

## 400V N-Channel MOSFETs

### General Description

This planar stripe MOSFET has better characteristics, such as fast switching time, low on resistance, low gate charge and excellent avalanche characteristics. It is mainly suitable for LED Lighting and switching mode power supplies.

### FEATURES

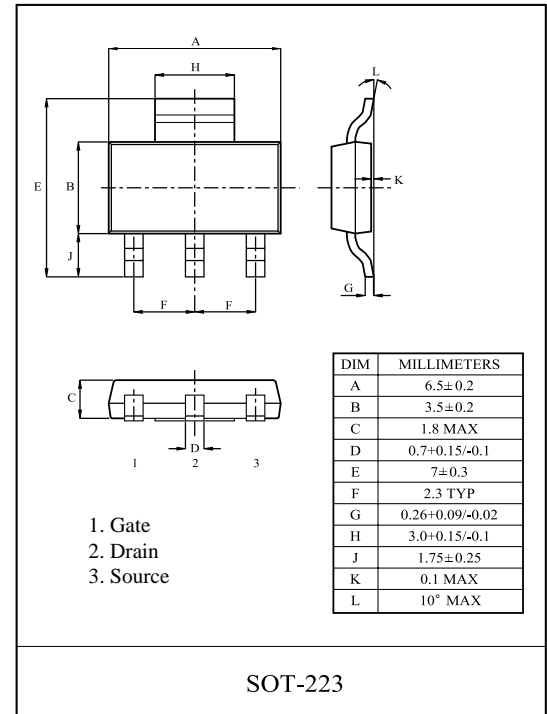
- $V_{DSS(Min)} = 400V$ ,  $I_D = 2A$
- Drain-Source ON Resistance :  $R_{DS(ON)} = 3.4\Omega$  (max) @  $V_{GS} = 10V$
- $Q_g$ (typ.) = 4.4nC

### MAXIMUM RATING (Tc=25°C)

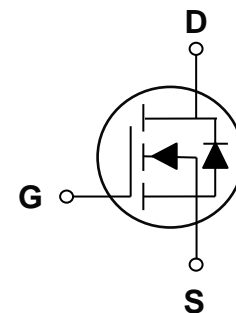
CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	400	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Drain Current	@T <sub>C</sub> =25°C	2*	A
	@T <sub>C</sub> =100°C	1.2*	
	Pulsed (Note1)	6*	
Single Pulsed Avalanche Energy (Note 2)	$E_{AS}$	52	mJ
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	0.2	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns
Drain Power Dissipation	T <sub>A</sub> =25°C	2**	W
	Derate above 25°C	0.02	W/°C
Maximum Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature Range	T <sub>stg</sub>	-55~150	°C
<b>Thermal Characteristics</b>			
Thermal Resistance, Junction-to-Case	R <sub>thJC</sub>	10.0	°C/W
Thermal Resistance, Junction-to-Ambient	R <sub>thJA</sub>	62.5**	°C/W

\* : Drain current limited by maximum junction temperature.

\*\* : Surface Mounted on FR4 Board 2 Inch×2 Inch×1mm.



### SYMBOL





# FTK3N40S

## ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	400	-	-	V
Breakdown Voltage Temperature Coefficient	Δ BV <sub>DSS</sub> /Δ T <sub>j</sub>	I <sub>D</sub> =250μA, Referenced to 25°C	-	0.4	-	V/°C
Drain Cut-off Current	I <sub>DSS</sub>	V <sub>DS</sub> =400V, V <sub>GS</sub> =0V,	-	-	10	μA
Gate Threshold Voltage	V <sub>th</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5	-	4.5	V
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =± 30V, V <sub>DS</sub> =0V	-	-	± 100	nA
Drain-Source ON Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1A	-	2.8	3.4	Ω
<b>Dynamic</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =320V, I <sub>D</sub> =2.2A V <sub>GS</sub> =10V (Note4,5)	-	4.4	5.8	nC
Gate-Source Charge	Q <sub>gs</sub>		-	1.0	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	2.0	-	
Turn-on Delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =200V, I <sub>D</sub> =2.2A R <sub>G</sub> =25Ω (Note4,5) V <sub>GS</sub> =10V	-	10	-	ns
Turn-on Rise time	t <sub>r</sub>		-	11	-	
Turn-off Delay time	t <sub>d(off)</sub>		-	20	-	
Turn-off Fall time	t <sub>f</sub>		-	17	-	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz	-	163	211	pF
Output Capacitance	C <sub>oss</sub>		-	26	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	2.5	-	
<b>Source-Drain Diode Ratings</b>						
Continuous Source Current	I <sub>S</sub>	V <sub>GS</sub> <V <sub>th</sub>	-	-	2	A
Pulsed Source Current	I <sub>SP</sub>		-	-	8	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =2A, V <sub>GS</sub> =0V	-	-	1.4	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>S</sub> =2.2A, V <sub>GS</sub> =0V, dI <sub>S</sub> /dt=100A/μs	-	240	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>		-	0.65	-	μC

Note 1) Repetivity rating : Pulse width limited by junction temperature.

Note 2) L = 23mH, I<sub>S</sub>=2A, V<sub>DD</sub>=50V, R<sub>G</sub> = 25Ω , Starting T<sub>j</sub> = 25°C.

Note 3) I<sub>S</sub> ≤ 2A, dI/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>j</sub> = 25°C.

Note 4) Pulse Test : Pulse width ≤ 300μs, Duty Cycle ≤ 2%.

Note 5) Essentially independent of operating temperature.



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Fig1.  $I_D - V_{DS}$

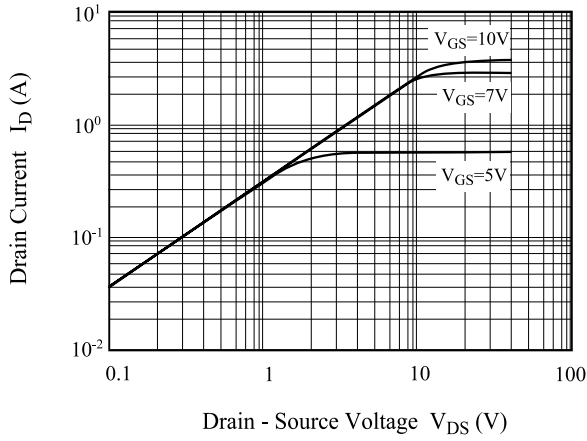


Fig2.  $I_D - V_{GS}$

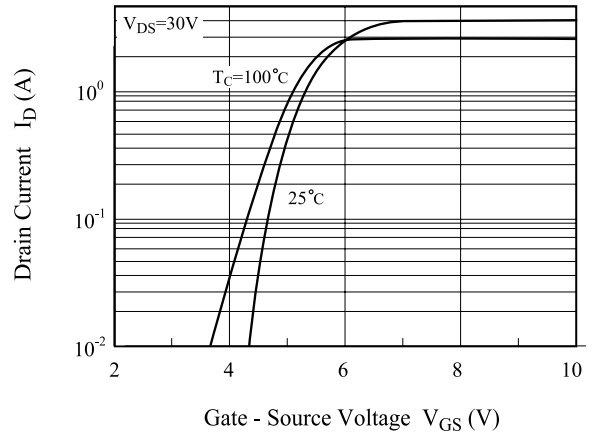


Fig3.  $BV_{DSS} - T_j$

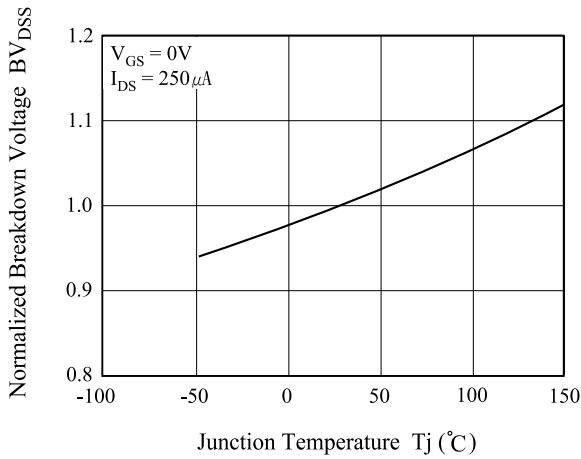


Fig4.  $R_{DS(ON)} - I_D$

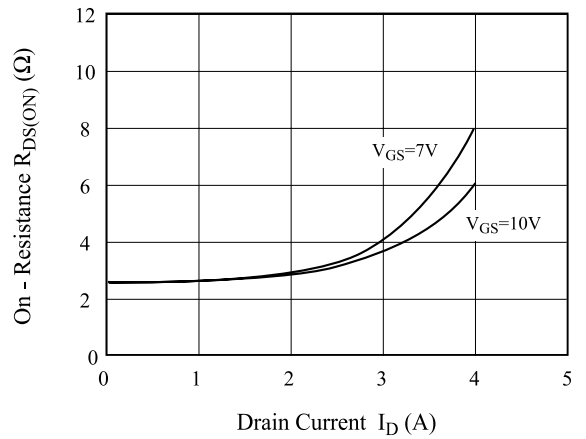


Fig5.  $I_S - V_{SD}$

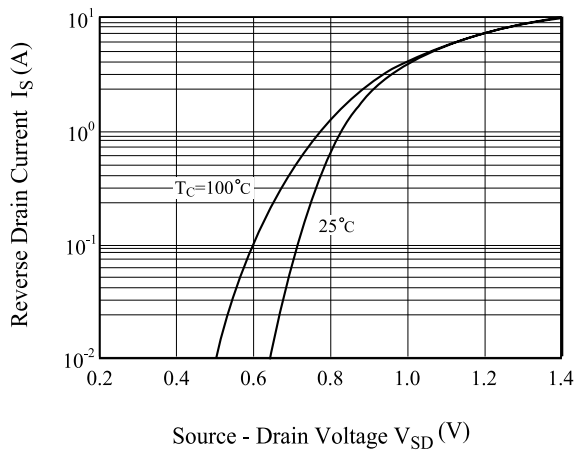
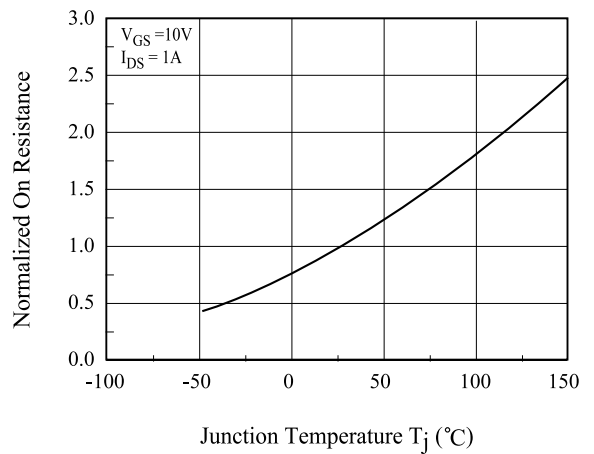


Fig6.  $R_{DS(ON)} - T_j$





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Fig 7. C - V<sub>DS</sub>

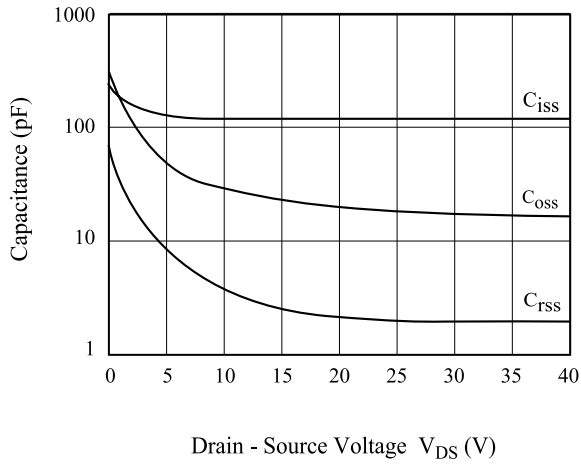


Fig8. Q<sub>g</sub>- V<sub>GS</sub>

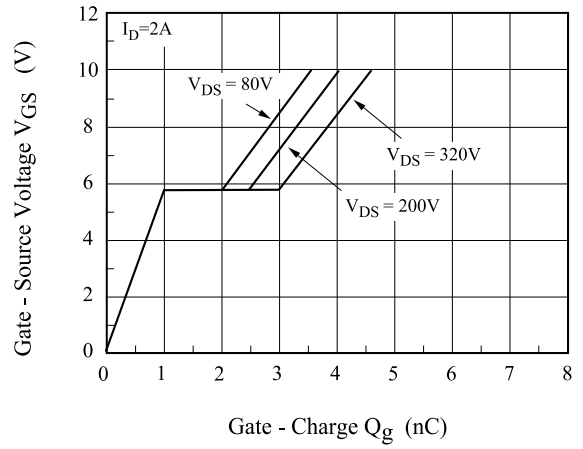


Fig9. Safe Operation Area

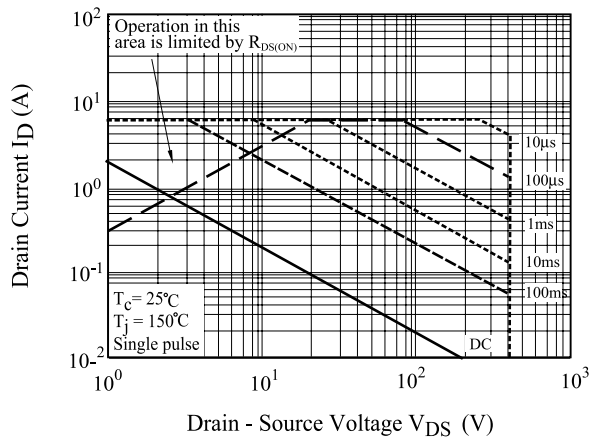


Fig10. I<sub>D</sub> - T<sub>j</sub>

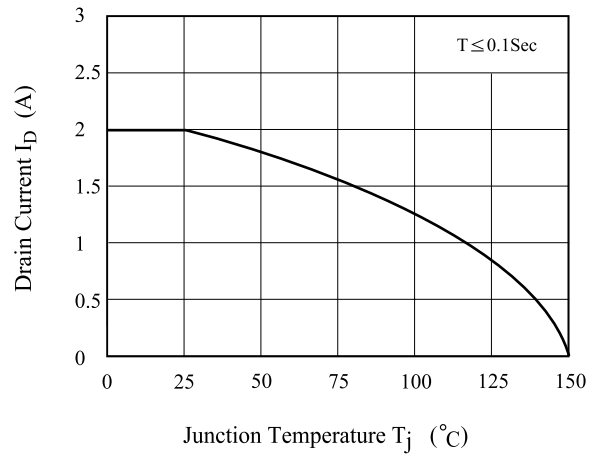


Fig11. Transient Thermal Response Curve

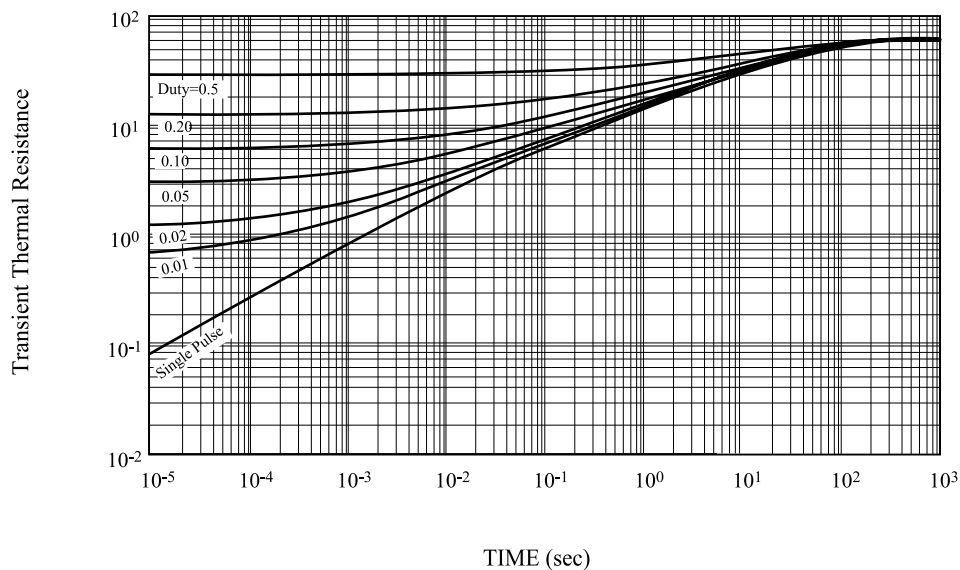


Fig12. Gate Charge

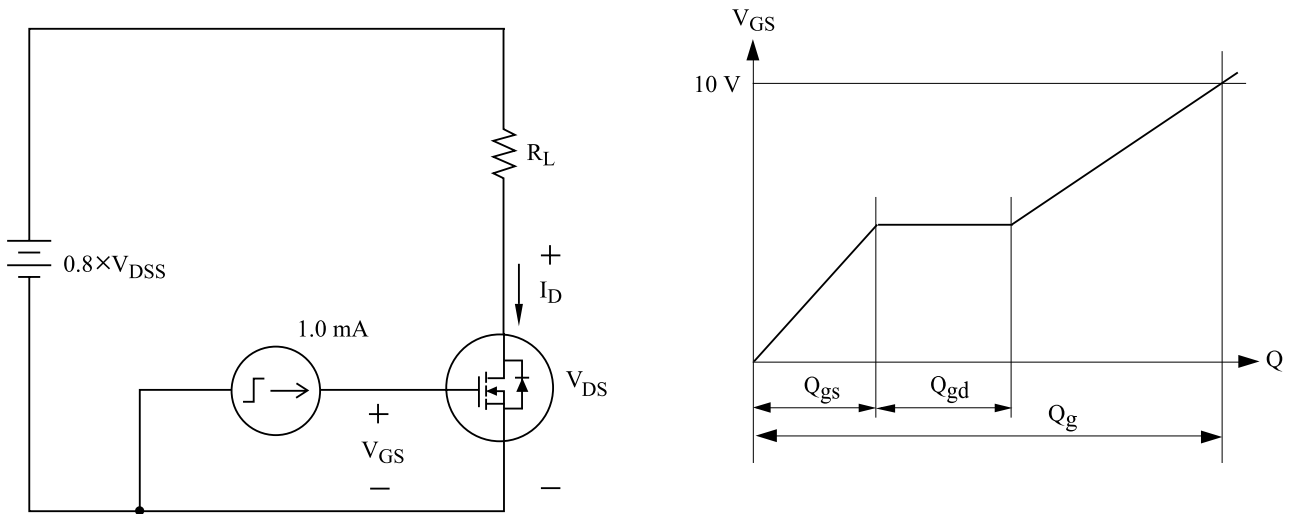


Fig13. Single Pulsed Avalanche Energy

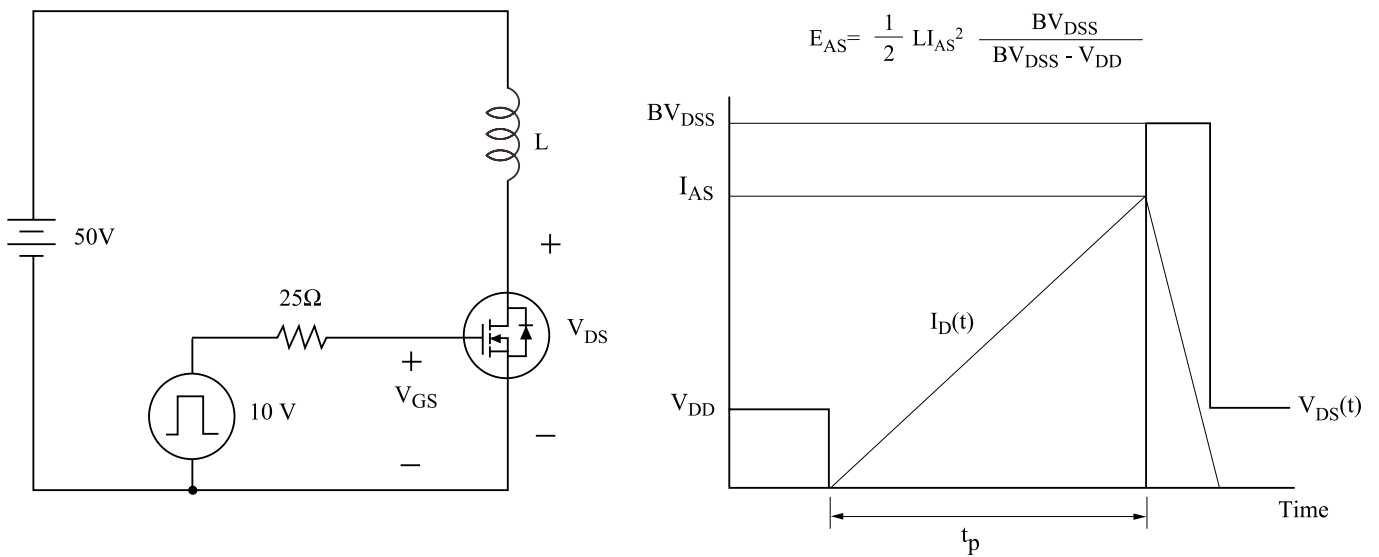


Fig14. Resistive Load Switching

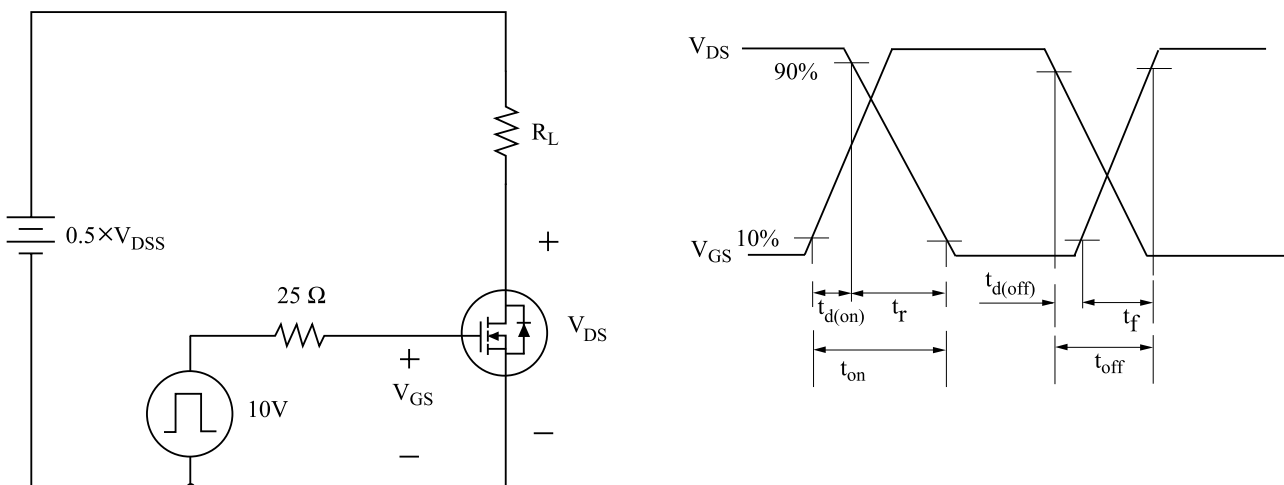


Fig15. Source - Drain Diode Reverse Recovery and  $dv/dt$

