MP13N50

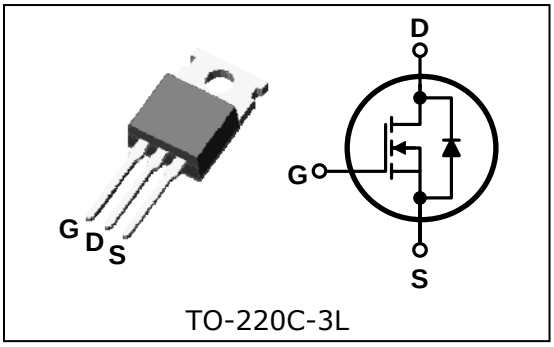
Power MOSFET

SWITCHING REGULATOR APPLICATIONS

Features

- High Voltage : BV_{DSS}=500V(Min.)
- Low C_{rss} : C_{rss}=21pF(Typ.)
- Low gate charge : Qg=43nC(Typ.)
- Low $R_{DS(on)}$: $R_{DS(on)}$=0.46Ω(Max.)

PIN Connection



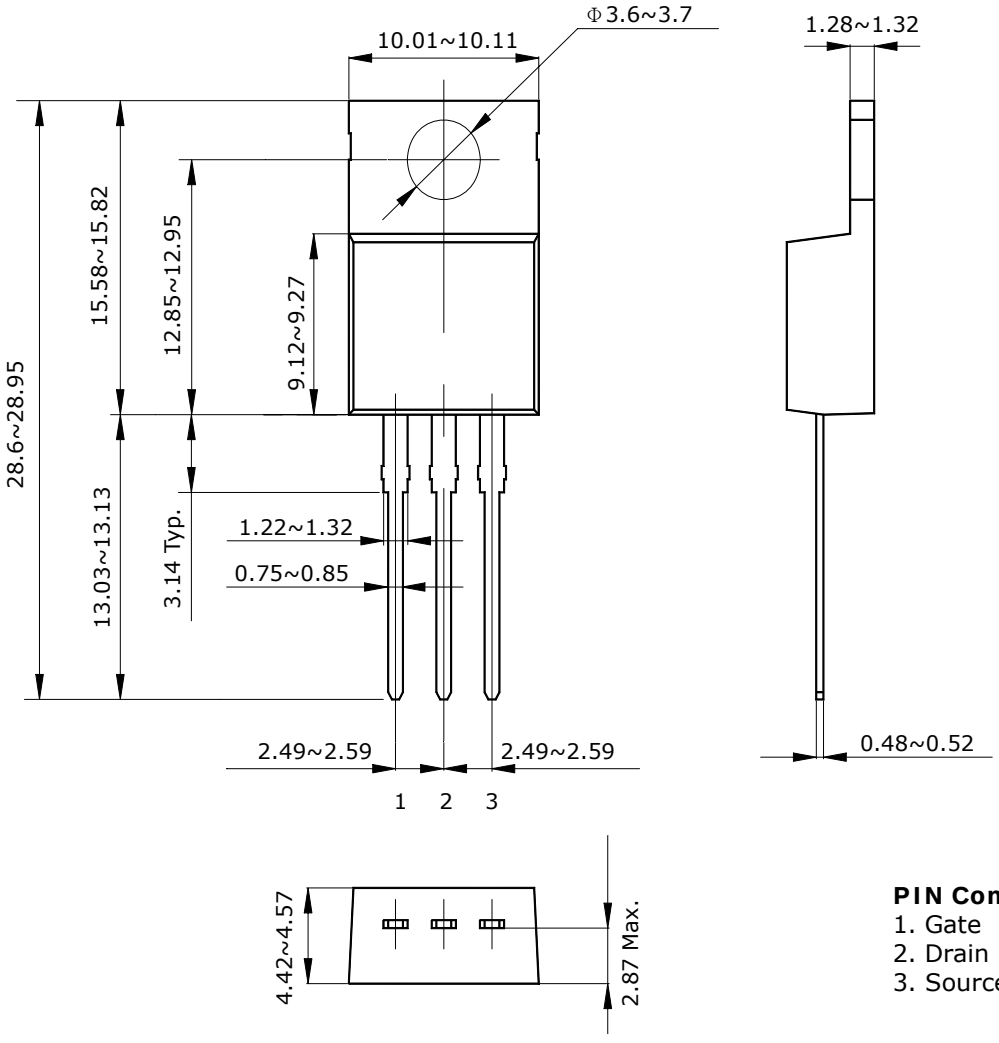
TO-220C-3L

Ordering Information

Type NO.	Marking	Package Code
MP13N50	MP13N50C	TO-220C-3L

Outline Dimensions

unit : mm



PIN Connections
1. Gate
2. Drain
3. Source

Absolute Maximum Ratings

Power MOSFET

Symbol	Parameter		Value	Units
V_{DSS}	Drain Source Voltage		500	V
I_D	Continuous Drain Current(@Tc=25℃)		13*	A
	Continuous Drain Current(@Tc=100℃)		8*	A
I_{DM}	Drain Current Pulsed	(Note1)	52*	A
V_{GS}	Gate to Source Voltage		±30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note2)	845	mJ
E_{AR}	Repetitive Avalanche Energy	(Note1)	5	mJ
dv/dt	Peak Diode Recovery dv /dt	(Note3)	3.5	V/ ns
P_D	Total Power Dissipation(@Tc=25℃)		190	W
	Derating Factor above 25℃		0.39	W/℃
T_J,T_{stg}	Junction and Storage Temperature		-55~150	℃
T_L	Channel Temperature		300	℃

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	Value			Units
		Min	Typ	Max	
R_{QJC}	Thermal Resistance , Junction -to -Case	-	-	0.66	℃/W
R_{QCS}	Thermal Resistance , Case-to-Sink	-	0.5	-	℃/W
R_{QJA}	Thermal Resistance , Junction-to -Ambient	-	-	62.5	℃/W

Electrical Characteristics (T_C=25°C unless otherwise noted)

Characteristics		Symbol	Test Condition	Min	Type	Max	Unit
Gate leakage current		I_{GSS}	V_{GS}=±30V,V_{DS}=0V	-	-	±100	nA
Gate-source breakdown voltage		$V_{(BR)GSS}$	I_G=±10 μA,V_{DS}=0V	±30	-	-	V
Drain cut -off current		I_{DSS}	V_{DS}=500V,V_{GS}=0V	-	-	1	μA
			V_{DS}=400V,TC=125℃			10	μA
Drain -source breakdown voltage		$V_{(BR)DSS}$	I_D=250 μA,V_{GS}=0V	500	-	-	V
Breakdown voltage Temperature Coefficient		△BV_{DSS}/ △T_J	I_D=250μA,Referenced to 25℃	-	0.5	-	V/℃
Gate threshold voltage		$V_{GS(th)}$	V_{DS}=10V,I_D=250 μA	3	-	4.5	V
Drain -source ON resistance		$R_{DS(ON)}$	V_{GS}=10V,I_D=6.5A	-	0.39	0.46	Ω
Forward Transconductance		gfs	V_{DS}=50V,I_D=6.5A	-	15	-	S
Input capacitance		C_{iss}	V_{DS}=25V,	-	1580	2055	pF
Reverse transfer capacitance		C_{rss}	V_{GS}=0V,	-	21	26	
Output capacitance		C_{oss}	f=1MHz	-	180	235	
Switching time	Rise time	tr	V_{DD}=250V,	-	160	270	ns
	Turn-on time	ton	I_D=13A	-	100	210	
	Fall time	tf	R_G=9.1Ω	-	130	270	
	Turn-off time	toff	R_D=31Ω (Note4,5)	-	100	210	
Total gate charge(gate-source plus gate-drain)		Qg	V_{DD}=400V,	-	43	56	nC
Gate-source charge		Qgs	V_{GS}=10V,	-	10.9	-	
Gate-drain("miller") Charge		Qgd	I_D=13A (Note4,5)	-	18.5	-	

Source-Drain Diode Ratings and Characteristics (T_C=25°C unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Type	Max	Unit
Continuous drain reverse current	I_{DR}	-	-	-	13	A
Pulse drain reverse current	I_{DRP}	-	-	-	52	A
Forward voltage(diode)	V_{DSF}	I_{DR}=13A,V_{GS}=0V	-	-	1.4	V
Reverse recovery time	trr	I_{DR}=13A,V_{GS}=0V,	-	442	633	ns
Reverse recovery charge	Qrr	dI_{DR} / dt =100 A / μs	-	2.16	3.24	μC

Note 1.Repeativity rating :pulse width limited by junction temperature

2.L=500uH I_{AS}=13A,V_{DD}=50V,R_G=0Ω,Starting T_J=25℃

3.I_{SD}≤13A,di/dt≤300A/us,V_{DD}<BV_{DSS},STARTING T_J=25℃

4.Pulse Test:Pulse Width≤300us,Duty Cycle≤2%

5. Essentially independent of operating temperature.

Electrical Characteristic Curves

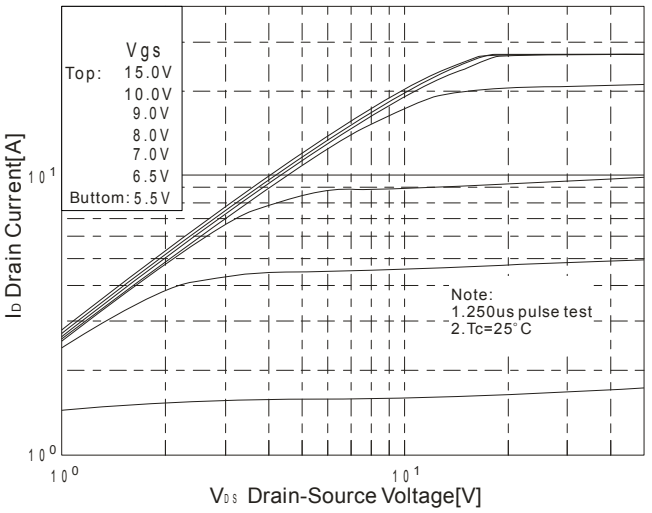


Fig.1 On Region Characteristics

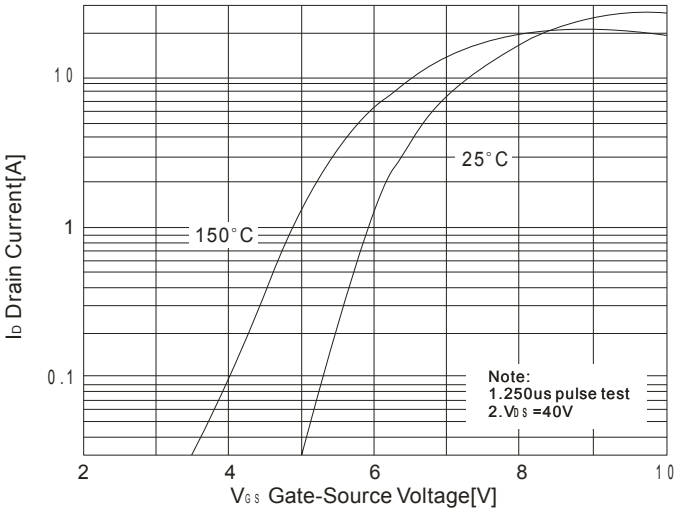


Fig.2 Transfer Characteristics

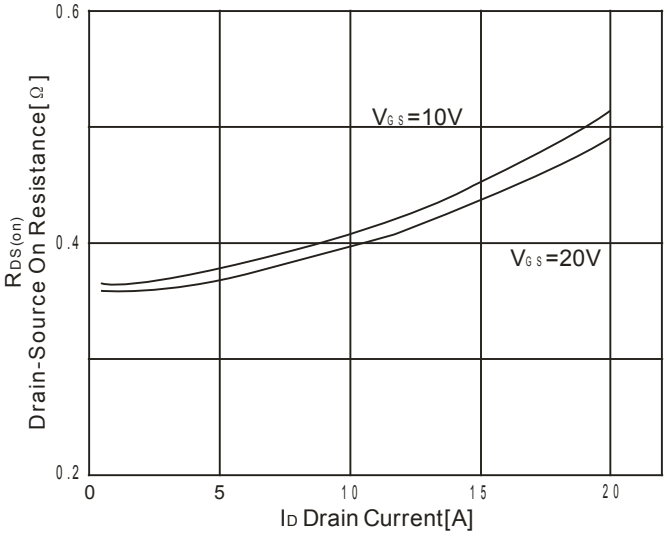


Fig.3 On-Resistance Variation vs Drain Current and Gate Voltage

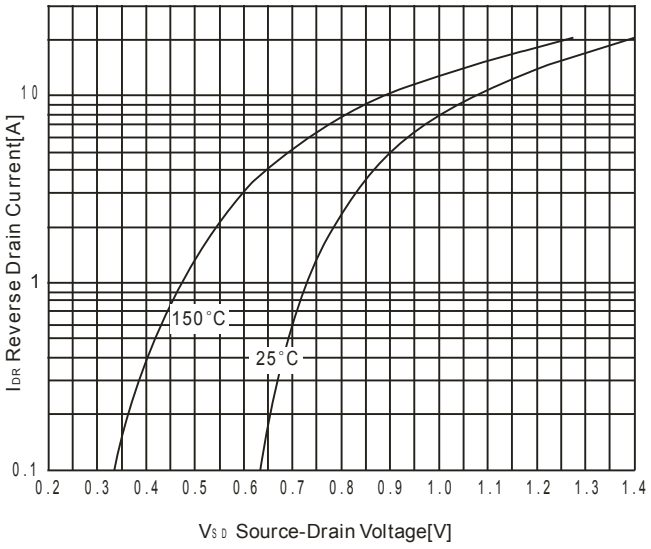


Fig.4 Body Diode Forward Voltage Variation vs. Source Current and Temperature

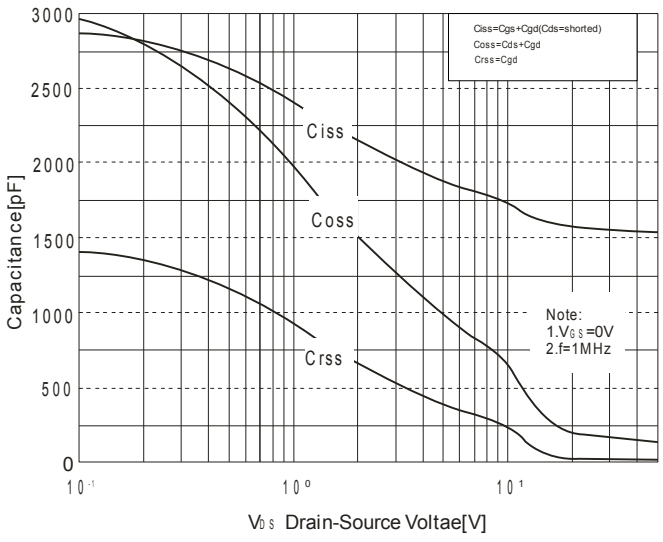


Fig.5 Capacitance Characteristics

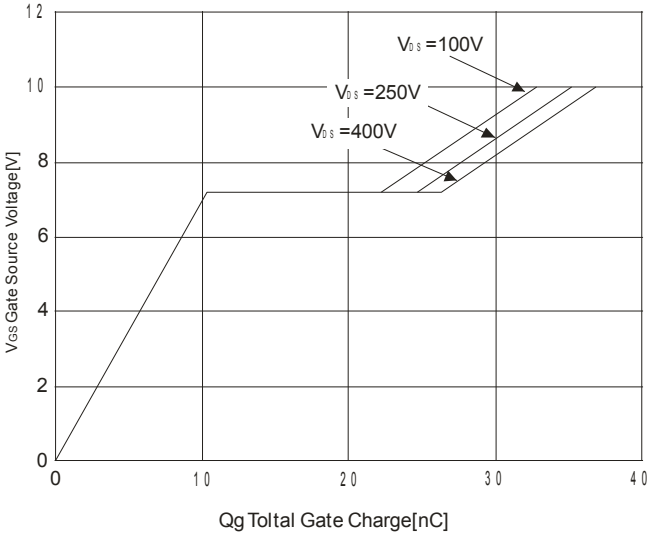


Fig.6 Gate Charge Characteristics

Electrical Characteristic Curves

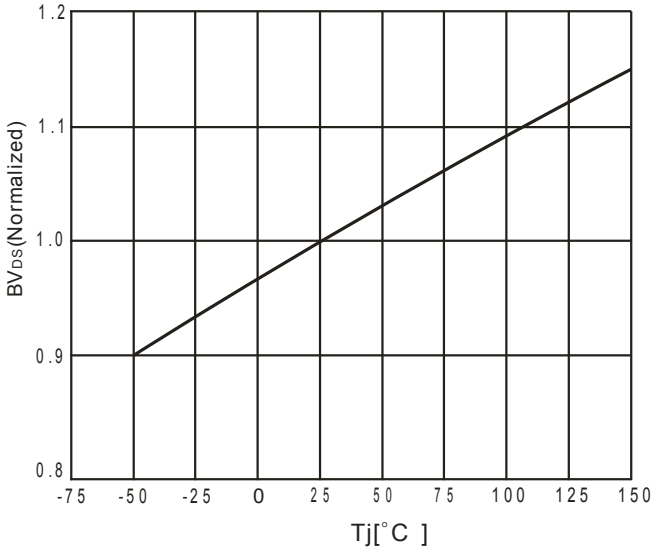


Fig.7 Breakdown Voltage Variation vs. Temperature

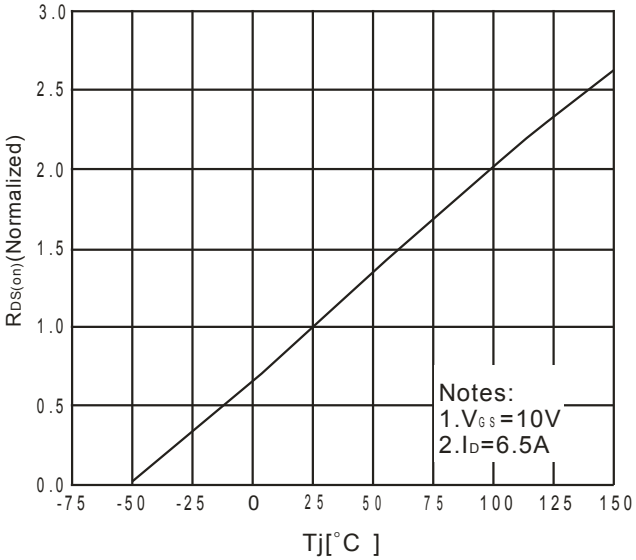
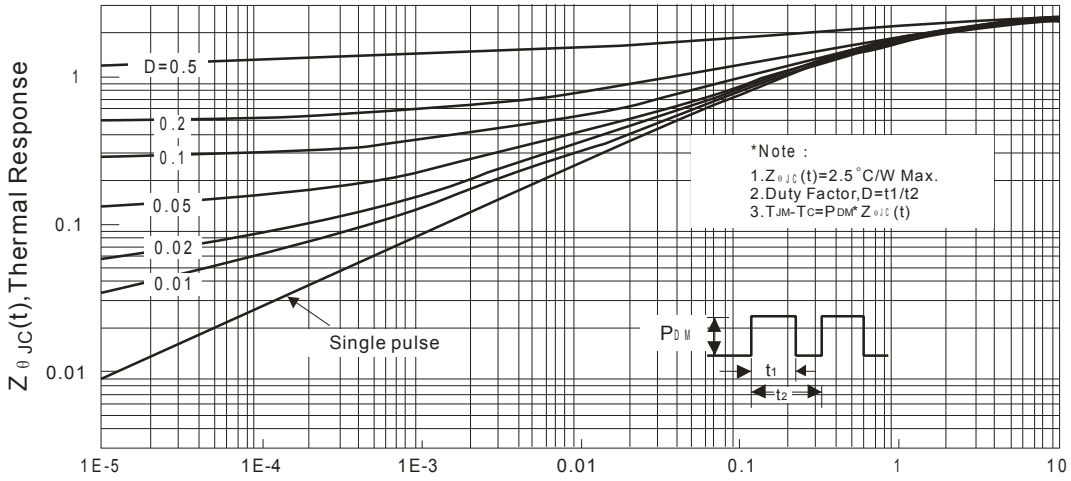


Fig.8On-Resistance Variation vs. Temperature



t_1,Square Wave Pulse Duration [sec]

Transient thermal Response Curve

Fig. 11 Gate Charge Test Circuit & Waveform

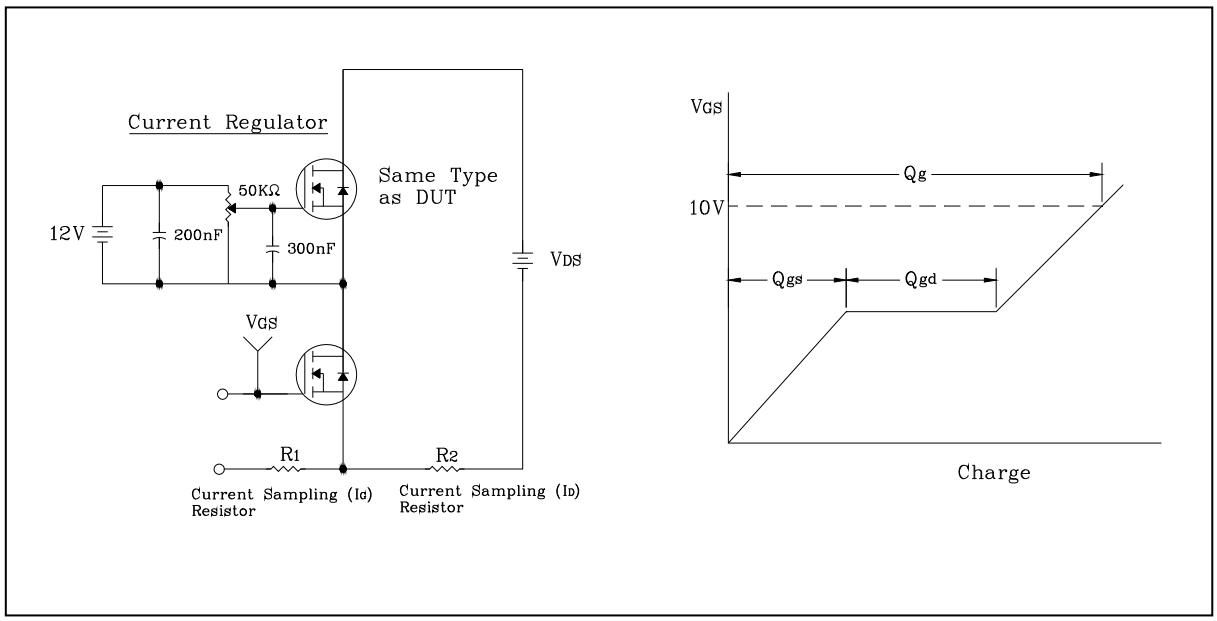


Fig. 12 Resistive Switching Test Circuit & Waveform

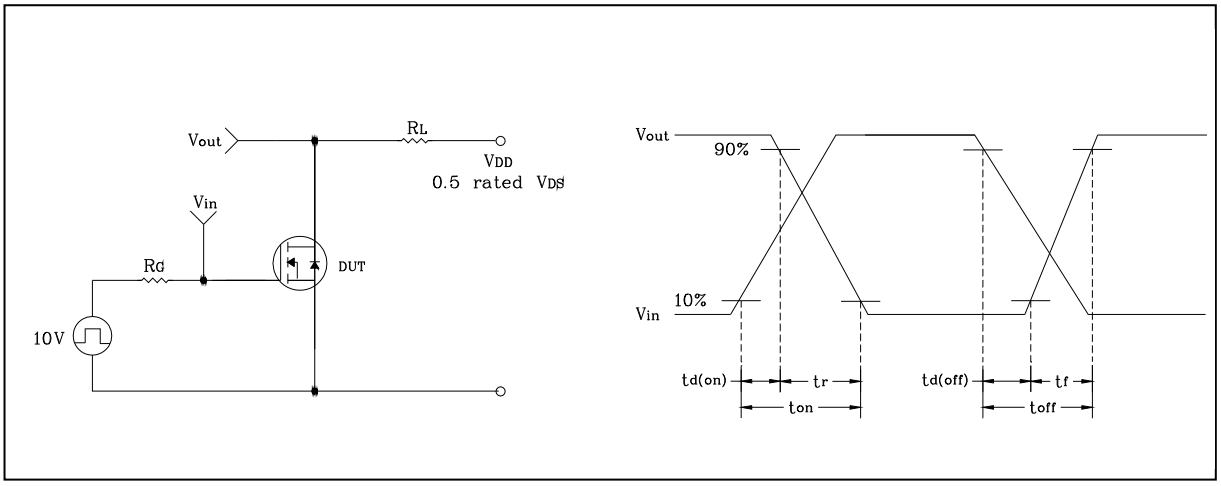


Fig. 13 E_{AS} Test Circuit & Waveform

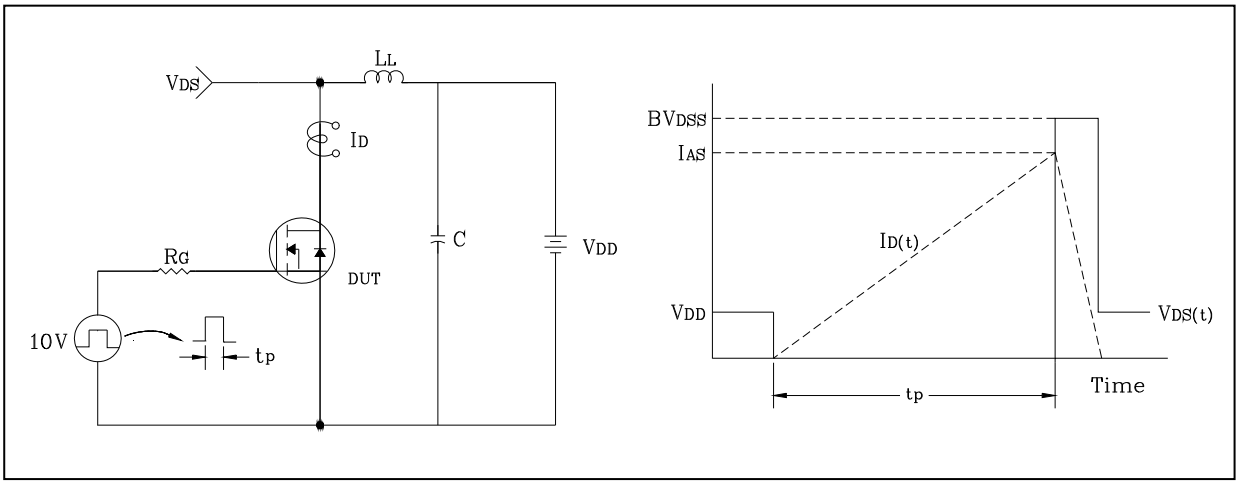


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform