

SWITCHING REGULATOR APPLICATIONS

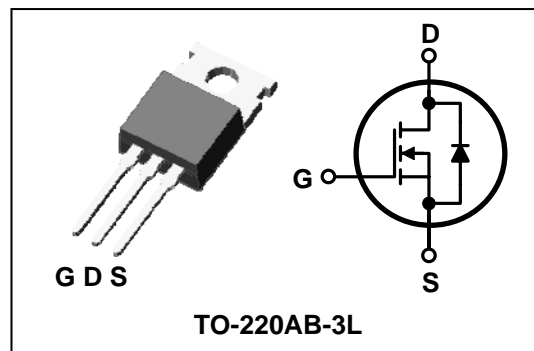
Features

- High Voltage: $BV_{DSS}=600V(\text{Min.})$
- Low C_{rSS} : $C_{rSS}=9.7pF(\text{Typ.})$
- Low gate charge : $Q_g=22nC(\text{Typ.})$
- Low $R_{DS(on)}$: $R_{DS(on)}=1.2\Omega(\text{Max.})$

Ordering Information

Type No.	Marking	Package Code
SMK0860P	SMK0860	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	($T_c=25^\circ\text{C}$)	7.5	A
		($T_c=100^\circ\text{C}$)	4.7	A
Drain current (Pulsed) *	I_{DM}	30	A	
Drain power dissipation	P_D	90	W	
Avalanche current (Single) ②	I_{AS}	7.5	A	
Single pulsed avalanche energy ②	E_{AS}	325	mJ	
Avalanche current (Repetitive) ①	I_{AR}	7.5	A	
Repetitive avalanche energy ①	E_{AR}	21.7	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	-	1.38	$^\circ\text{C}/\text{W}$
	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	600	-	-	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} =600V, 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 =3.75A	-	1.0	1.2	Ω	
Forward transfer conductance ④	g _{fs}	V _{DS} =10V, I _D =3.75A	-	7.3	-	S	
Input capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V f=1MHz	-	968	1210	pF	
Output capacitance	C _{oss}		-	105	131		
Reverse transfer capacitance	C _{rss}		-	9.7	12.1		
Turn-on delay time	t _{d(on)}	V _{DD} =300V, I _D =7.5A R _G =25Ω	-	18	-	ns	
Rise time	t _r		-	19	-		
Turn-off delay time	t _{d(off)}		③④	-	72		-
Fall time	t _f		-	28	-		
Total gate charge	Q _g	V _{DS} =480V, V _{GS} =10V I _D =7.5A	-	22	27	nC	
Gate-source charge	Q _{gs}		-	5.2	-		
Gate-drain charge	Q _{gd}		③④	-	6.3		-

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	-	-	7.5	A
Source current (Pulsed) ①	I _{SM}		-	-	30	
Forward voltage ④	V _{SD}	V _{GS} =0V, I _S =7.5A	-	-	1.4	V
Reverse recovery time	t _{rr}	I _S =7.5A, V _{GS} =0, di _S /dt=100A/us	-	365	-	ns
Reverse recovery charge	Q _{rr}		-	3.4	-	μC

Note ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② L=10.6mH, I_{AS}=7.5A, 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 $I_D - V_{DS}$

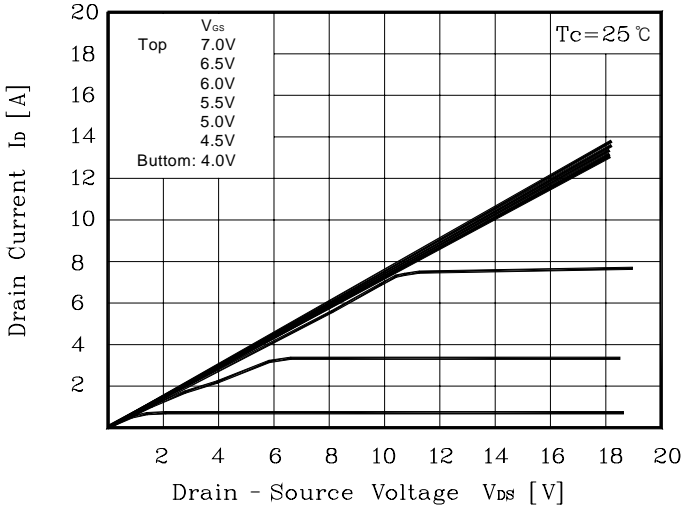


Fig. 2 $I_D - V_{GS}$

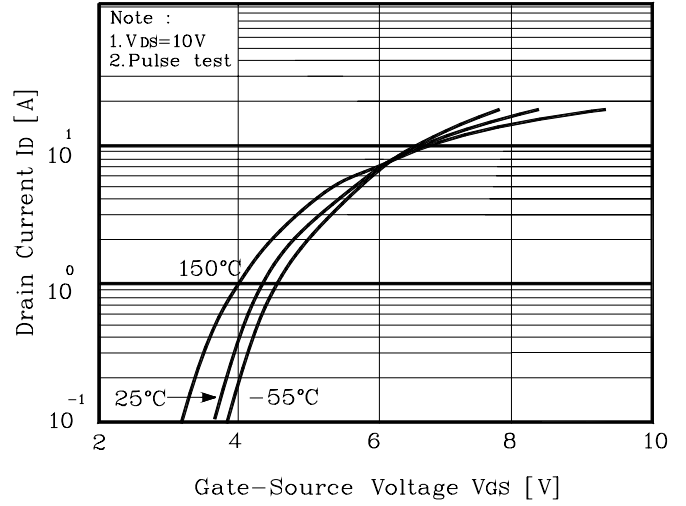


Fig. 3 $R_{DS(on)} - I_D$

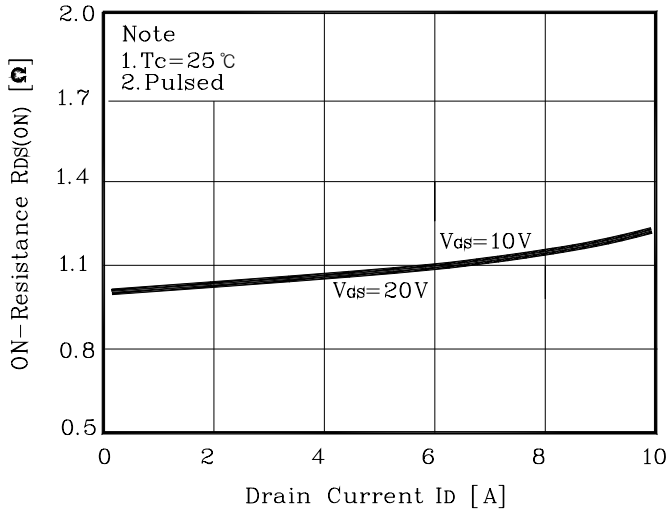


Fig. 4 $I_S - V_{SD}$

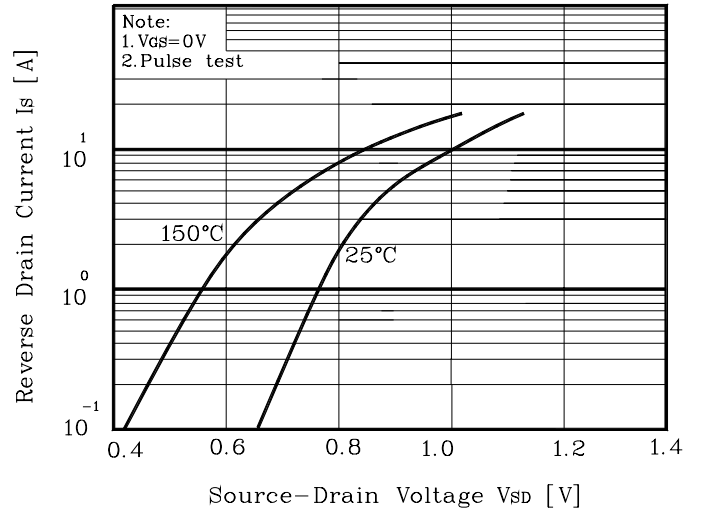


Fig. 5 Capacitance - V_{DS}

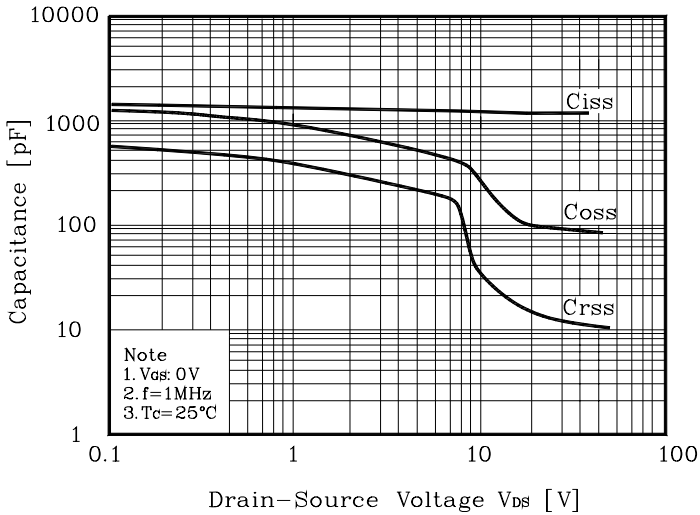
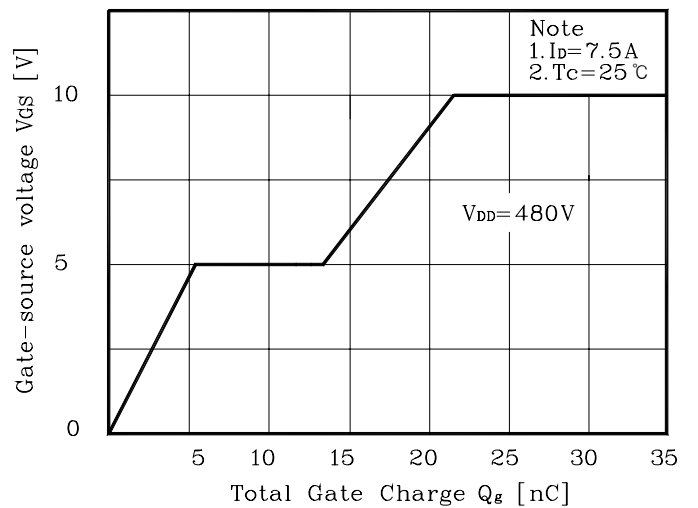


Fig. 6 $V_{GS} - Q_G$



Electrical Characteristic Curves

Fig. 7 $V_{DSS} - T_J$

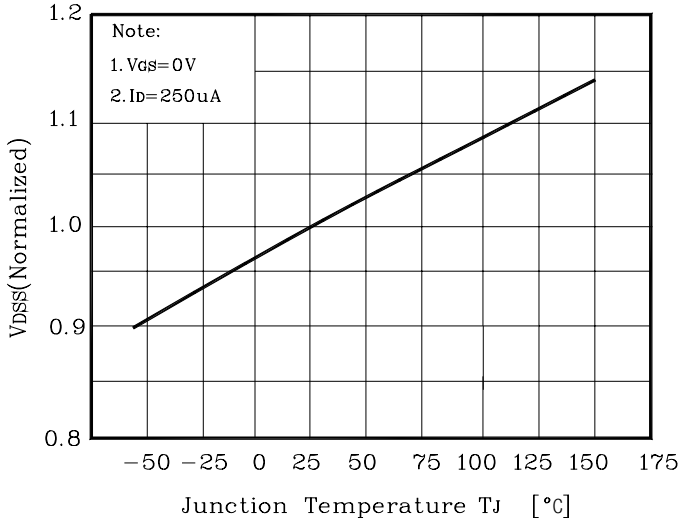


Fig.8 $R_{DS(on)} - T_J$

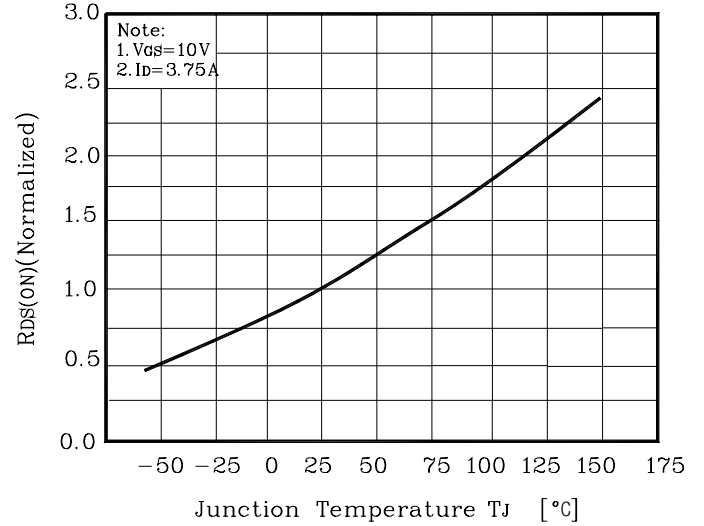


Fig. 9 $I_D - T_C$

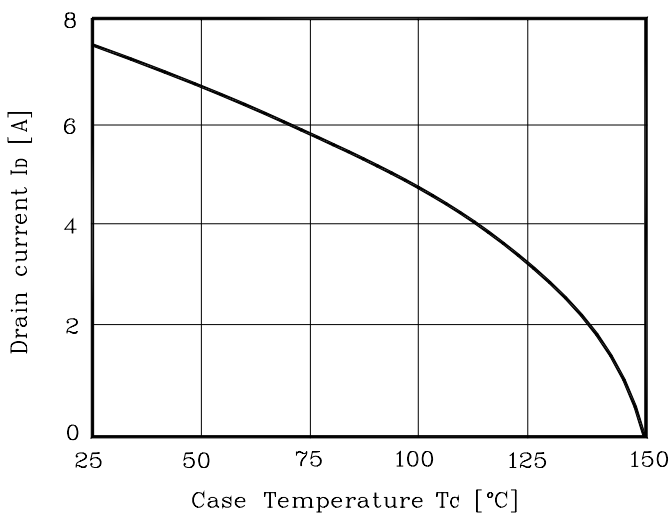


Fig. 10 Safe Operating Area

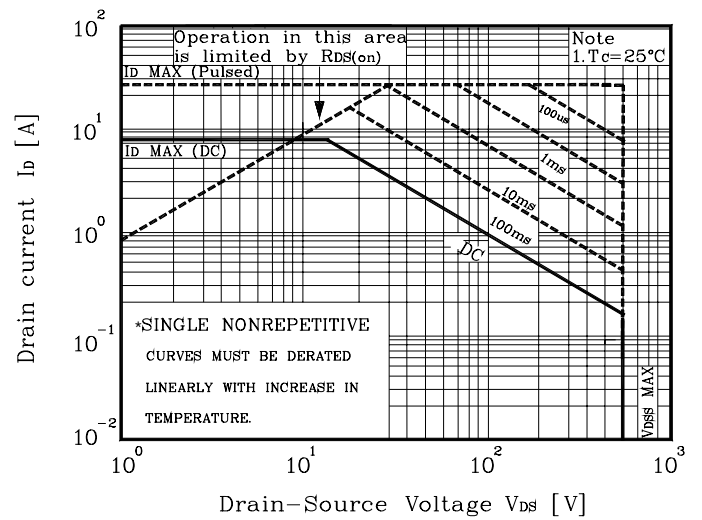


Fig. 10 Gate Charge Test Circuit & Waveform

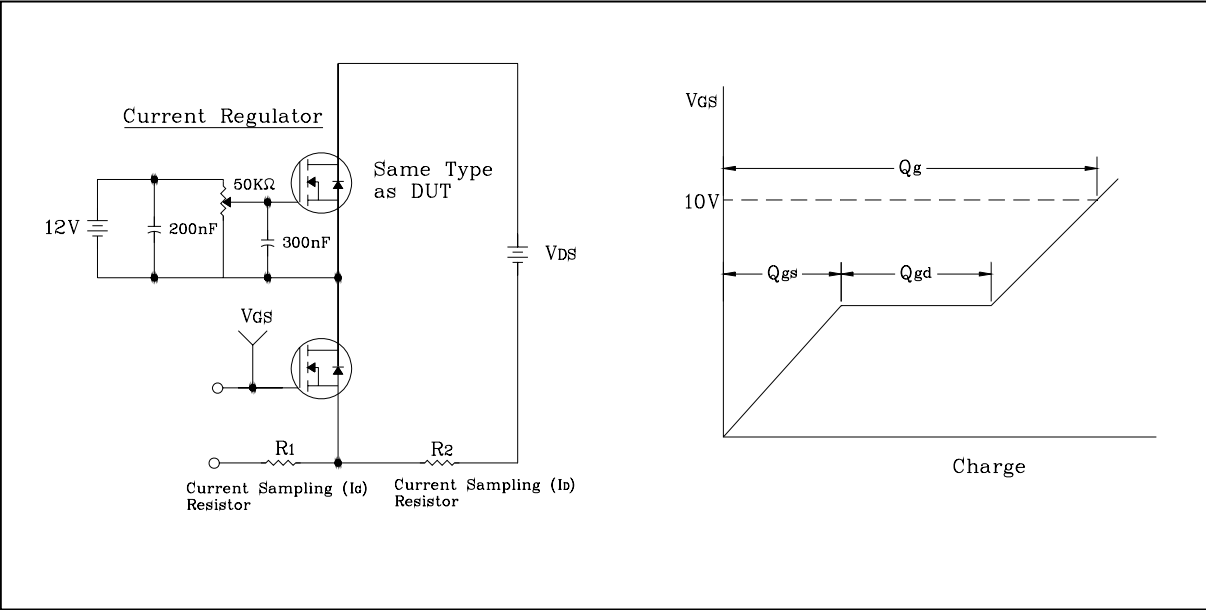


Fig. 11 Resistive Switching Test Circuit & Waveform

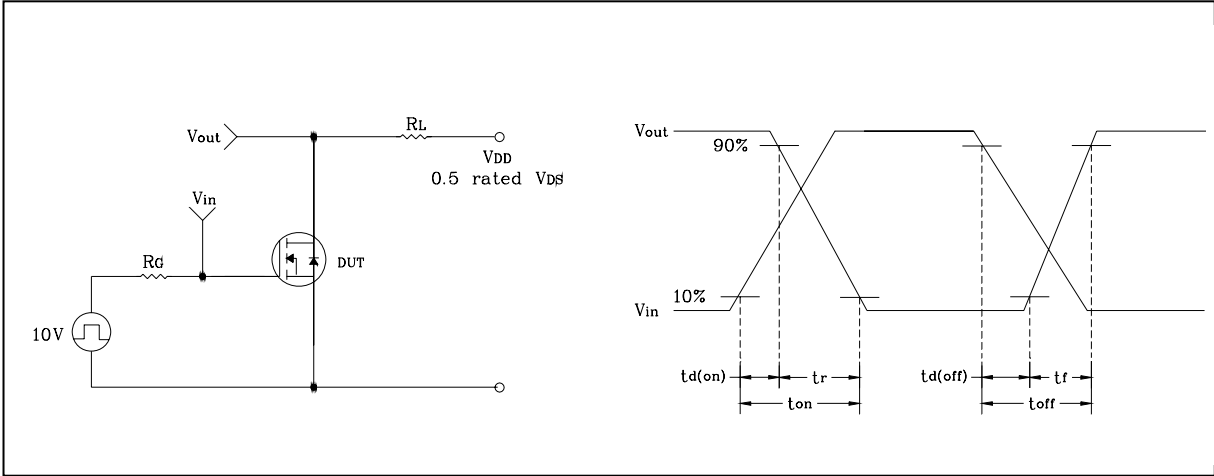


Fig. 12 E_{AS} Test Circuit & Waveform

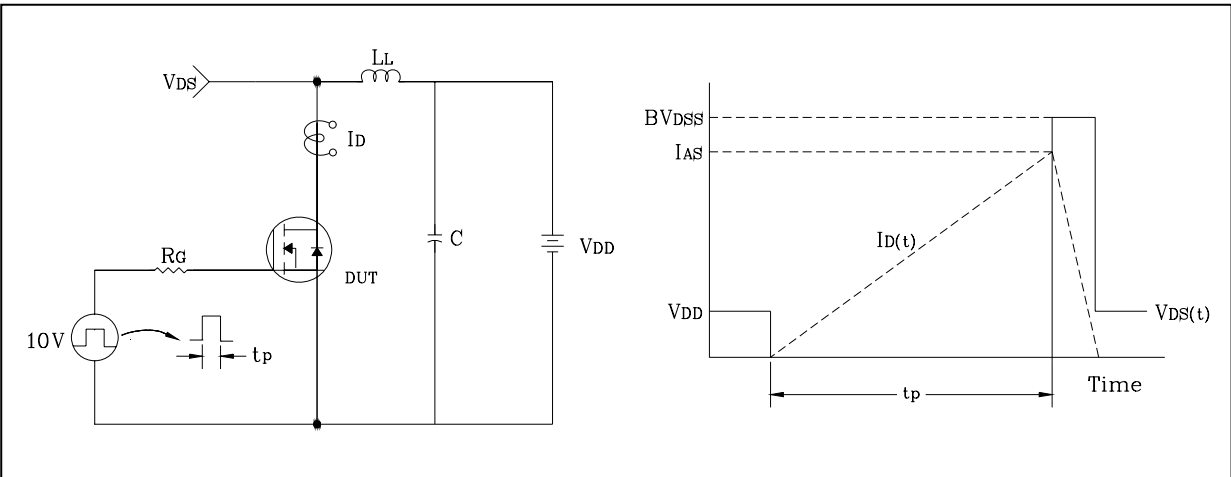
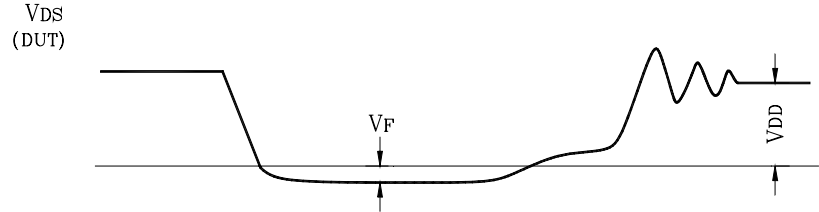
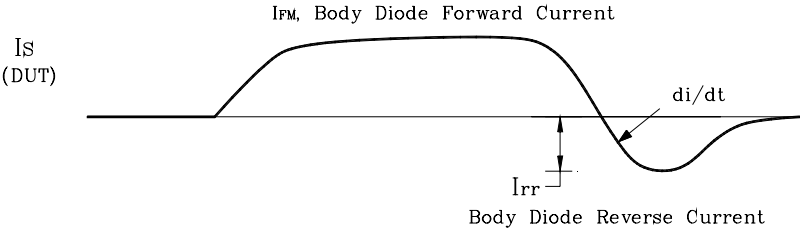
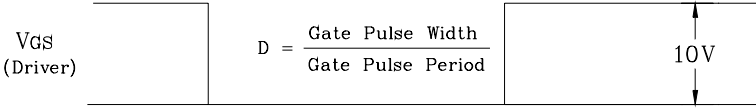
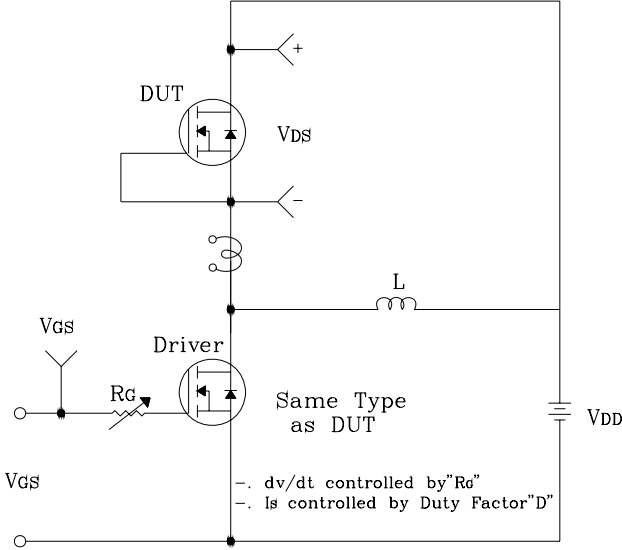
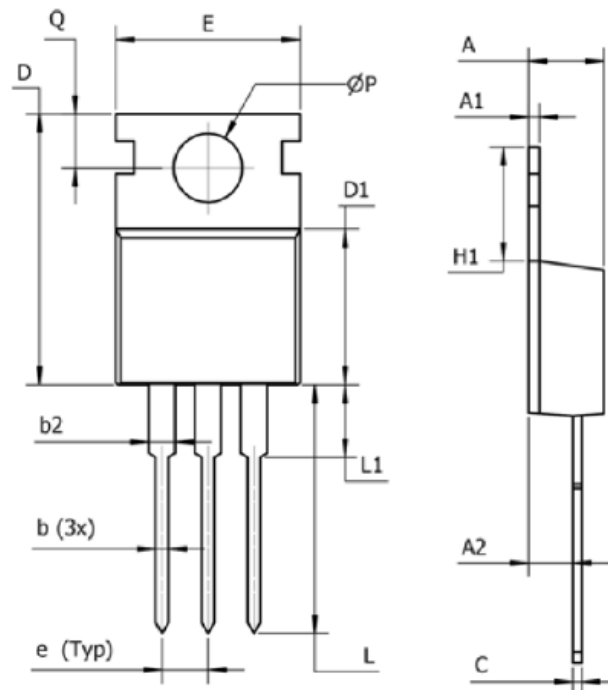


Fig. 13 Diode Reverse Recovery Time Test Circuit & Waveform



Outline Dimension



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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