

SWITCHING REGULATOR APPLICATIONS

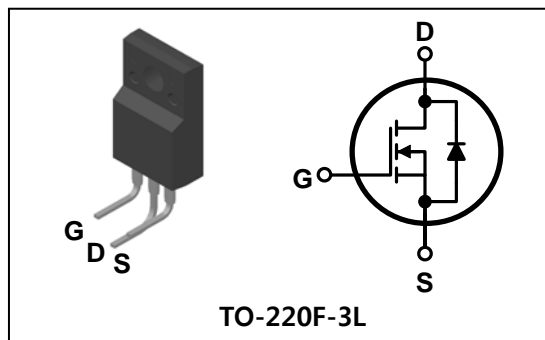
Features

- High Voltage : $BV_{DSS}=650V(\text{Min.})$
- Low C_{RSS} : $C_{RSS}=5.6pF(\text{Typ.})$
- Low gate charge : $Qg=11.2nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=3.0\Omega(\text{Max.})$

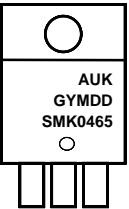
Ordering Information

Type No.	Marking	Package Code
SMK0465FJ	SMK0465	TO-220F-3L (J Forming)

PIN Connection



Marking Diagram

	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 ($T_C=25^\circ\text{C}$ 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	$T_C=25^\circ\text{C}$	4	A
		$T_C=100^\circ\text{C}$	2.0	A
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}	81.5	mJ	
Avalanche current (Repetitive) ①	I_{AR}	4	A	
Repetitive avalanche energy ①	E_{AR}	3.4	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	-	4.16	$^\circ\text{C/W}$
	Junction-ambient	-	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	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 =2.0A	-	2.4	3.0	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	-	703	878	pF	
Output capacitance	C _{oss}		-	54.6	68.2		
Reverse transfer capacitance	C _{rss}		-	5.6	7.0		
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} =520V, V _{GS} =10V I _D =4.0A	-	11.2	14.0	nC	
Gate-source charge	Q _{gs}		-	3.9	-		
Gate-drain charge	Q _{gd}		③④	-	2.5		-

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=9.4mH, I_{AS}=4.0A, 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 $I_D - V_{DS}$

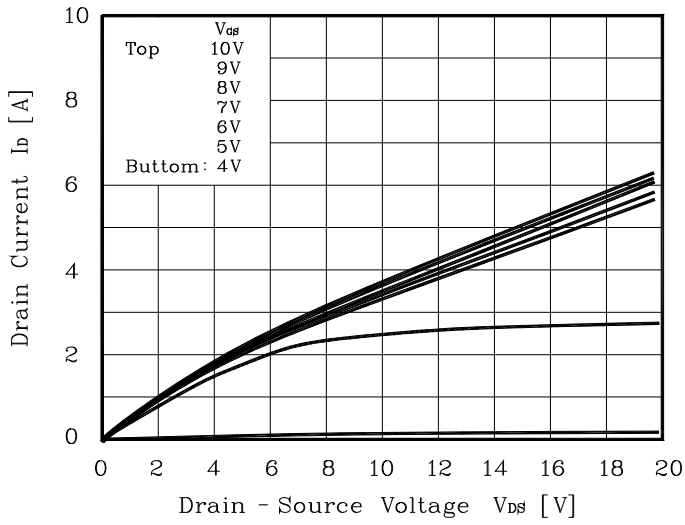


Fig. 2 $I_D - V_{GS}$

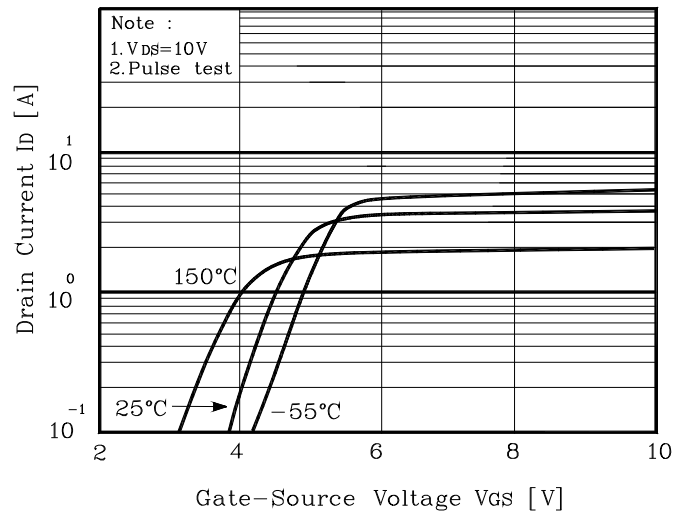


Fig. 3 $R_{DS(on)} - I_D$

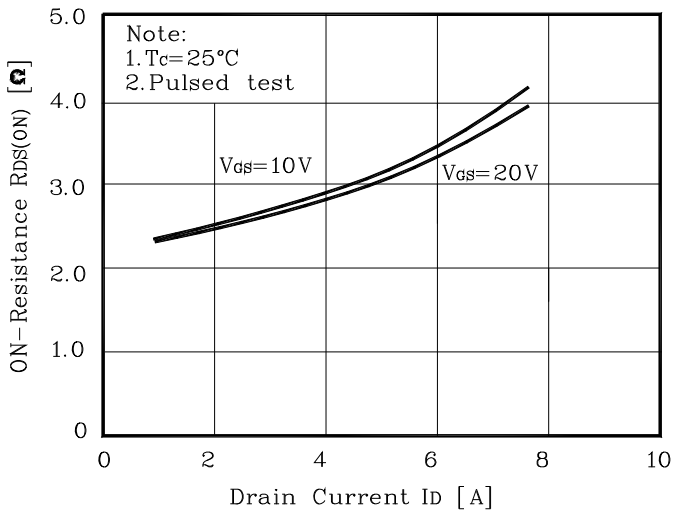


Fig. 4 $I_S - V_{SD}$

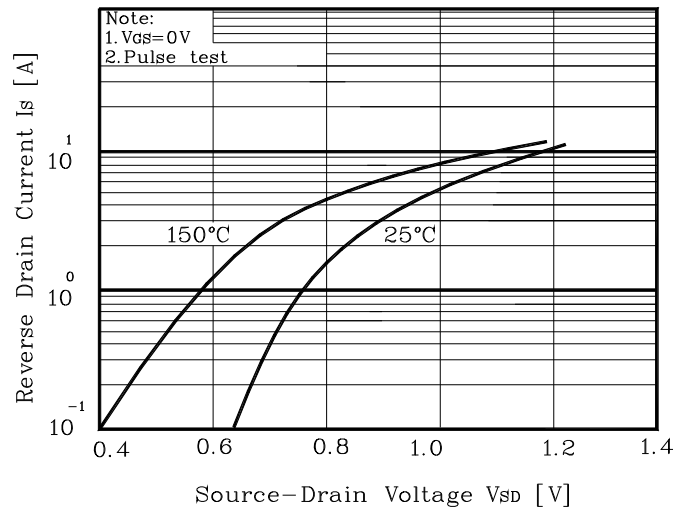


Fig. 5 Capacitance - V_{DS}

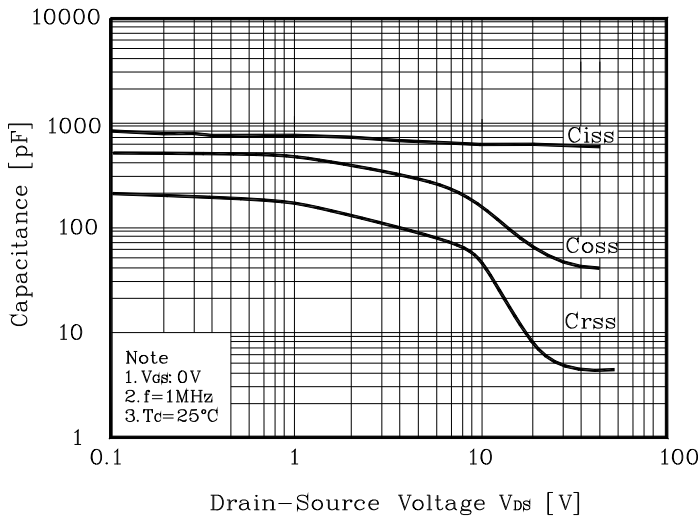
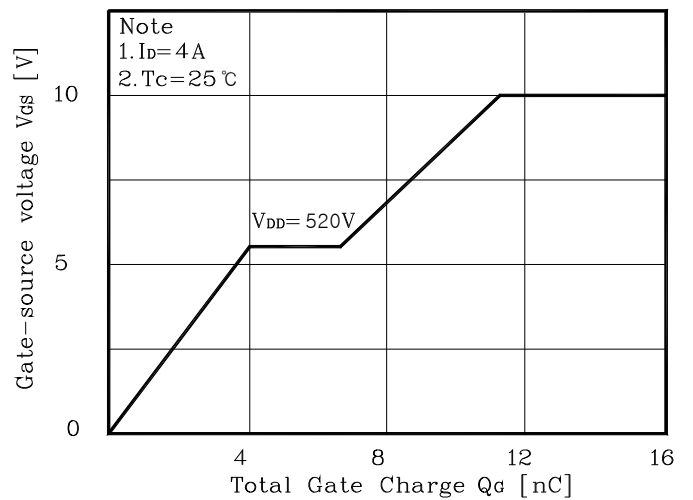


Fig. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

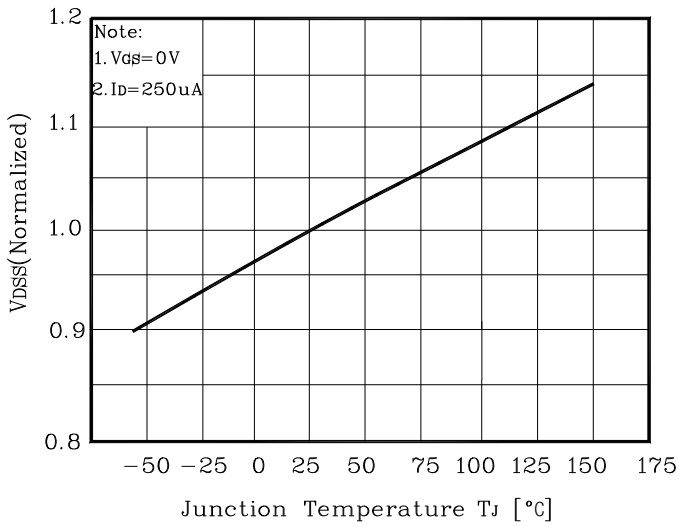


Fig. 8 $R_{DS(on)} - T_J$

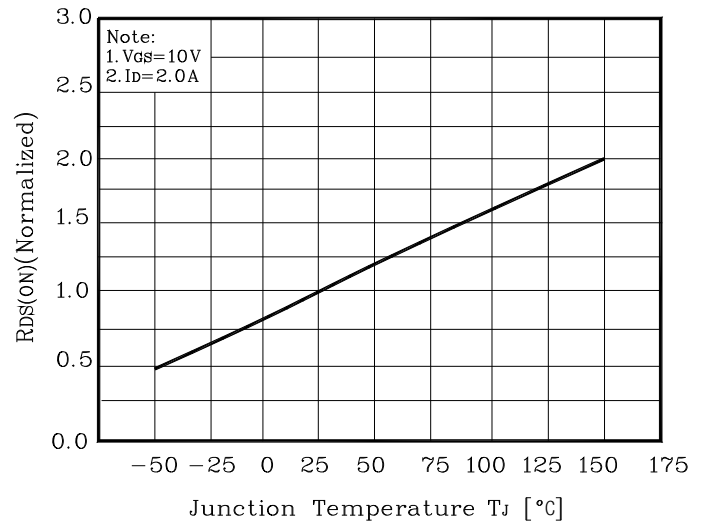


Fig. 9 $I_D - T_C$

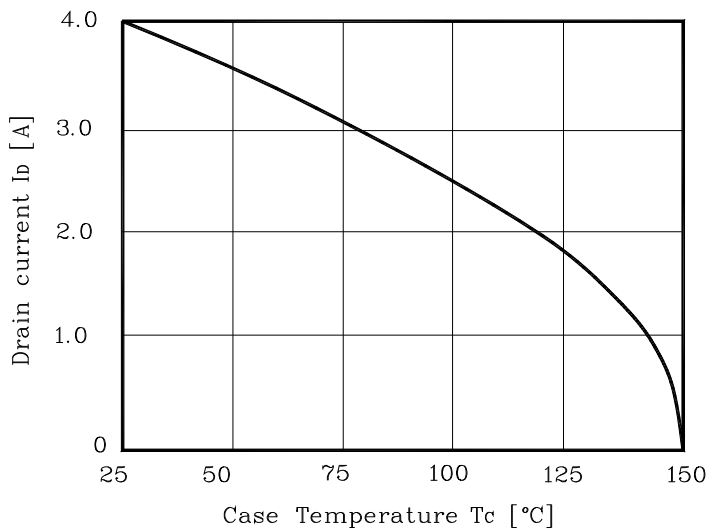


Fig. 10 Safe Operating Area

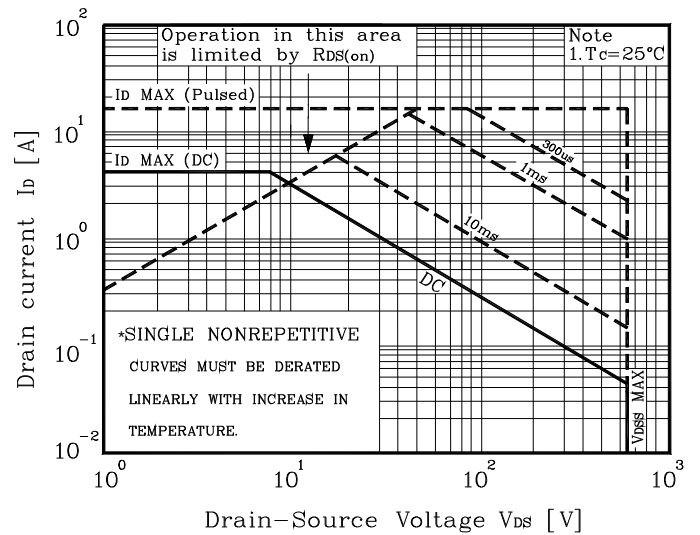


Fig. 11 Gate Charge Test Circuit & Waveform

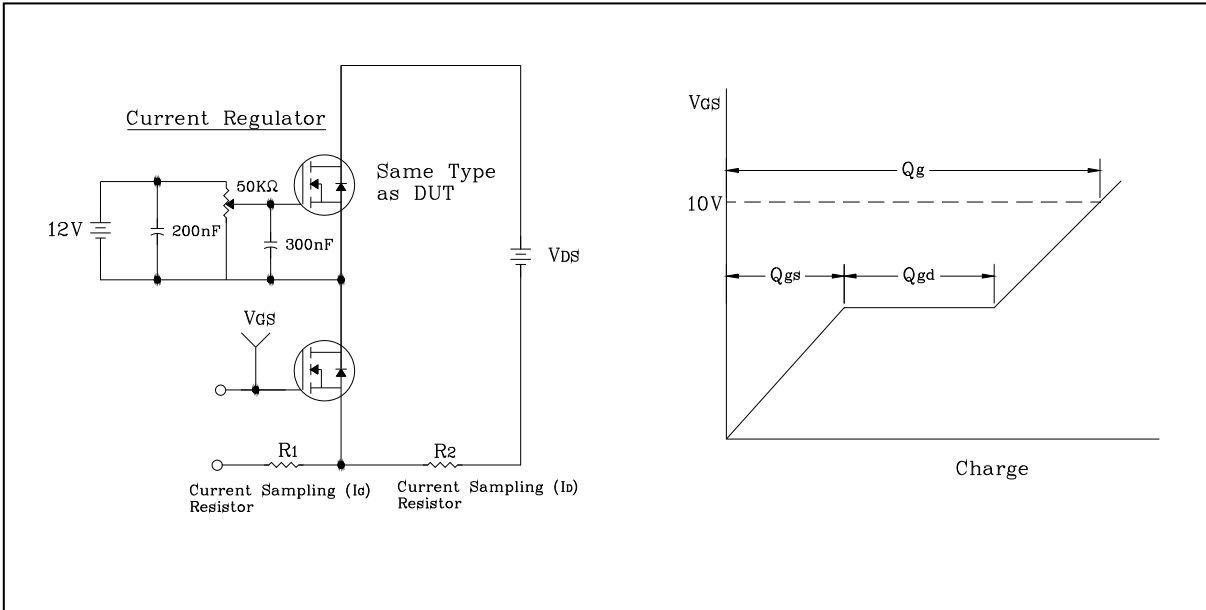


Fig. 12 Resistive Switching Test Circuit & Waveform

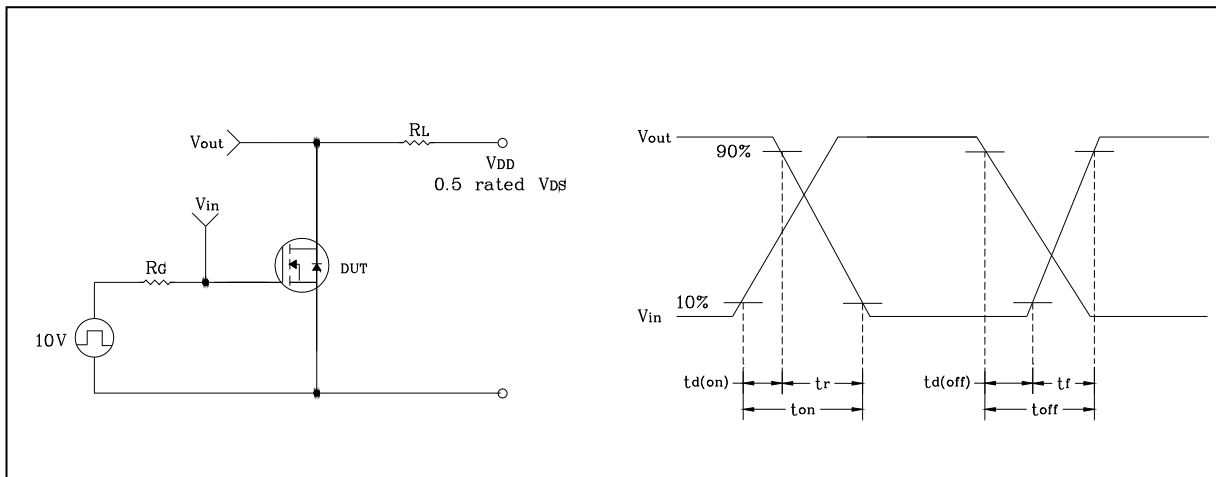


Fig. 13 E_{AS} Test Circuit & Waveform

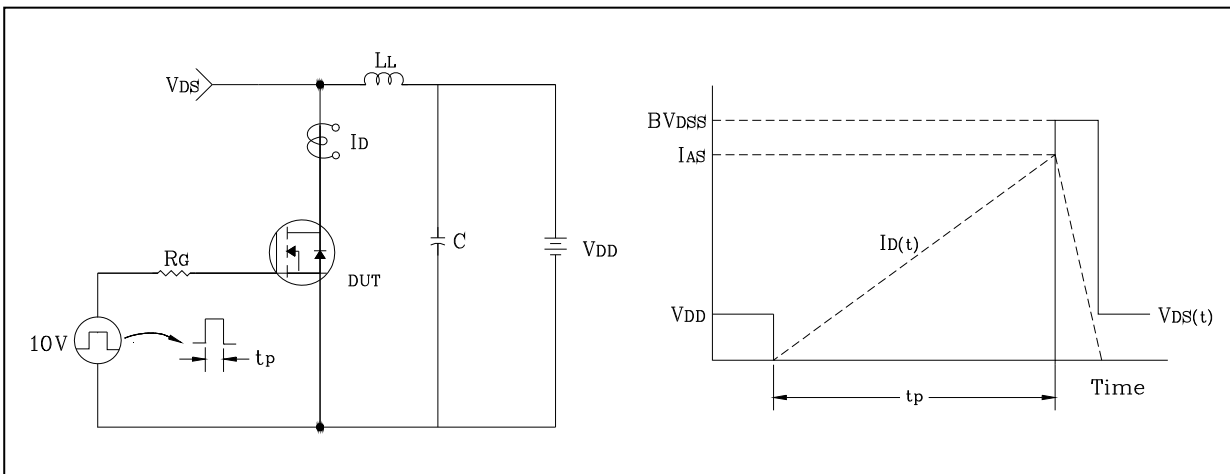
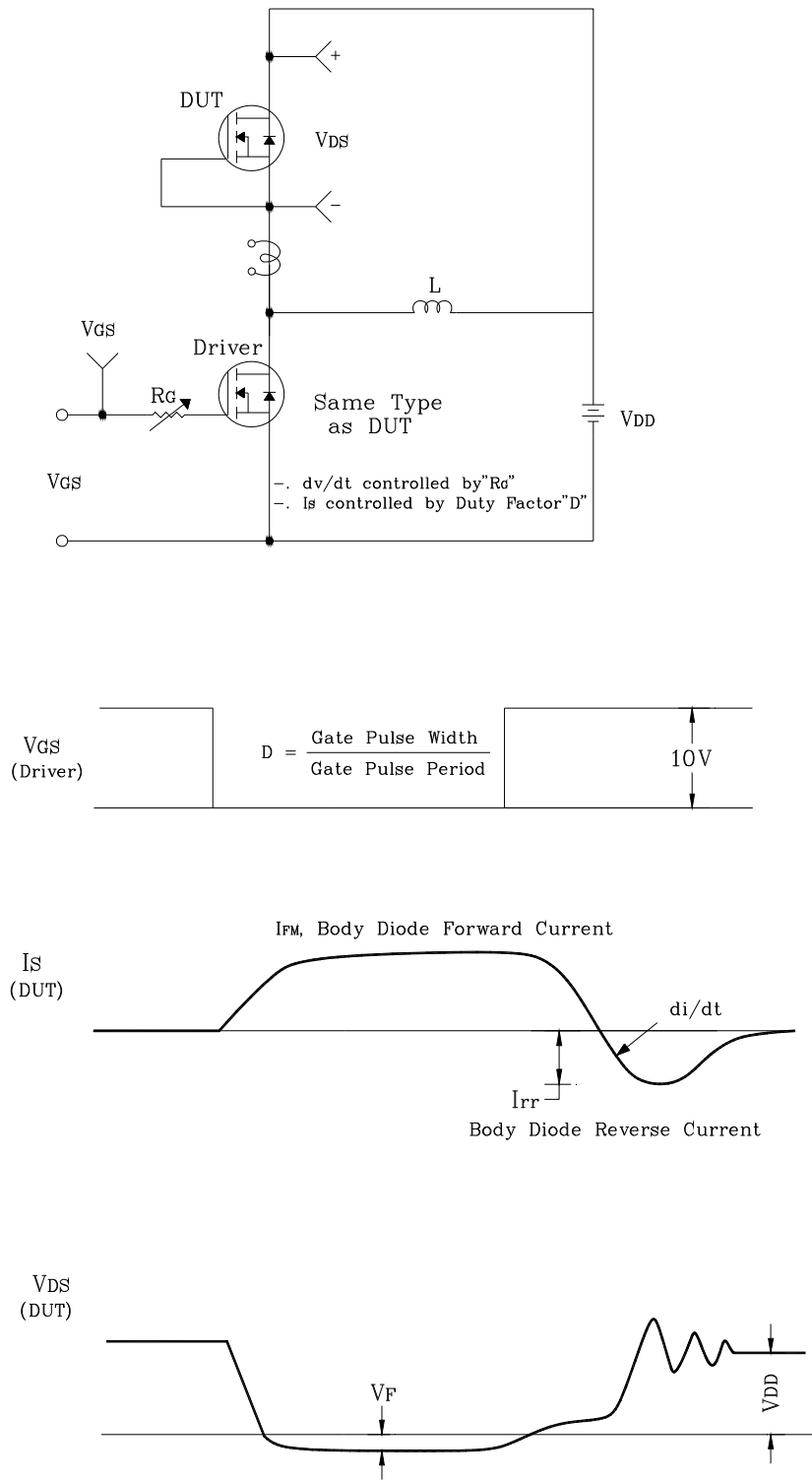
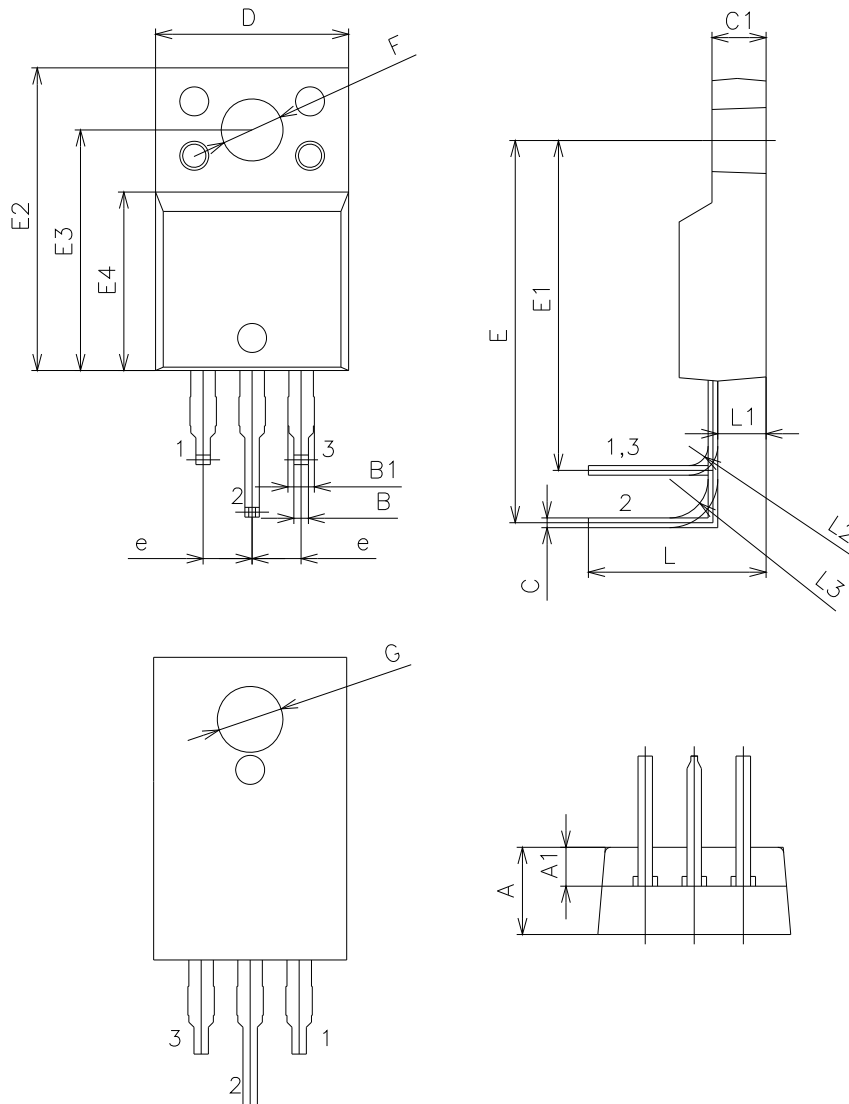


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension

unit: mm



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	4.40	4.50	4.60	
A1	1.90	2.00	2.10	
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	9.80	10.00	10.20	
E	19.20	19.70	20.20	
E1	16.50	17.00	17.50	
E2	15.40	15.60	15.80	
E3	12.20	12.40	12.60	
E4	9.00	9.20	9.40	
F	3.10	3.20	3.30	
G	3.30	3.40	3.50	
e	2.54 BSC			
L	9.00	9.20	9.40	
L1	-	2.50	-	
L2	-	1.00	-	
L3	-	2.00	-	

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