

SWITCHING REGULATOR APPLICATIONS

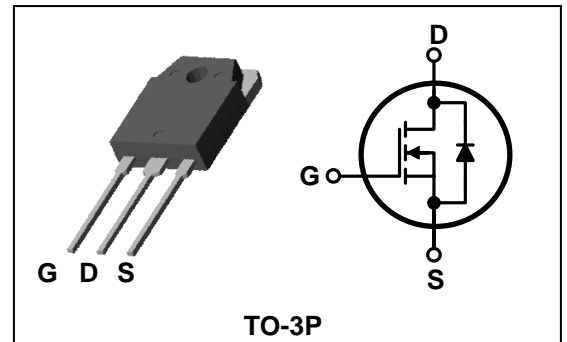
Features

- High Voltage: $BV_{DSS}=500V(\text{Min.})$
- Low C_{rss} : $C_{rss}=27pF(\text{Typ.})$
- Low gate charge : $Qg=65nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=0.26\Omega(\text{Max.})$

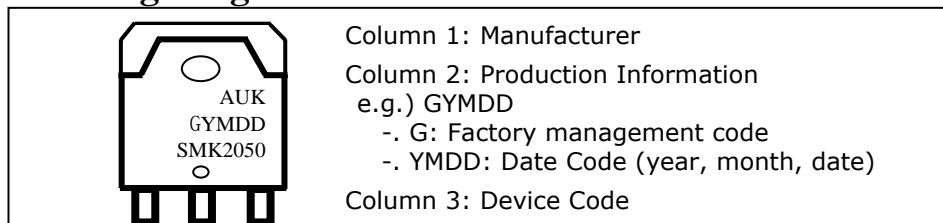
Ordering Information

Type No.	Marking	Package Code
SMK2050CI	SMK2050	TO-3P

PIN Connection



Marking Diagram



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

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	500	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current (DC)*	I_D	($T_C=25^\circ\text{C}$)	20
		($T_C=100^\circ\text{C}$)	12.6
Drain current (Pulsed)*	I_{DM}	80	A
Drain power dissipation	P_D	150	W
Avalanche current (Single) ②	I_{AS}	20	A
Single pulsed avalanche energy ②	E_{AS}	1000	mJ
Avalanche current (Repetitive) ①	I_{AR}	20	A
Repetitive avalanche energy ①	E_{AR}	28	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	$R_{th(J-C)}$	-	0.83	$^\circ\text{C}/\text{W}$
	Junction-ambient	$R_{th(J-a)}$	-	40	

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	500	-	-	V
Gate threshold voltage	V _{GS(th)}	I _D =250μA, V _{DS} =V _{GS}	3.0	-	5.0	V
Drain-source cut-off current	I _{DSS}	V _{DS} =500V, V _{GS} =0V	-	-	1	μA
		V _{DS} =400V, V _{GS} =0V T _C =125°C	-	-	100	
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 =10A	-	0.212	0.260	Ω
Forward transfer conductance ④	g _{fs}	V _{DS} =10V, I _D =10A	-	24.6	-	S
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V f=1MHz	-	3120	-	pF
Output capacitance	C _{oss}		-	355	-	
Reverse transfer capacitance	C _{rss}		-	27	-	
Turn-on delay time	t _{d(on)}	V _{DD} =250V, I _D =20A R _G =25Ω	-	95	-	ns
Rise time	t _r		-	375	-	
Turn-off delay time	t _{d(off)}		-	100	-	
Fall time	t _f		-	105	-	
Total gate charge	Q _g	V _{DS} =400V, V _{GS} =10V I _D =20A	-	65	-	nC
Gate-source charge	Q _{gs}		-	17.6	-	
Gate-drain charge	Q _{gd}		-	18.4	-	

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	-	-	20	A
Source current (Pulsed) ①	I _{SM}		-	-	80	
Forward voltage ④	V _{SD}	V _{GS} =0V, I _S =20A	-	-	1.4	V
Reverse recovery time	t _{rr}	I _S =20A, V _{GS} =0, di _S /dt=100A/ us	-	507	-	ns
Reverse recovery charge	Q _{rr}		-	7.2	-	uC

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=4.5mH, I_{AS}=20A, 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 $I_D - V_{DS}$

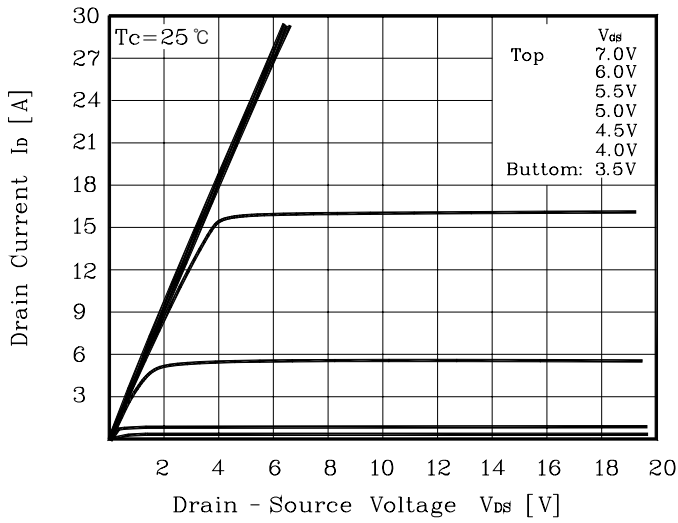


Fig. 2 $I_D - V_{GS}$

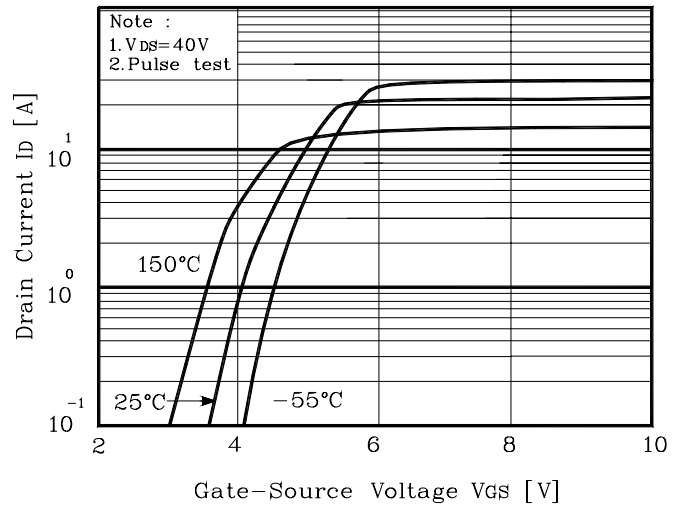


Fig. 3 $R_{DS(on)} - I_D$

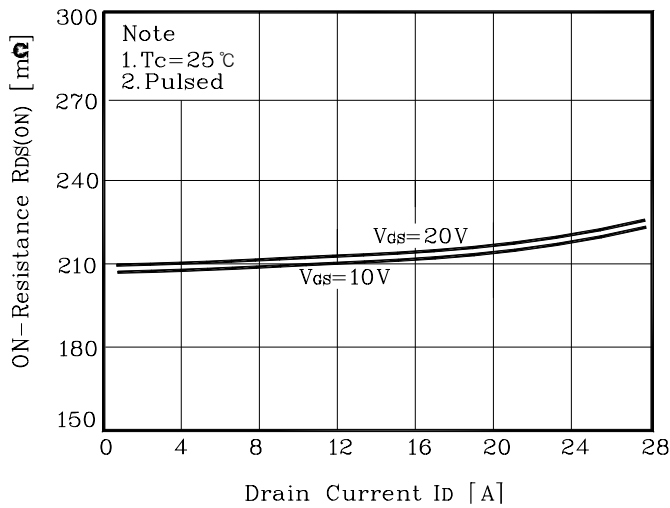


Fig. 4 $I_S - V_{SD}$

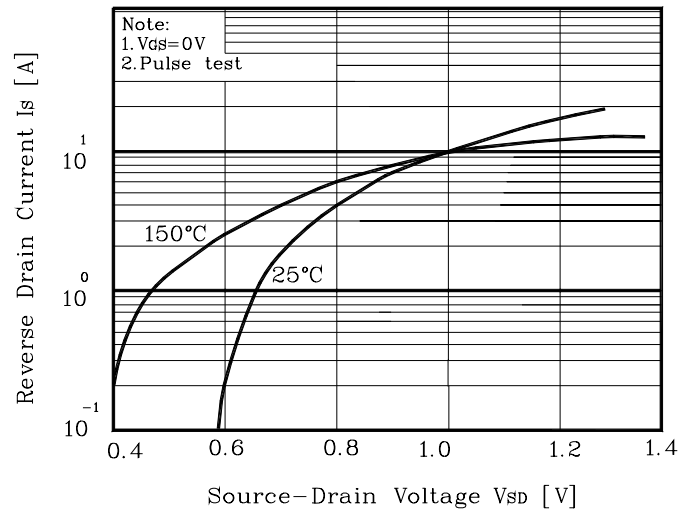


Fig. 5 Capacitance - V_{DS}

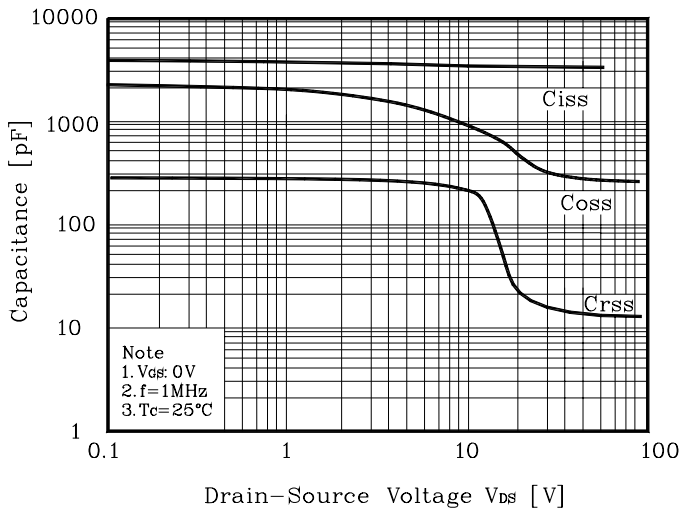
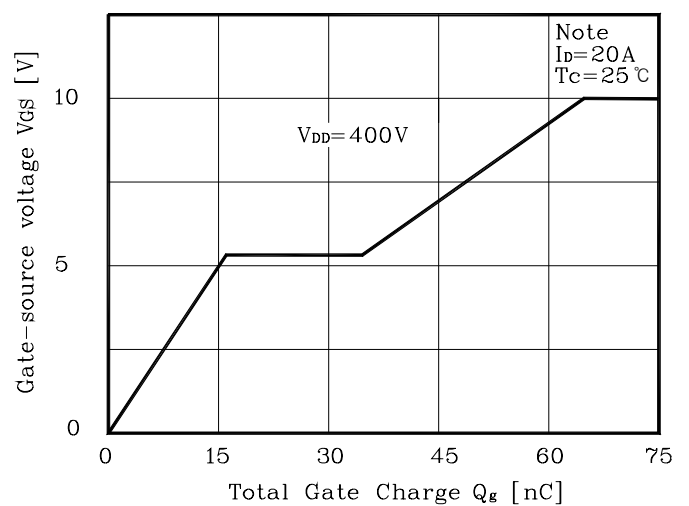


Fig.6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

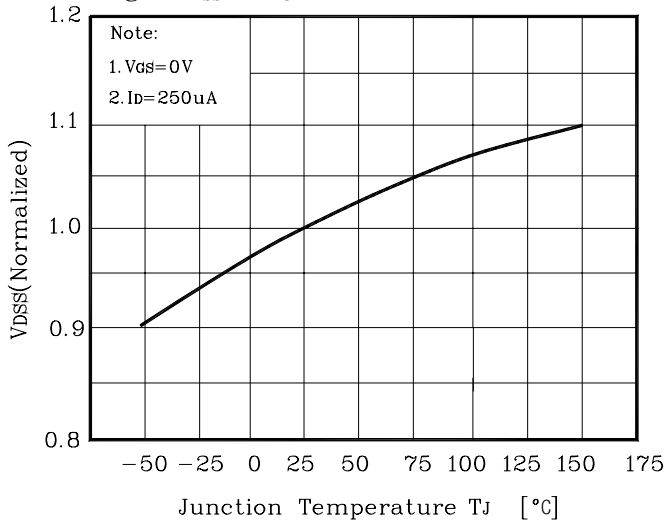


Fig.8 $R_{DS(on)} - T_J$

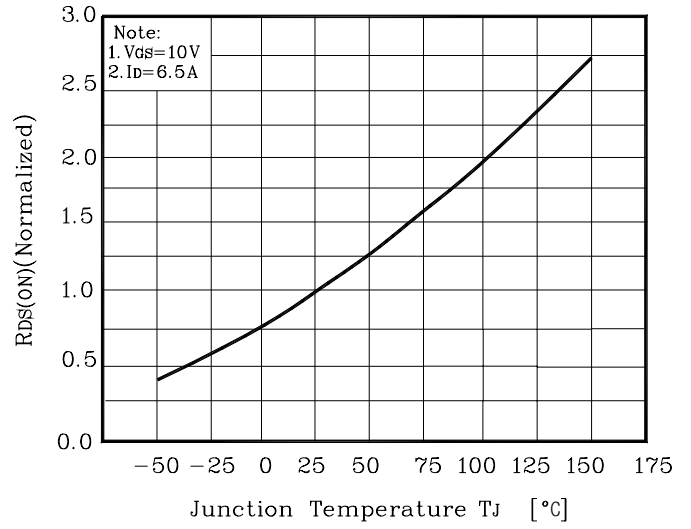


Fig. 9 $I_D - T_C$

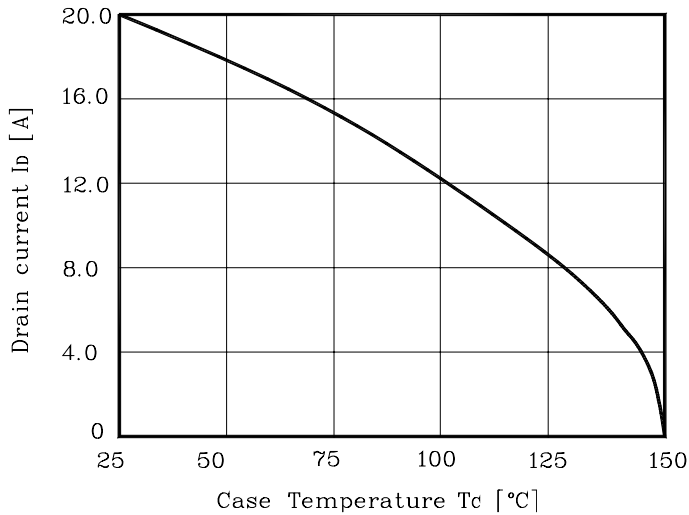


Fig. 10 Safe Operating Area

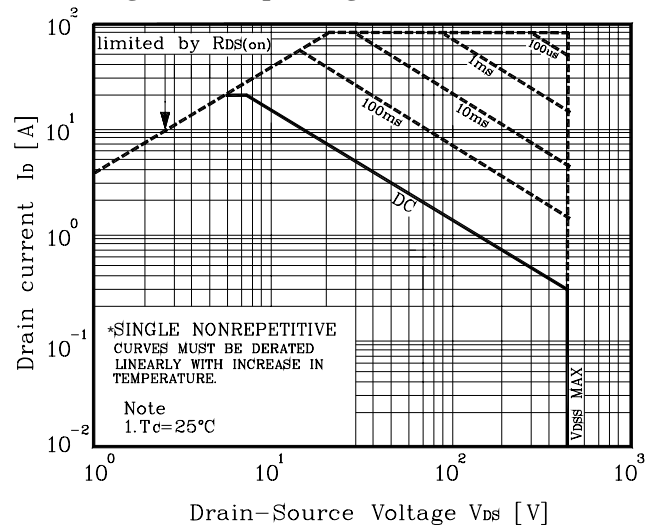


Fig. 10 Gate Charge Test Circuit & Waveform

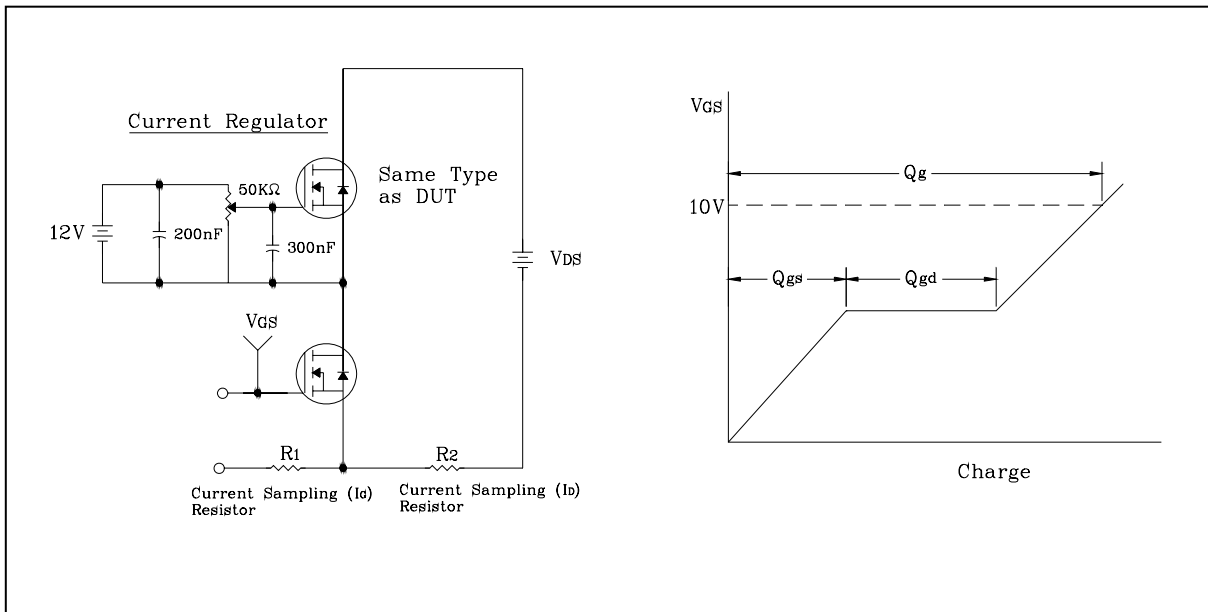


Fig. 11 Resistive Switching Test Circuit & Waveform

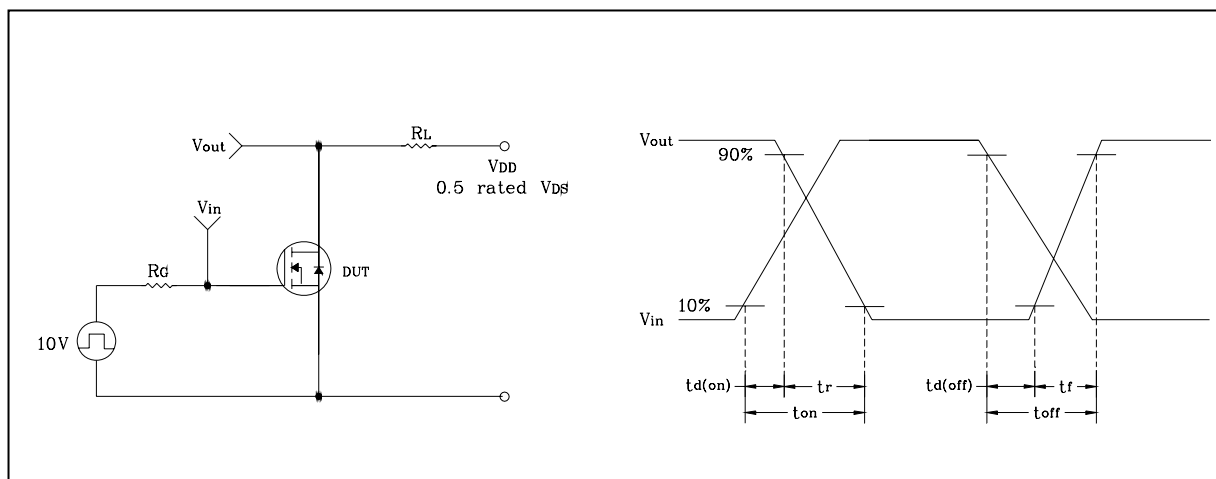


Fig. 12 E_{AS} Test Circuit & Waveform

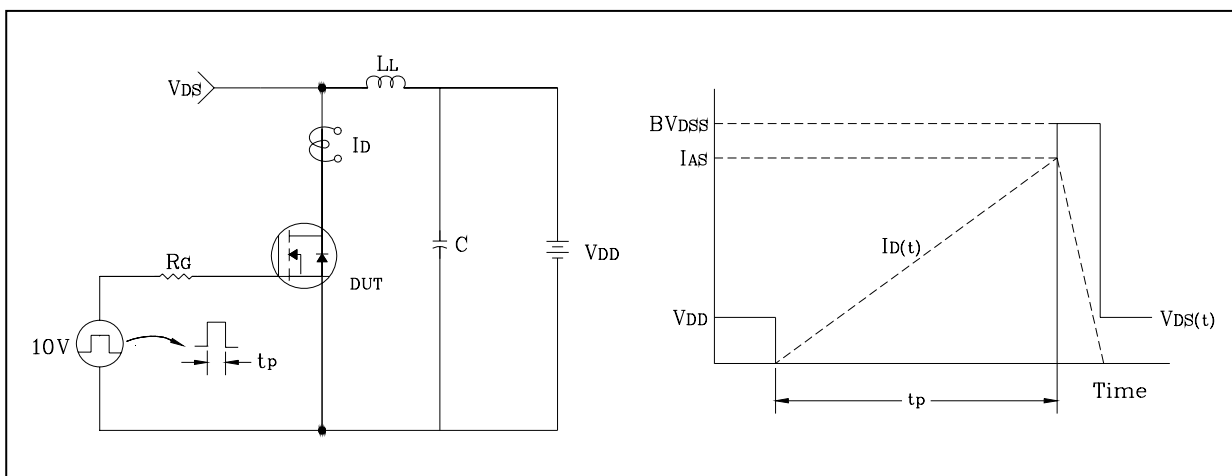
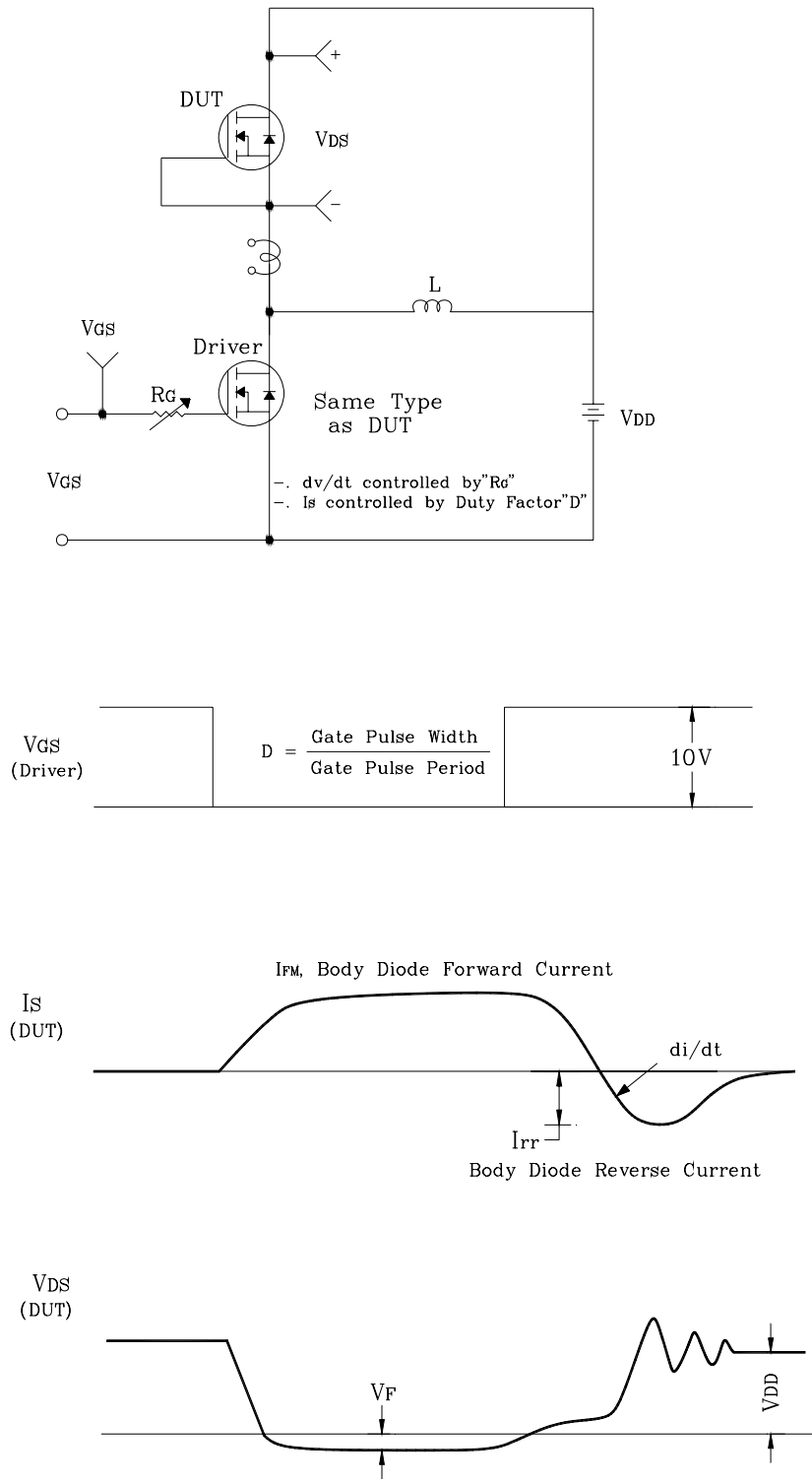
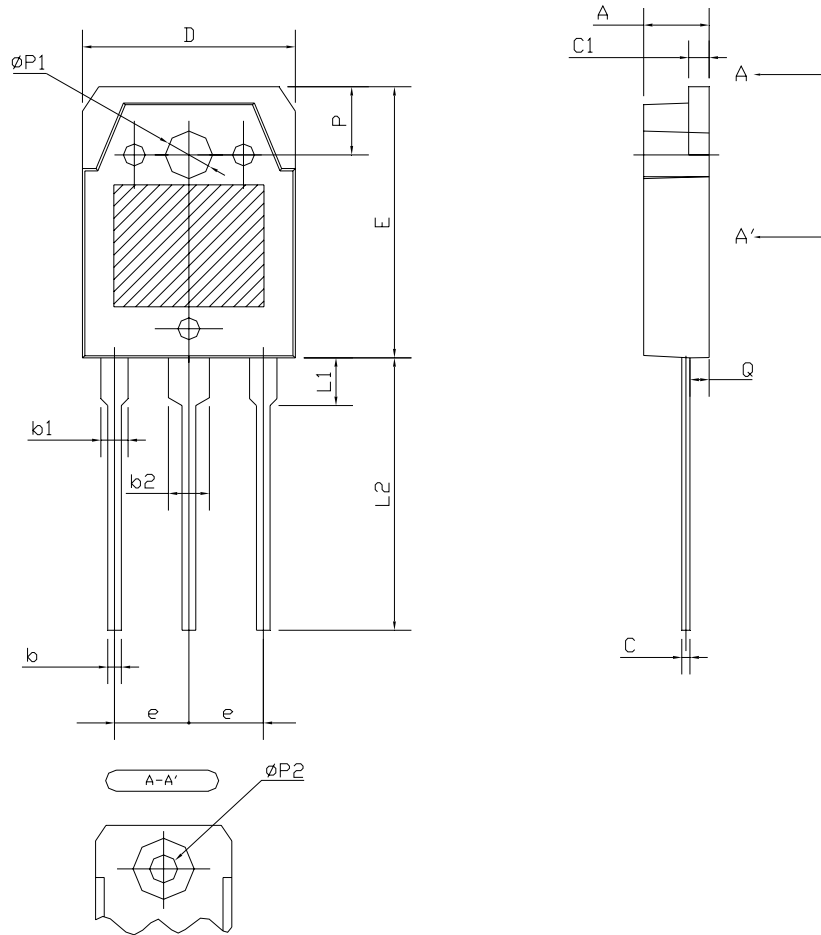


Fig. 13 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension



SYMBOL	MIN	NOM	MAX
A	4.60	4.80	5.00
b	0.80	1.00	1.20
b1	1.80	2.00	2.20
b2	2.80	3.00	3.20
C	0.55	0.60	0.75
C1	1.45	1.50	1.65
D	15.40	15.60	15.80
E	19.70	19.90	20.10
e	5.15	5.45	5.75
L1	3.30	3.50	3.70
L2	19.80	20.00	20.20
P	4.80	5.00	5.20
$\phi P1$	3.30	3.40	3.50
$\phi P2$	(3.20)		
Q	1.20	1.40	1.60

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