20		
Turn-on delay time	t _{d(on)}	V _{DD} =300V, I _D =9A R _G =25Ω	-	23	-	ns	
Rise time	t _r		-	69	-		
Turn-off delay time	t _{d(off)}		③④	-	144		-
Fall time	t _f		-	77	-		
Total gate charge	Q _g	V _{DS} =520V, V _{GS} =10V I _D =9A	-	35	57	nC	
Gate-source charge	Q _{gs}		③④	-	10		-
Gate-drain charge	Q _{gd}		-	9	-		

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	-	-	9	A
Source current (Pulsed) ①	I _{SM}		-	-	36	
Forward voltage ④	V _{SD}	V _{GS} =0V, I _S =9A	-	-	1.4	V
Reverse recovery time	t _{rr}	I _S =9A, V _{GS} =0V dI _F /dt=100A/μs	-	420	-	ns
Reverse recovery charge	Q _{rr}		-	4.2	-	μC

Note ;

- ① Repetitive rating : Pulse width limited by maximum junction temperature
- ② L=5.7mH, I_{AS}=9A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C
- ③ Pulse Test : Pulse width≤300μs, Duty cycle≤2%
- ④ Essentially independent of operating temperature

Electrical Characteristic Curves

Fig. 1 $I_D - V_{DS}$

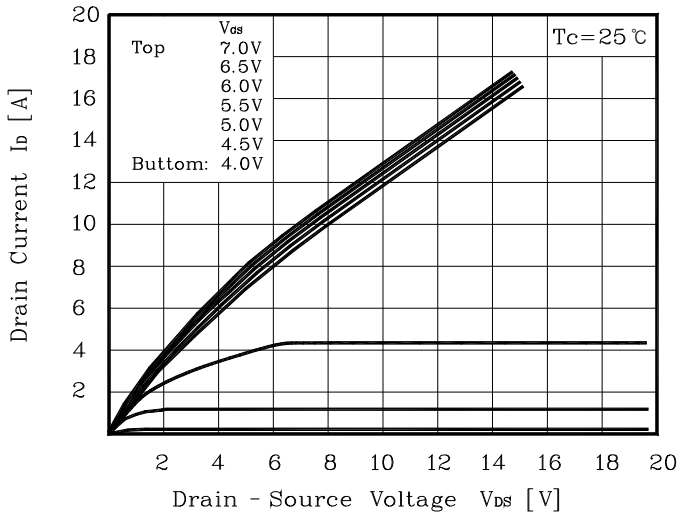


Fig. 2 $I_D - V_{GS}$

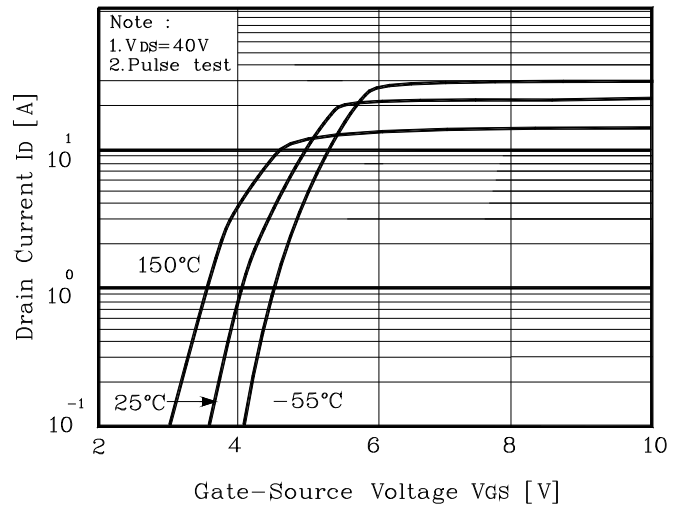


Fig. 3 $R_{DS(on)} - I_D$

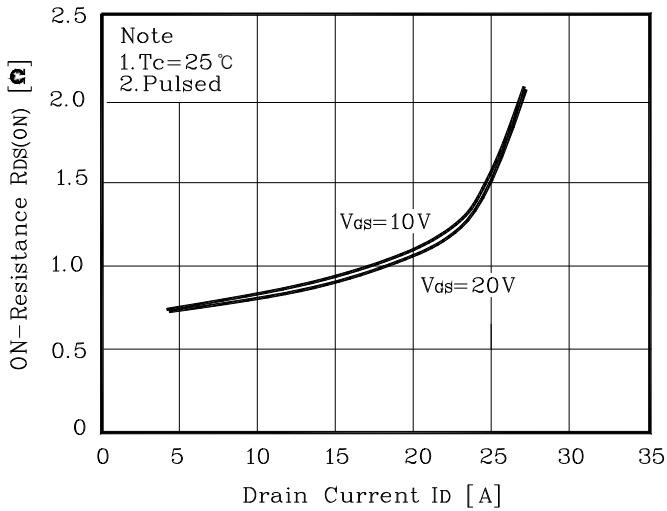


Fig. 4 $I_S - V_{SD}$

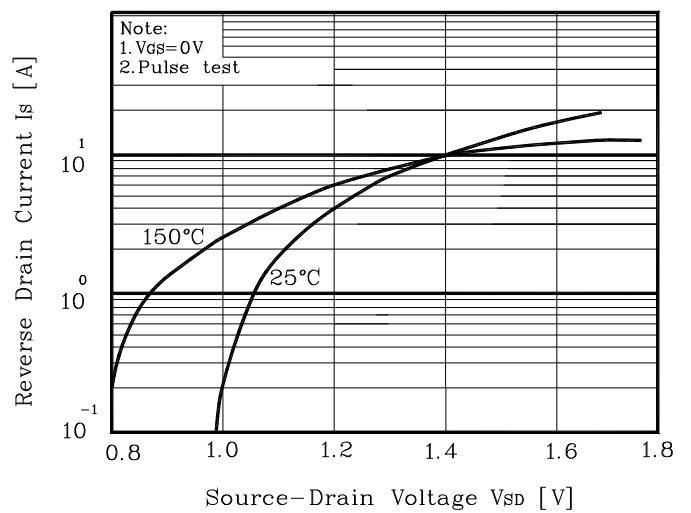


Fig. 5 Capacitance - V_{DS}

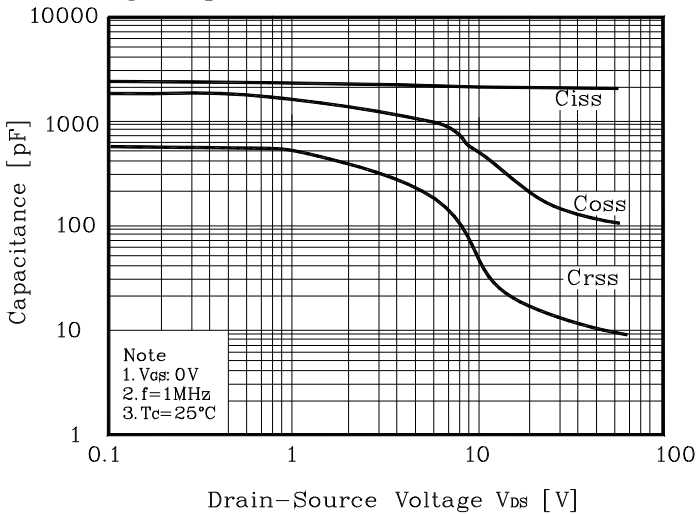
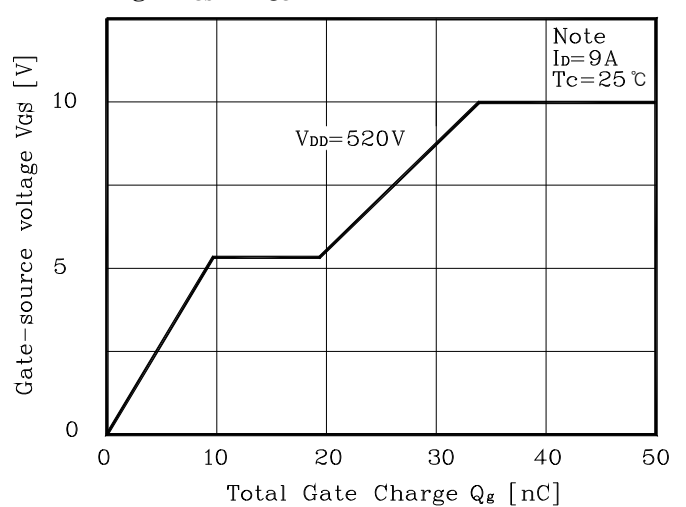


Fig. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 V_{DS} - T_J

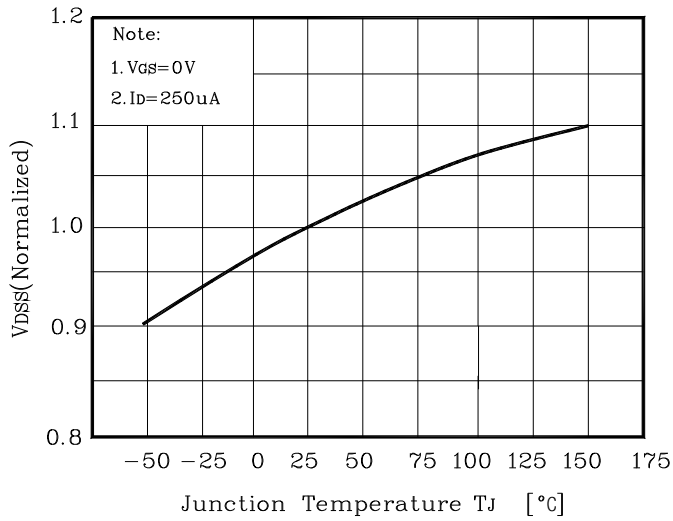


Fig.8 $R_{DS(on)}$ - T_J

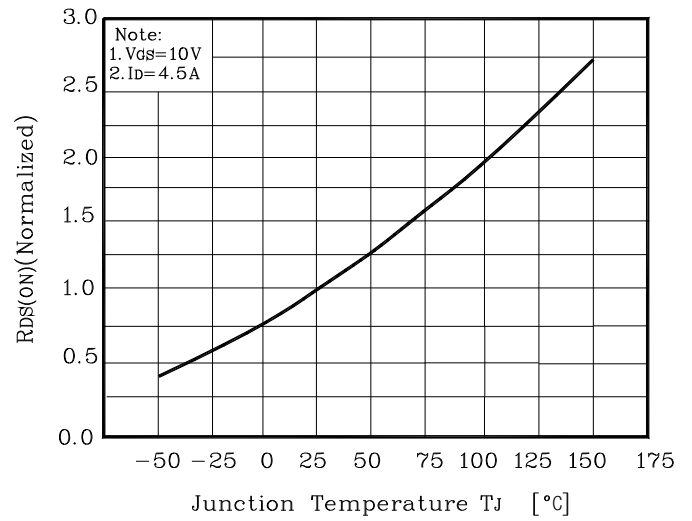


Fig. 9 I_D - T_C

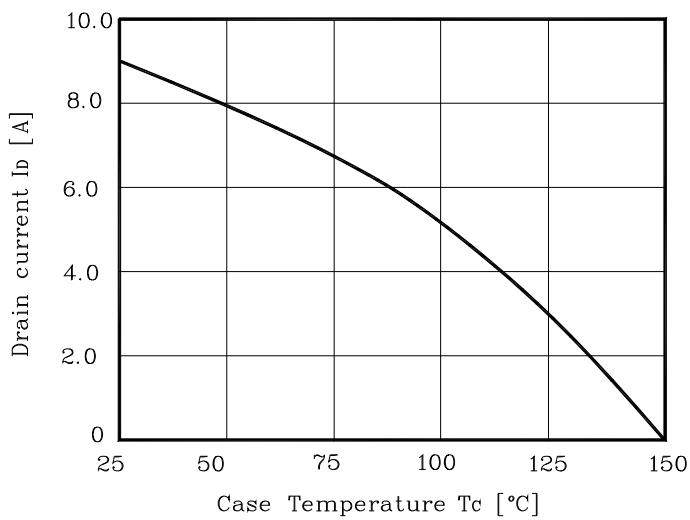


Fig. 10 Safe Operating Area

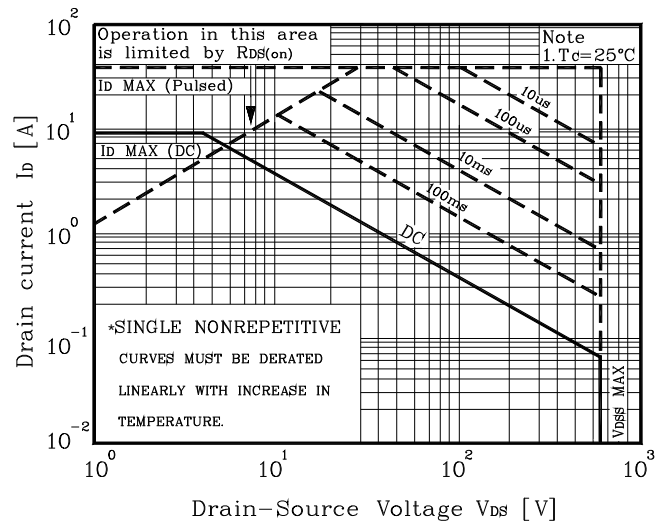


Fig. 11 Gate Charge Test Circuit & Waveform

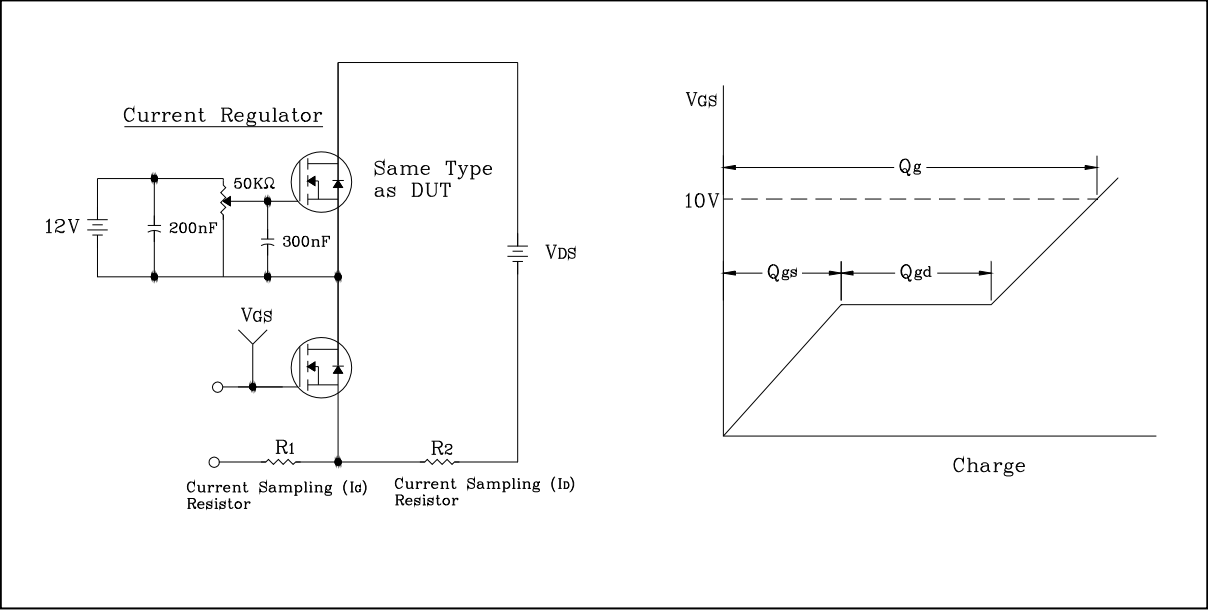


Fig. 12 Resistive Switching Test Circuit & Waveform

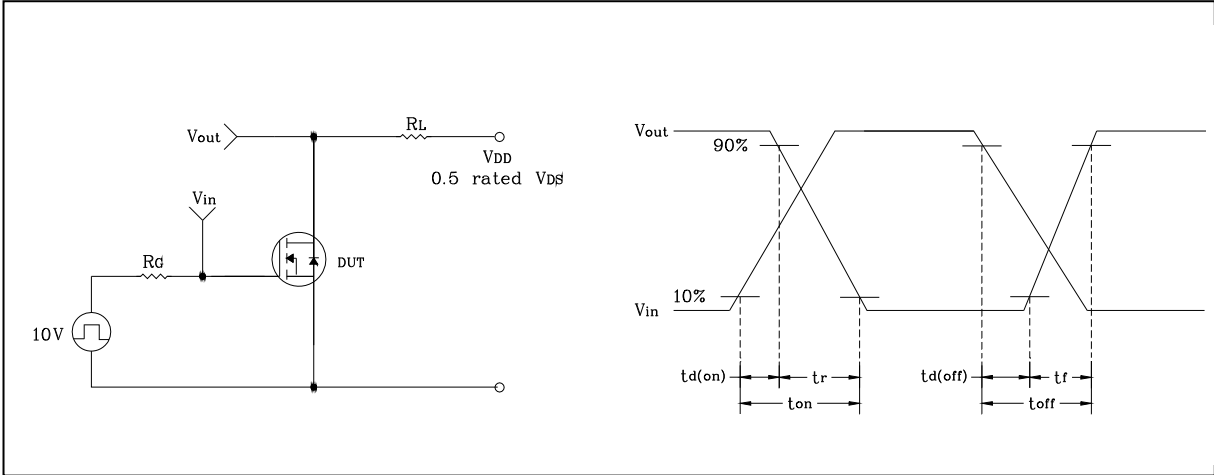


Fig. 13 E_{AS} Test Circuit & Waveform

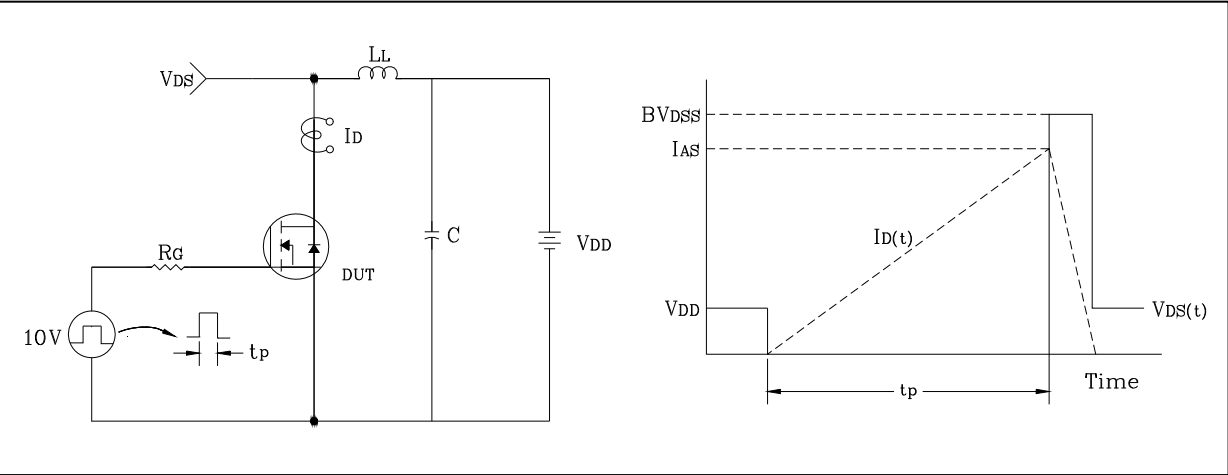
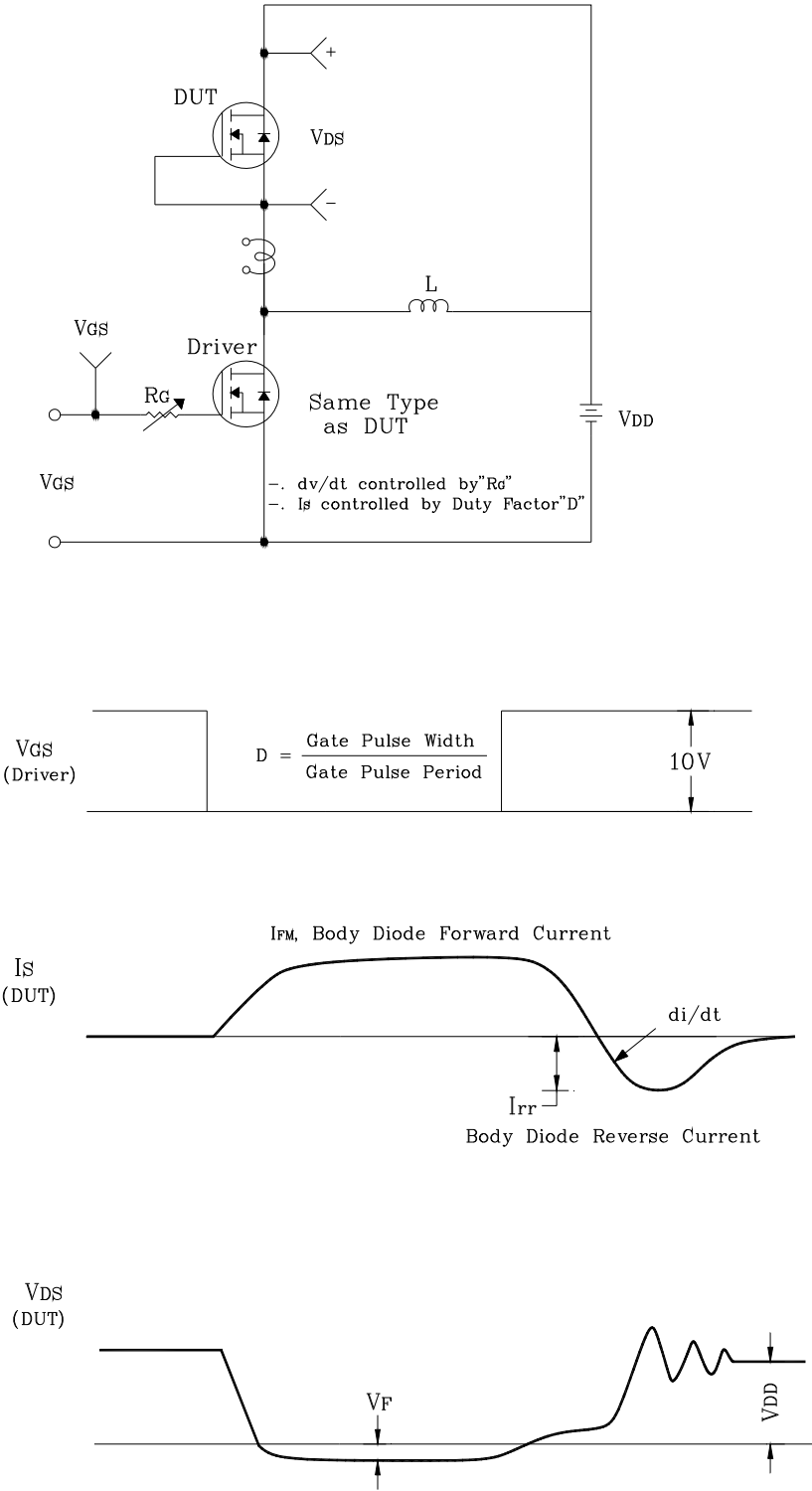
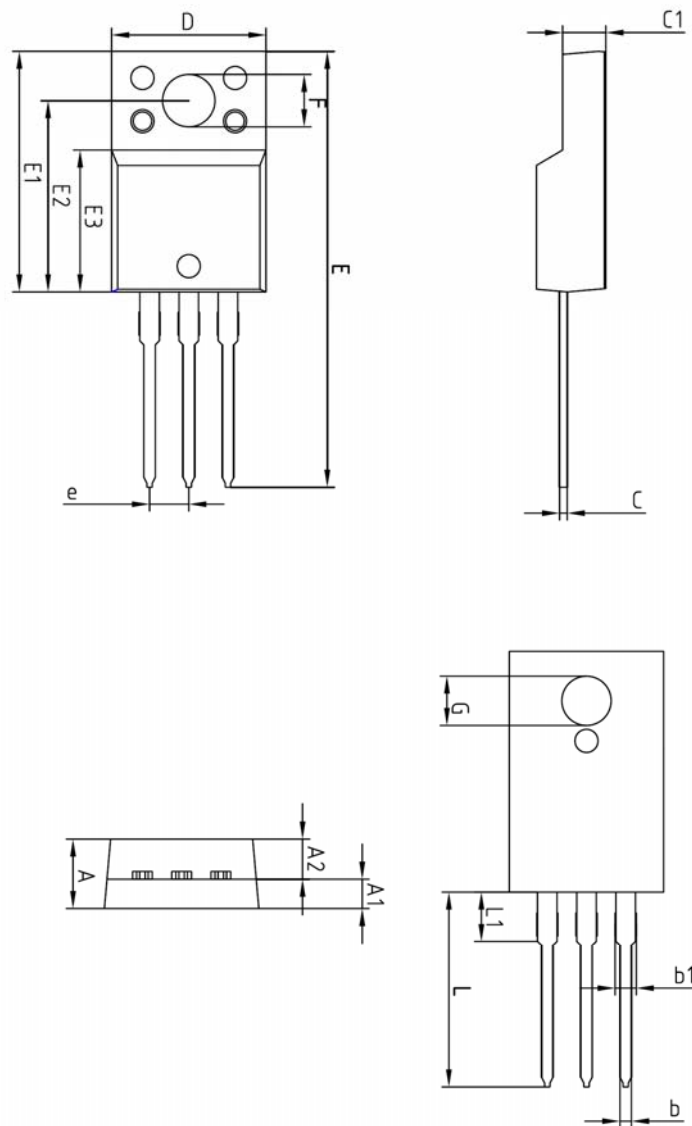


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



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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