

# GTS9928E

## N-CHANNEL ENHANCEMENT MODE POWER MOSFET

BVDSS	20V
RDS(ON)	22mΩ
ID	5A

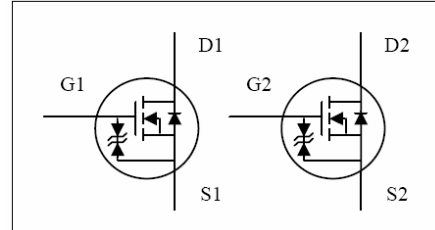
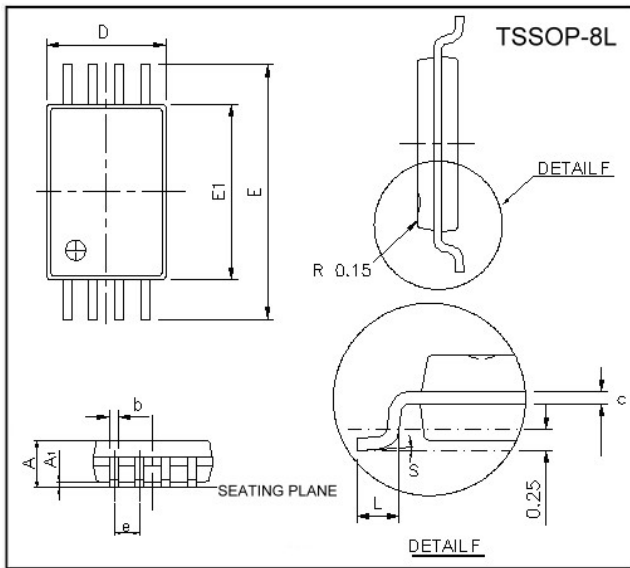
### Description

The GTS9928E provides the designer with the best combination of fast switching, ruggedized device design, ultra low on-resistance and cost-effectiveness.

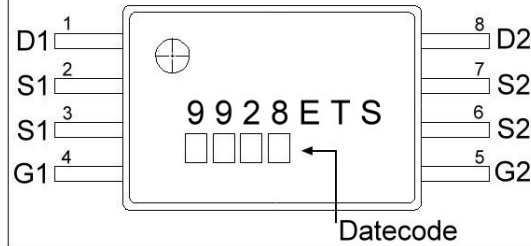
### Features

- \*Low on-resistance
- \*Capable of 2.5V gate drive
- \*Optimal DC/DC battery application

### Package Dimensions



### Marking:



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	-	1.20	E	6.20	6.60
A1	0.05	0.15	E1	4.30	4.50
b	0.19	0.30	e	0.65 BSC	
c	0.09	0.20	L	0.45	0.75
D	2.90	3.10	S	0°	8°

### Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Drain Current <sup>3</sup> , $V_{GS}@4.5V$	$I_D @Ta=25^\circ C$	5.0	A
Drain Current <sup>3</sup> , $V_{GS}@4.5V$	$I_D @Ta=70^\circ C$	3.5	A
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	25	A
Power Dissipation	$P_D @Ta=25^\circ C$	1	W
Linear Derating Factor		0.008	W/°C
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	-55 ~ +150	°C

### Thermal Data

Parameter	Symbol	Ratings	Unit
Thermal Resistance Junction-ambient <sup>3</sup> Max.	$R_{thj-a}$	125	°C/W

**Electrical Characteristics(T<sub>j</sub> = 25°C Unless otherwise specified)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	20	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250uA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS} / \Delta T_j$	-	0.02	-	V/°C	Reference to 25°C, I <sub>D</sub> =1mA
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.5	-	-	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA
Forward Transconductance	g <sub>fs</sub>	-	21	-	S	V <sub>DS</sub> =10V, I <sub>D</sub> =5A
Gate-Source Leakage Current	I <sub>GSS</sub>	-	-	±10	uA	V <sub>GS</sub> = ±12V
Drain-Source Leakage Current(T <sub>j</sub> =25°C)	I <sub>DSS</sub>	-	-	1	uA	V <sub>DS</sub> =20V, V <sub>GS</sub> =0
Drain-Source Leakage Current(T <sub>j</sub> =70°C)		-	-	25	uA	V <sub>DS</sub> =20V, V <sub>GS</sub> =0
Static Drain-Source On-Resistance <sup>2</sup>	R <sub>DS(ON)</sub>	-	-	22	mΩ	V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A
		-	-	28		V <sub>GS</sub> =2.5V, I <sub>D</sub> =2A,
Total Gate Charge <sup>2</sup>	Q <sub>g</sub>	-	15.9	-	nC	I <sub>D</sub> =5A V <sub>DS</sub> =10V V <sub>GS</sub> =4.5V
Gate-Source Charge	Q <sub>gs</sub>	-	1.5	-		
Gate-Drain ("Miller") Change	Q <sub>gd</sub>	-	7.4	-		
Turn-on Delay Time <sup>2</sup>	T <sub>d(on)</sub>	-	6.2	-	ns	V <sub>DS</sub> =10V I <sub>D</sub> =1A V <sub>GS</sub> =4.5V R <sub>G</sub> =3.3Ω R <sub>D</sub> =10Ω
Rise Time	T <sub>r</sub>	-	9	-		
Turn-off Delay Time	T <sub>d(off)</sub>	-	30	-		
Fall Time	T <sub>f</sub>	-	11	-		
Input Capacitance	C <sub>iss</sub>	-	530	-	pF	V <sub>GS</sub> =0V V <sub>DS</sub> =20V f=1.0MHz
Output Capacitance	C <sub>oss</sub>	-	245	-		
Reverse Transfer Capacitance	C <sub>rss</sub>	-	125	-		

**Source-Drain Diode**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Forward On Voltage <sup>2</sup>	V <sub>SD</sub>	-	-	1.2	V	I <sub>S</sub> =5A, V <sub>GS</sub> =0, T <sub>j</sub> =25°C
Continuous Source Current(Body Diode)	I <sub>S</sub>	-	-	0.83	A	V <sub>D</sub> =V <sub>G</sub> =0V, V <sub>S</sub> =1.2V

Notes: 1. Pulse width limited by Max. junction temperature.

2. Pulse width ≤ 300us, duty cycle ≤ 2%.

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 208°C/W when mounted on Min. copper pad.

## Characteristics Curve

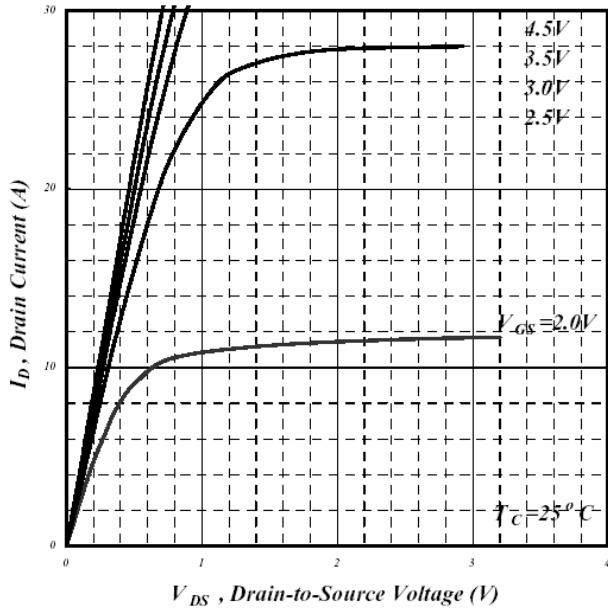


Fig 1. Typical Output Characteristics

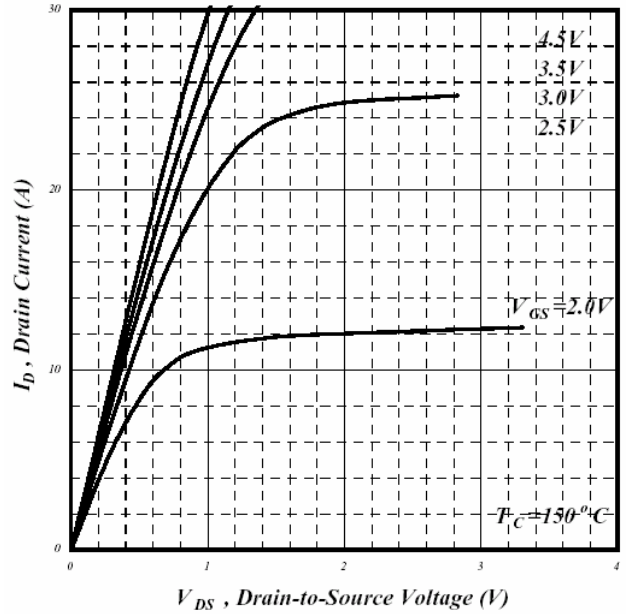


Fig 2. Typical Output Characteristics

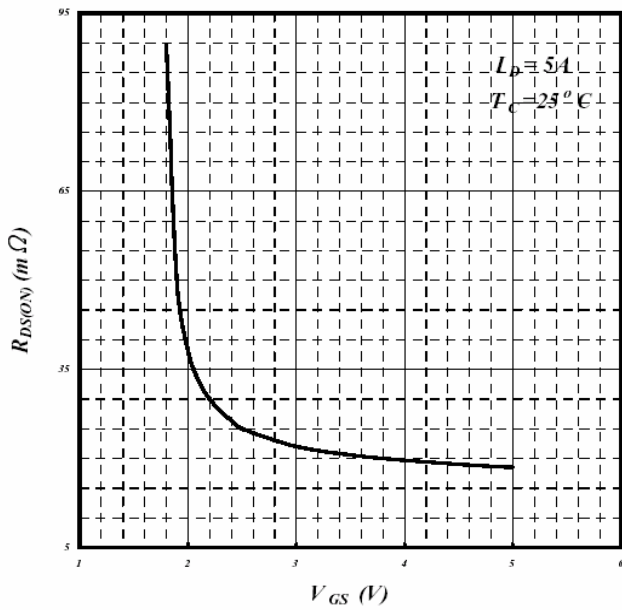


Fig 3. On-Resistance v.s. Gate Voltage

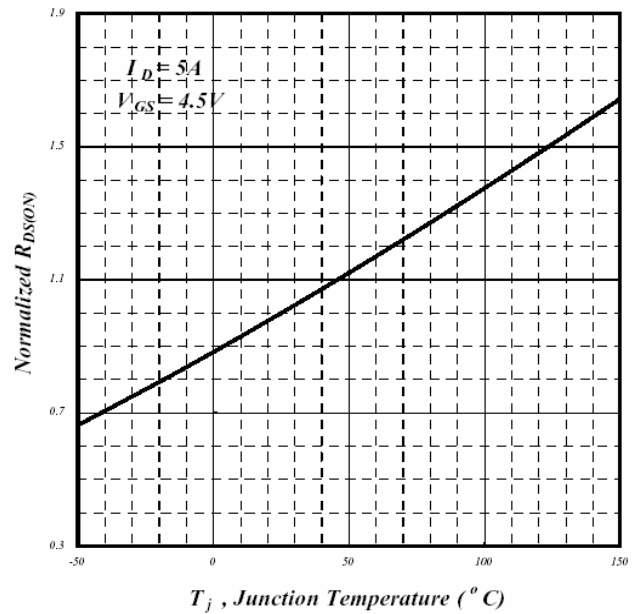
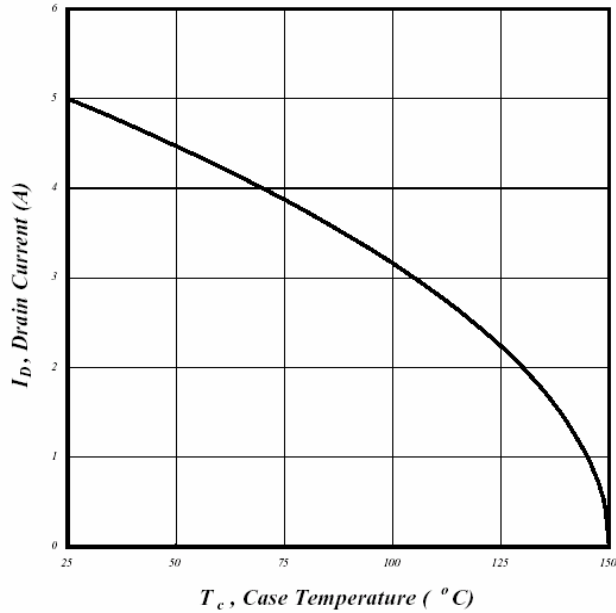
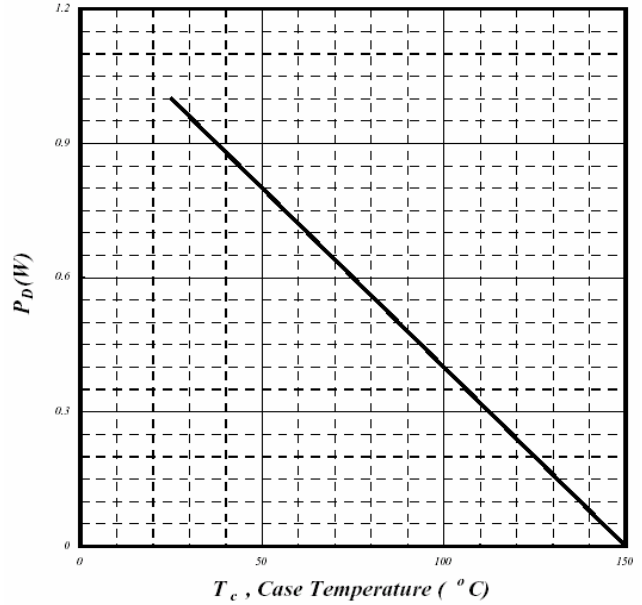


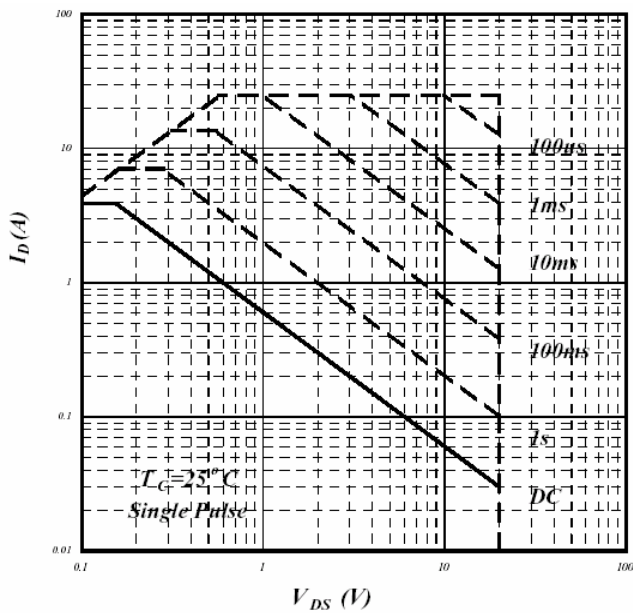
Fig 4. Normalized On-Resistance v.s. Junction Temperature



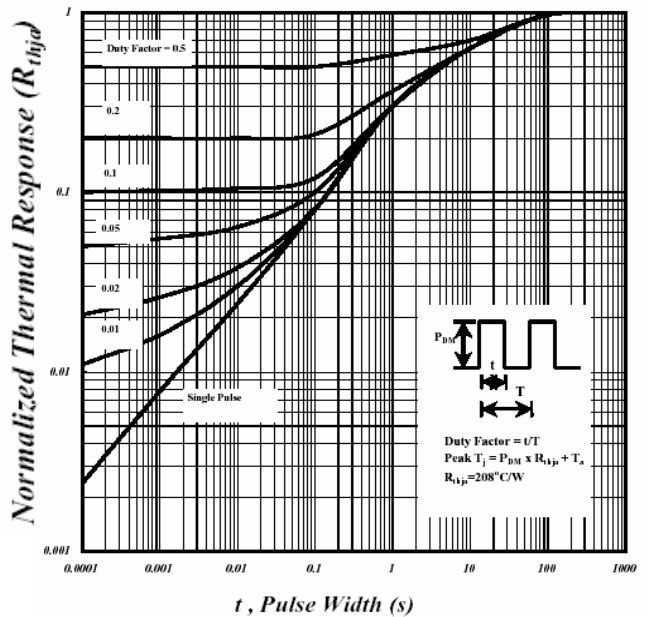
**Fig 5. Maximum Drain Current v.s. Case Temperature**



**Fig 6. Typical Power Dissipation**



**Fig 7. Maximum Safe Operating Area**



**Fig 8. Effective Transient Thermal Impedance**

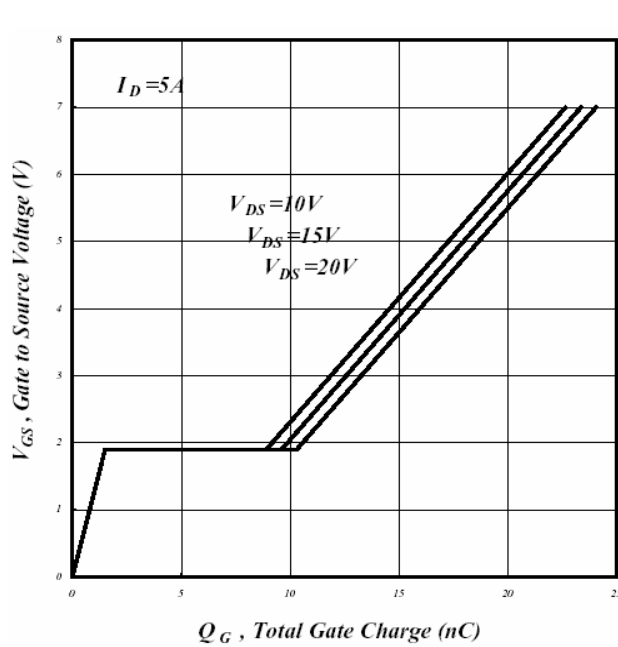


Fig 9. Gate Charge Characteristics

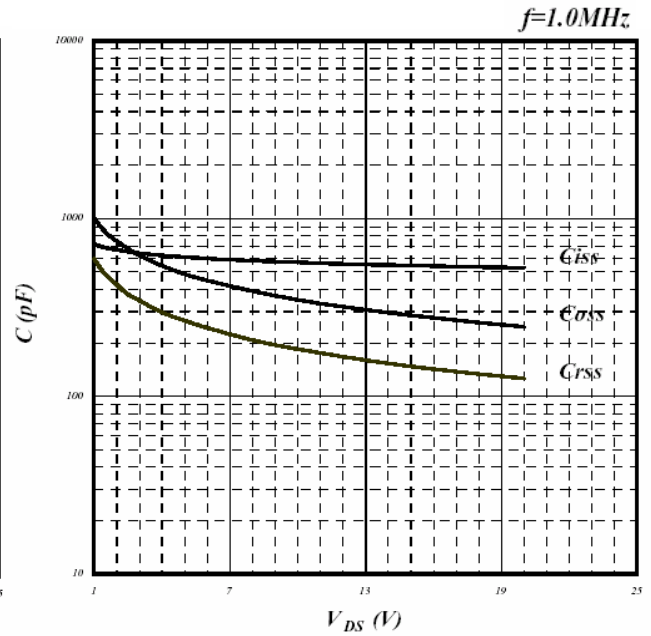


Fig 10. Typical Capacitance Characteristics

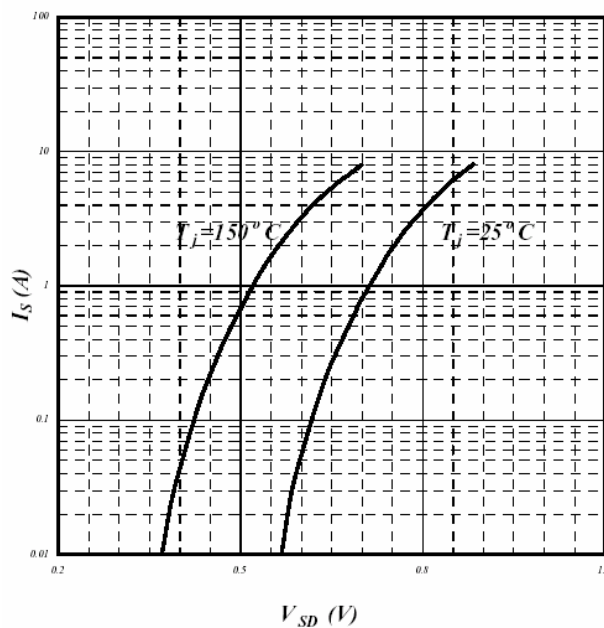


Fig 11. Forward Characteristic of Reverse Diode

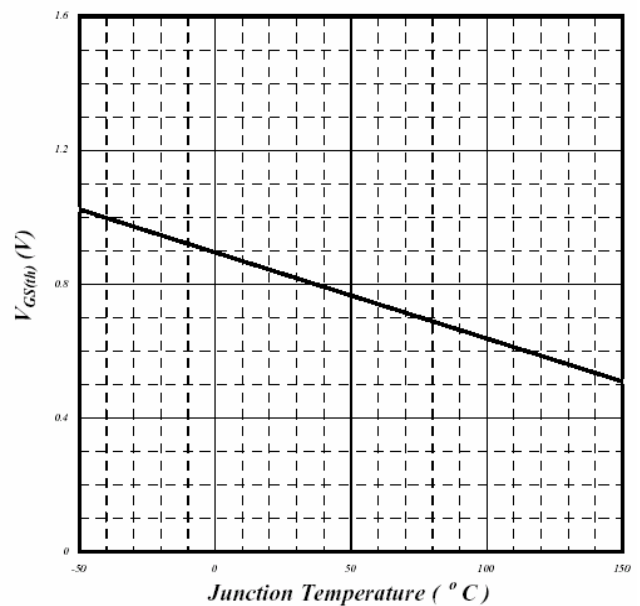


Fig 12. Gate Threshold Voltage v.s. Junction Temperature

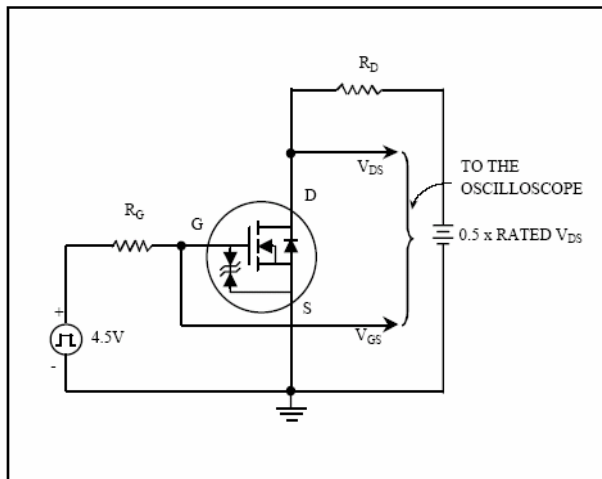


Fig 13. Switching Time Circuit

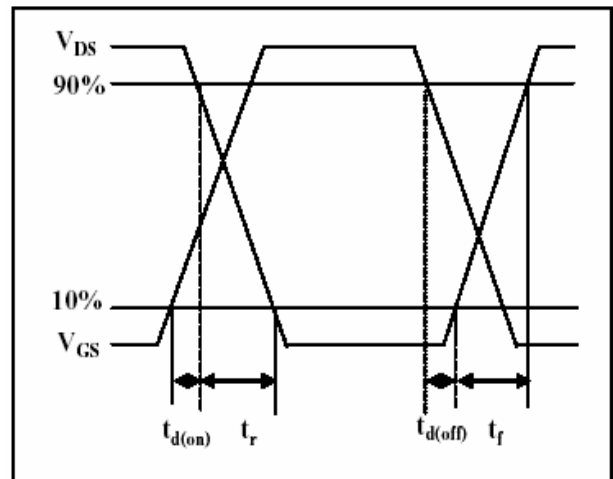


Fig 14. Switching Time Waveform

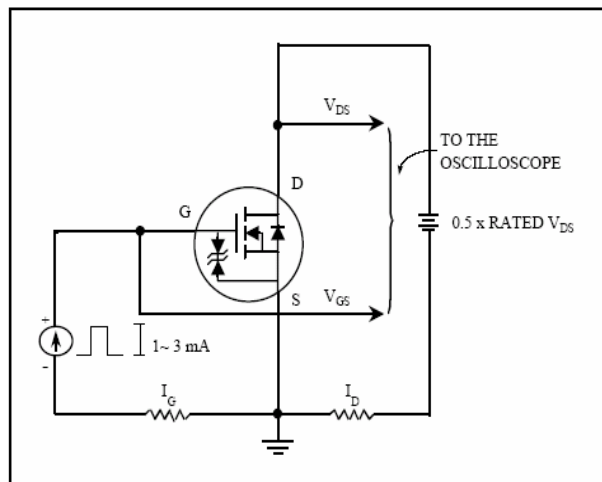


Fig 15. Gate Charge Circuit

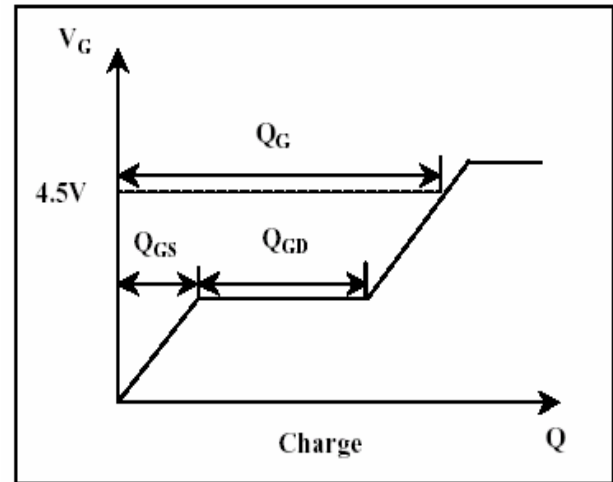


Fig 16. Gate Charge Waveform

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