

SWITCHING REGULATOR APPLICATIONS

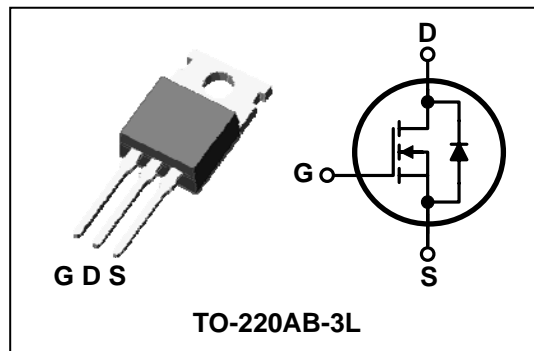
Features

- High Voltage: $BV_{DSS}=600V(\text{Min.})$
- Low C_{rSS} : $C_{rSS}=5.8pF(\text{Typ.})$
- Low gate charge : $Qg=13nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=2.5\Omega(\text{Max.})$

Ordering Information

Type No.	Marking	Package Code
SMK0460P	SMK0460	TO-220AB-3L

PIN Connection



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
Drain Power dissipation	P_D	70	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	$R_{th(J-C)}$	-	1.78
	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 leakage current	I _{DSS}	V _{DS} =600V, V _{GS} =0V	-	-	1	μA	
Gate-source leakage	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 admittance 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	-	592	789	pF	
Output capacitance	C _{oss}		-	54	72		
Reverse transfer capacitance	C _{rss}		-	5.8	7.7		
Turn-on delay time	t _{d(on)}	V _{DD} =300V, I _D =4A 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 =4A	-	13	17	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
Continuous source current	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 =4A	-	-	1.4	V
Reverse recovery time	t _{rr}	I _S =4A di _s /dt=100A/us	-	300	-	ns
Reverse recovery charge	Q _{rr}		-	2.2	-	uC

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=25.9mH, I_{AS}=4A, V_{DD}=50V, R_G=27Ω, 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 $I_D - V_{DS}$

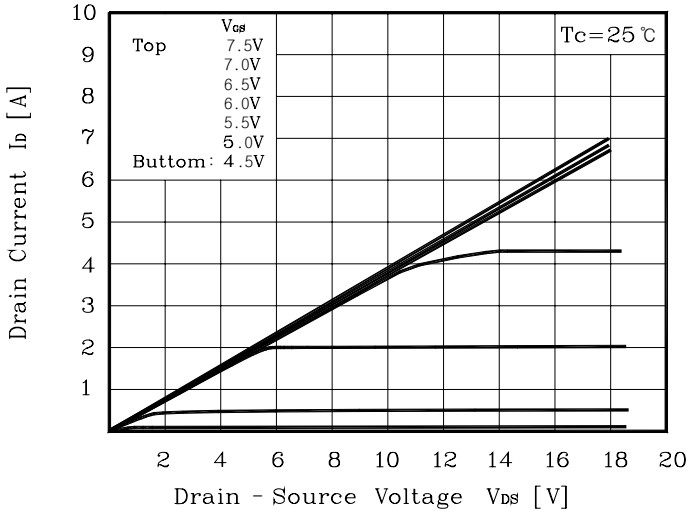


Fig. 2 $I_D - V_{GS}$

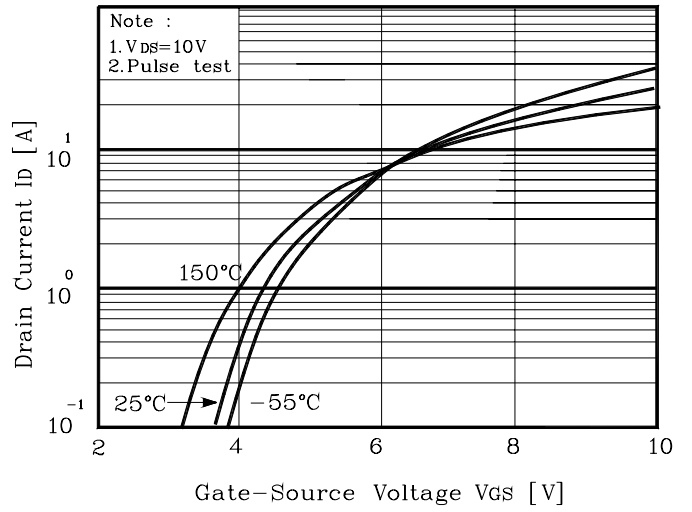


Fig. 3 $R_{DS(on)} - I_D$

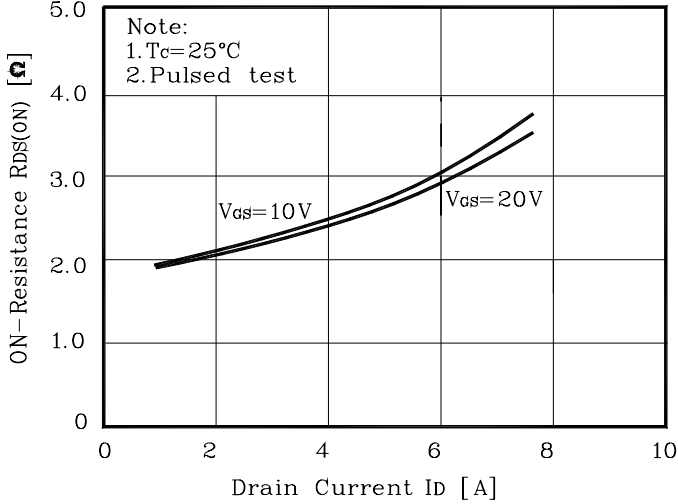


Fig. 4 $I_S - V_{SD}$

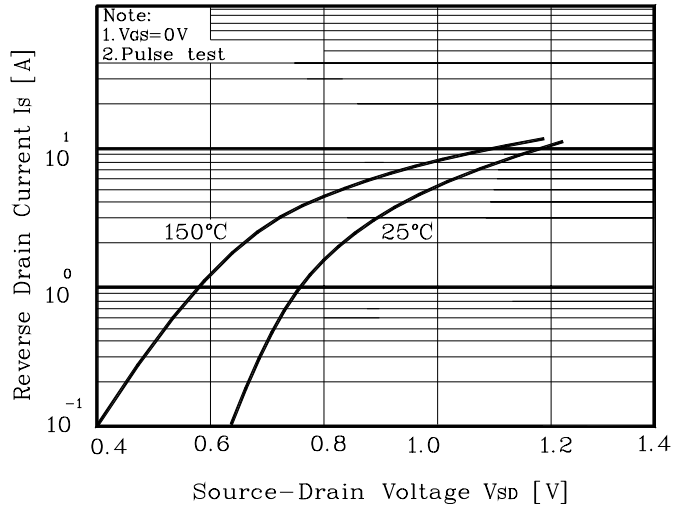


Fig. 5 Capacitance - V_{DS}

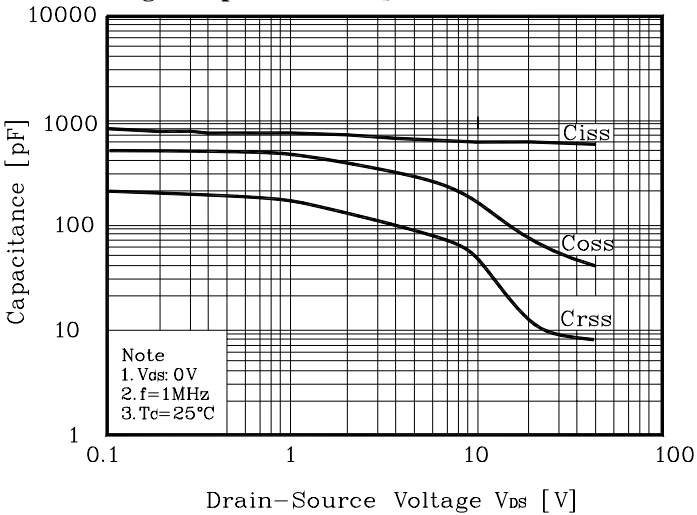
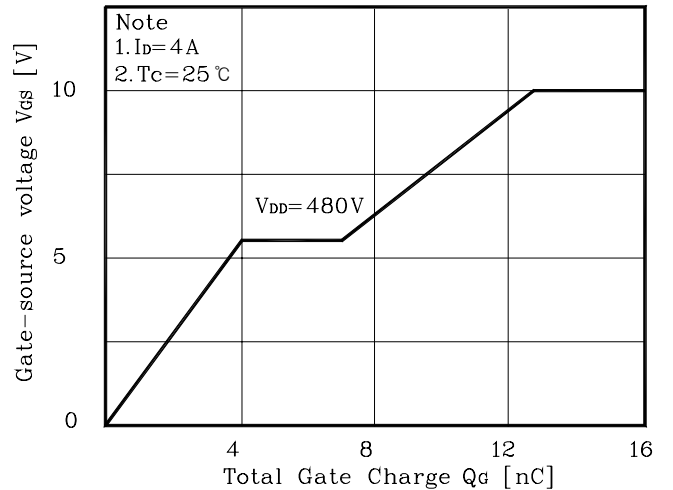


Fig. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

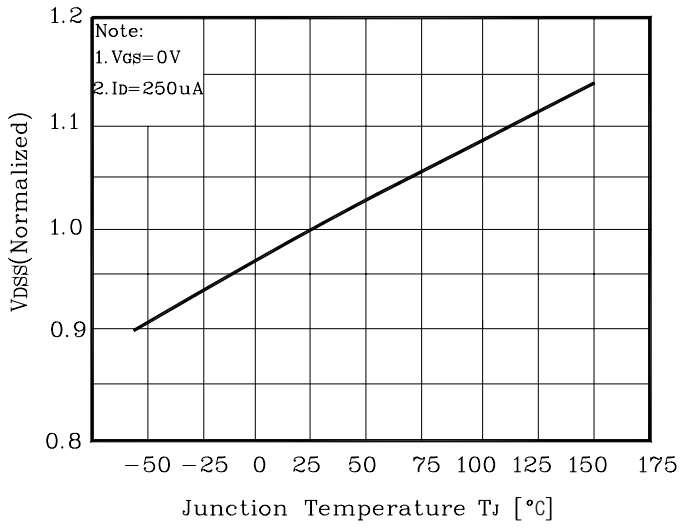


Fig. 8 $R_{DS(on)} - T_J$

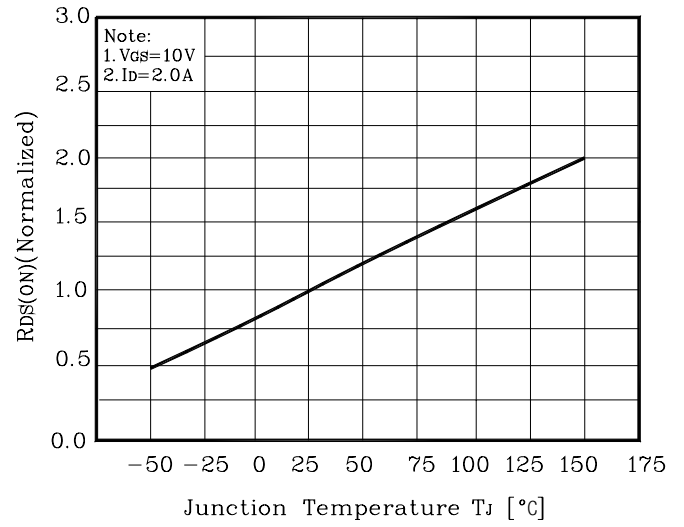


Fig. 9 $I_D - T_C$

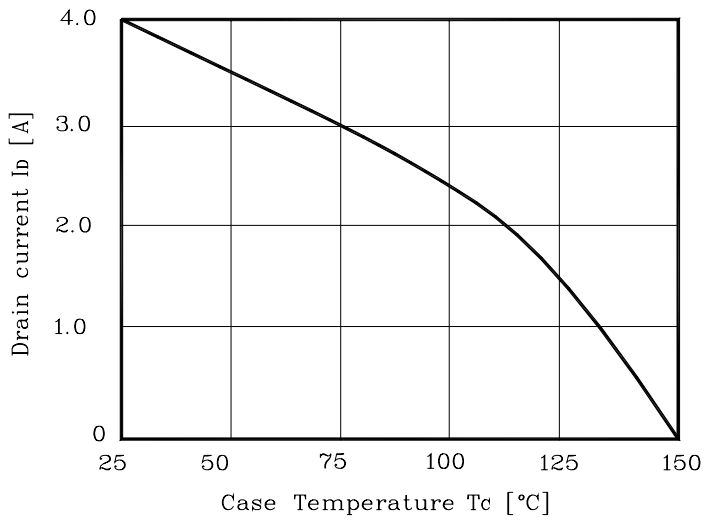


Fig. 10 Safe Operating Area

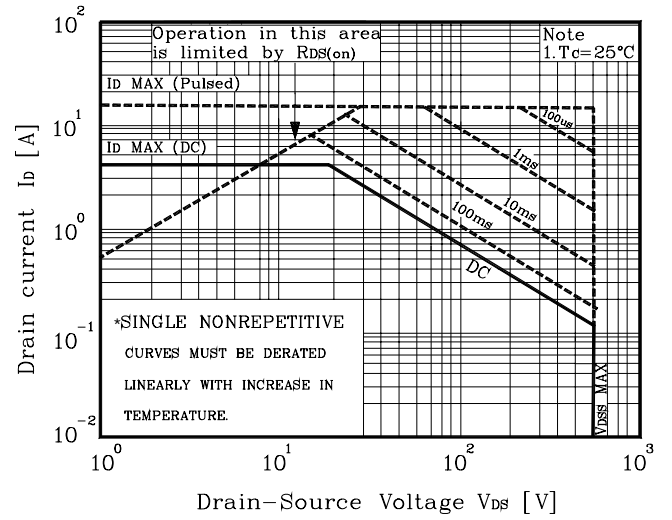


Fig. 11 Gate Charge Test Circuit & Waveform

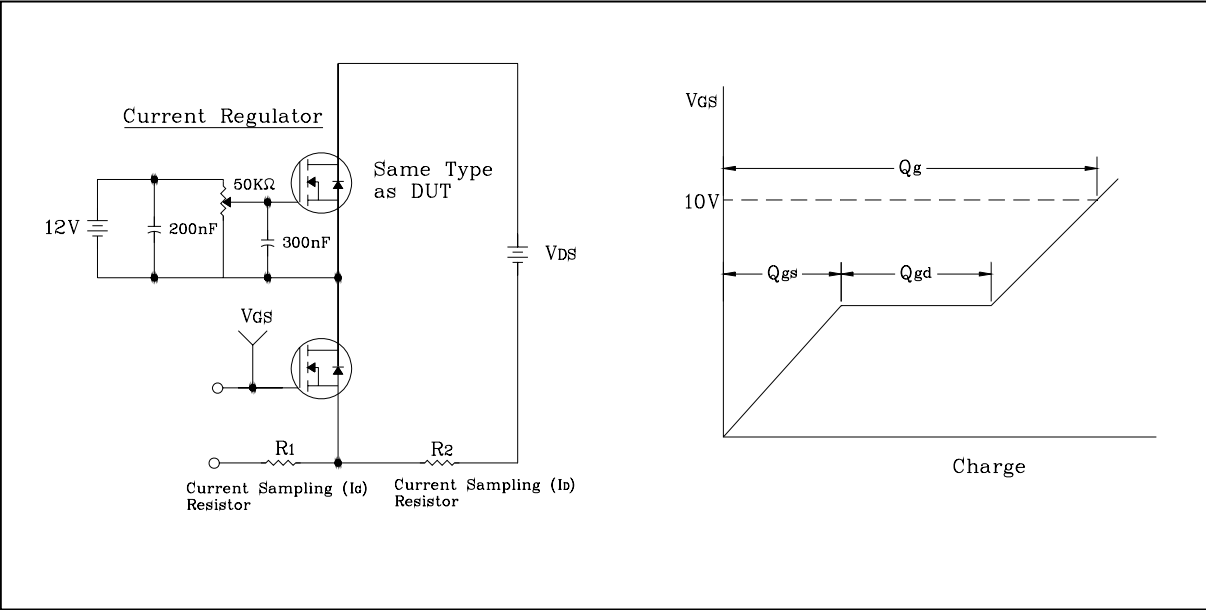


Fig. 12 Resistive Switching Test Circuit & Waveform

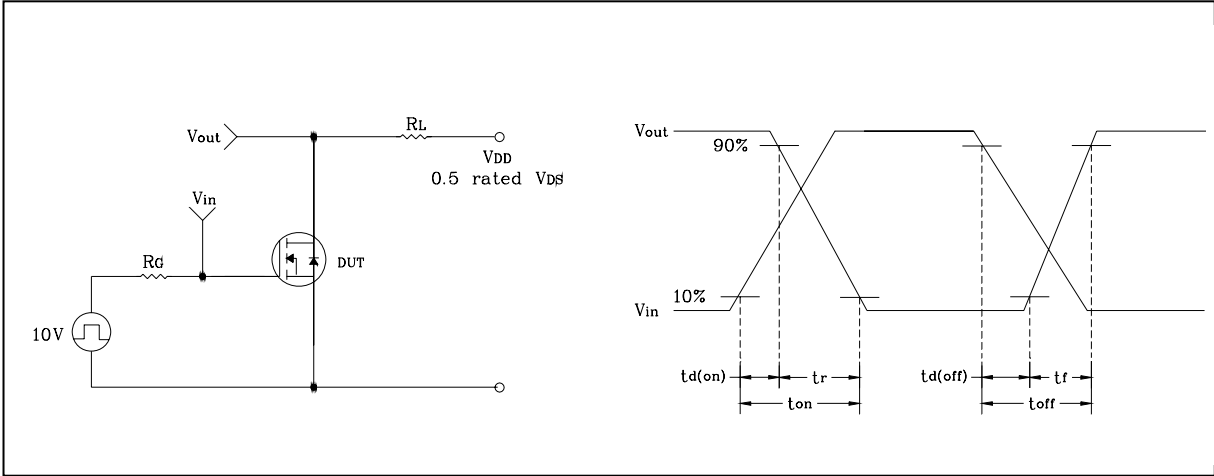


Fig. 13 E_{AS} Test Circuit & Waveform

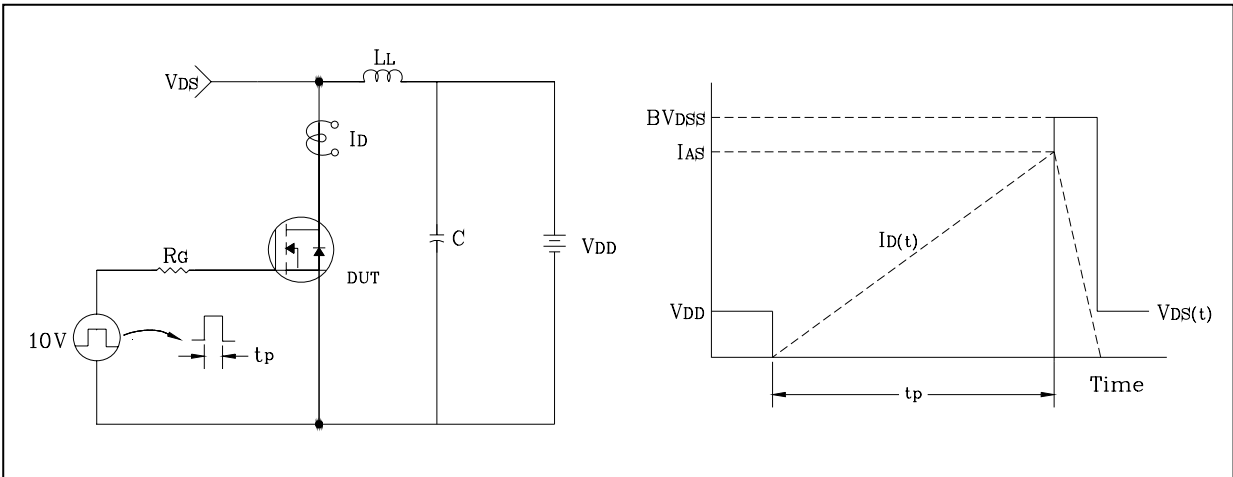
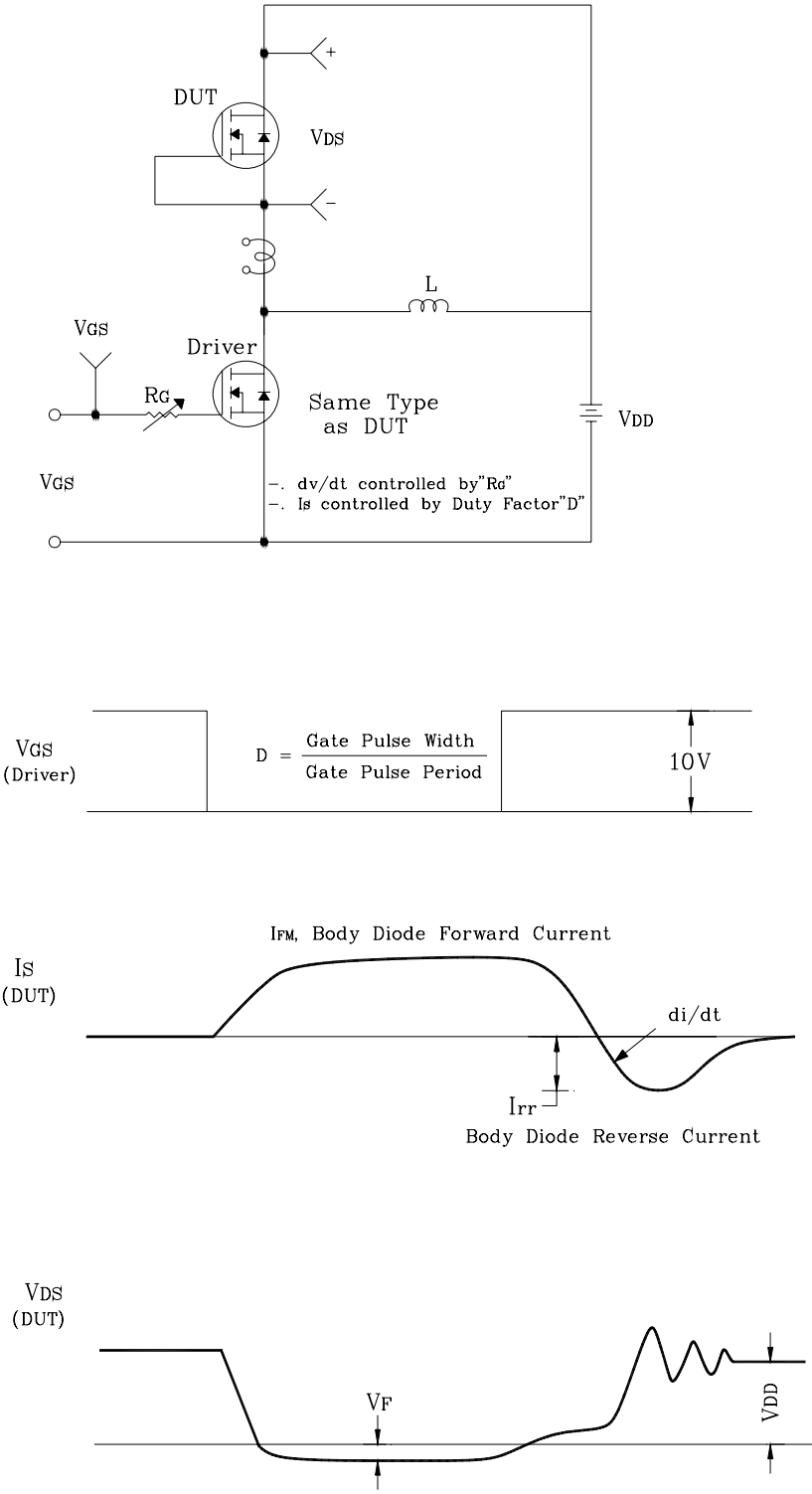
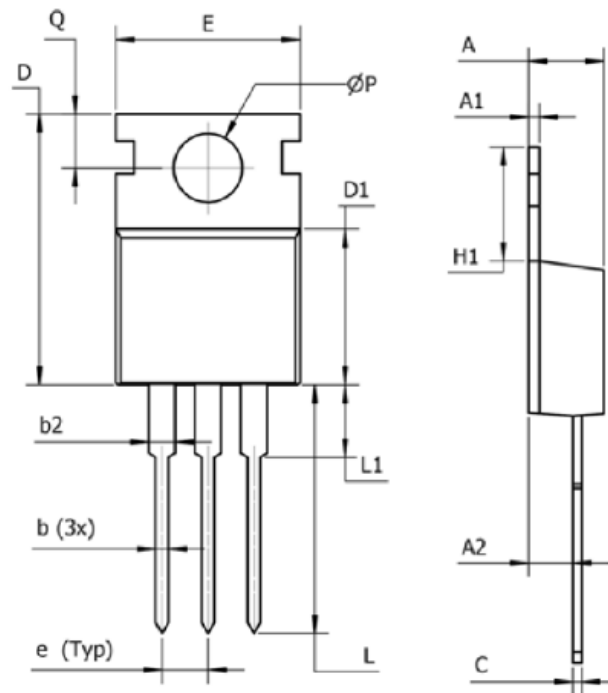


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension



DIM	MM	INCHES
D	14.22-16.51	0.560-0.650
$\varnothing P$	$\varnothing 3.53-4.09$	$\varnothing 0.139-0.161$
H1	5.84-6.86	0.230-0.270
b	0.38-1.02	0.015-0.040
b2	1.14-1.78	0.045-0.070
D1	8.38-9.02	0.330-0.355
e	2.54	0.100
E	9.65-10.67	0.380-0.420
L1	6.35(MAX)	0.250(MAX)
A	3.56-4.83	0.140-0.190
A1	0.51-0.71	0.020-0.028
L	12.70-14.73	0.500-0.580
A2	2.03-2.92	0.080-0.115
Q	2.54-3.43	0.100-0.135
C	0.36-0.61	0.014-0.024

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