

# GTM CORPORATION

ISSUED DATE :2006/04/27  
REVISED DATE :

## GSS4501S

N AND P-CHANNEL ENHANCEMENT MODE POWER MOSFET

N-CH BV <sub>DSS</sub>	30V
R <sub>DS(ON)</sub>	33mΩ
I <sub>D</sub>	6A
P-CH BV <sub>DSS</sub>	-30V
R <sub>DS(ON)</sub>	50mΩ
I <sub>D</sub>	-5.3A

### Description

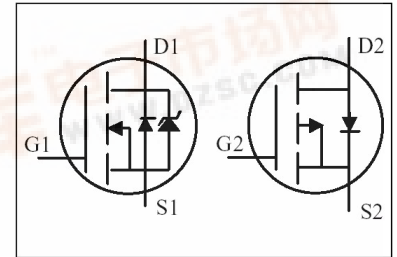
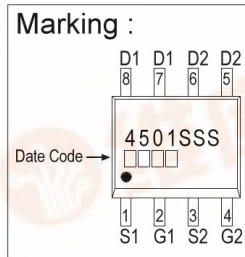
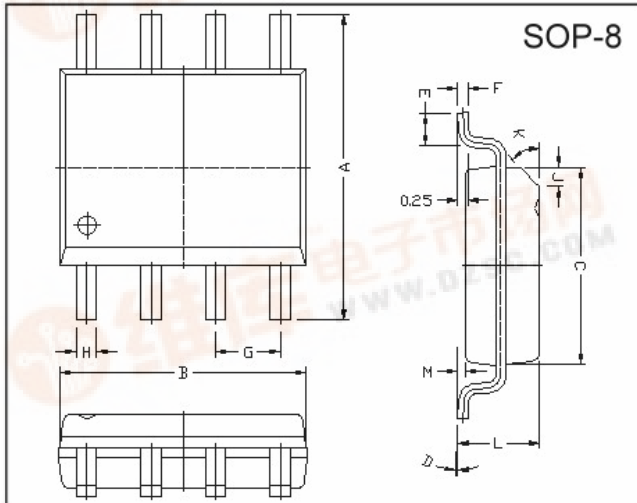
The GSS4501S provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOP-8 package is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

### Features

- \*Simple Drive Requirement
- \*Low On-resistance
- \*Schottky Diode Included

### Package Dimensions



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	5.80	6.20	M	0.10	0.25
B	4.80	5.00	H	0.35	0.49
C	3.80	4.00	L	1.35	1.75
D	0°	8°	J	0.375 REF.	
E	0.40	0.90	K	45°	
F	0.19	0.25	G	1.27 TYP.	

### Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit
		N-channel	P-channel	
Drain-Source Voltage	V <sub>DS</sub>	30	-30	V
Gate-Source Voltage	V <sub>GS</sub>	±20	±20	V
Continuous Drain Current <sup>3</sup>	I <sub>D</sub> @TA=25°C	6	-5.3	A
Continuous Drain Current <sup>3</sup>	I <sub>D</sub> @TA=70°C	4.8	-4.7	A
Pulsed Drain Current <sup>1</sup>	I <sub>DM</sub>	20	-20	A
Total Power Dissipation	P <sub>D</sub> @TA=25°C	2.0		W
Linear Derating Factor		0.016		W/°C
Operating Junction and Storage Temperature Range	T <sub>j</sub> , T <sub>stg</sub>	-55 ~ +150		°C

### Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-ambient <sup>3</sup> Max.	R <sub>thj-a</sub>	62.5	°C/W

**N-Channel 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>	30	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250uA
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.0	-	3.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA
Forward Transconductance	g <sub>fs</sub>	-	12	-	S	V <sub>DS</sub> =10V, I <sub>D</sub> =6A
Gate-Source Leakage Current	I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> = ±20V
Drain-Source Leakage Current(T <sub>j</sub> =25°C)	I <sub>DSS</sub>	-	-	100	uA	V <sub>DS</sub> =30V, V <sub>GS</sub> =0
Drain-Source Leakage Current(T <sub>j</sub> =70°C)		-	-	1	mA	V <sub>DS</sub> =24V, V <sub>GS</sub> =0
Static Drain-Source On-Resistance <sup>2</sup>	R <sub>DS(ON)</sub>	-	-	33	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =6A
				50		V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A
Total Gate Charge <sup>2</sup>	Q <sub>g</sub>	-	8.2	-	nC	I <sub>D</sub> =6A V <sub>DS</sub> =24V V <sub>GS</sub> =4.5V
Gate-Source Charge	Q <sub>gs</sub>	-	2	-		
Gate-Drain ("Miller") Change	Q <sub>gd</sub>	-	4.3	-		
Turn-on Delay Time <sup>2</sup>	T <sub>d(on)</sub>	-	6	-	ns	V <sub>DS</sub> =15V I <sub>D</sub> =1A V <sub>GS</sub> =10 R <sub>G</sub> =3.3Ω R <sub>D</sub> =15Ω
Rise Time	T <sub>r</sub>	-	5.2	-		
Turn-off Delay Time	T <sub>d(off)</sub>	-	18.8	-		
Fall Time	T <sub>f</sub>	-	4.4	-		
Input Capacitance	C <sub>iss</sub>	-	645	-	pF	V <sub>GS</sub> =0V V <sub>DS</sub> =25V f=1.0MHz
Output Capacitance	C <sub>oss</sub>	-	150	-		
Reverse Transfer Capacitance	C <sub>rss</sub>	-	95	-		

**Source-Drain & Schottky Diode**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Forward On Voltage <sup>2</sup>	V <sub>SD</sub>	-	-	0.5	V	I <sub>S</sub> =1.7A, V <sub>GS</sub> =0V
Reverse Recovery Time	T <sub>rr</sub>	-	16	-	ns	I <sub>S</sub> =1.7A, V <sub>GS</sub> =0V di/dt=100A/μs
Reverse Recovery Charge	Q <sub>rr</sub>	-	8	-	nC	

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; 135°C/W when mounted on Min. copper pad.

**P-Channel 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>	-30	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =-250uA
Gate Threshold Voltage	V <sub>GS(th)</sub>	-1.0	-	-3.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA
Forward Transconductance	g <sub>fs</sub>	-	8.5	-	S	V <sub>DS</sub> =-10V, I <sub>D</sub> =-5.3A
Gate-Source Leakage Current	I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> = ±20V
Drain-Source Leakage Current(T <sub>j</sub> =25°C)	I <sub>DSS</sub>	-	-	-1	uA	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0
Drain-Source Leakage Current(T <sub>j</sub> =70°C)		-	-	-25	uA	V <sub>DS</sub> =-24V, V <sub>GS</sub> =0
Static Drain-Source On-Resistance <sup>2</sup>	R <sub>DS(ON)</sub>	-	-	50	mΩ	V <sub>GS</sub> =-10V, I <sub>D</sub> =-5.3A
				90		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.2A
Total Gate Charge <sup>2</sup>	Q <sub>g</sub>	-	20	-	nC	I <sub>D</sub> =-5.3A V <sub>DS</sub> =-15V V <sub>GS</sub> =-10V
Gate-Source Charge	Q <sub>gs</sub>	-	3.5	-		
Gate-Drain ("Miller") Change	Q <sub>gd</sub>	-	2	-		
Turn-on Delay Time <sup>2</sup>	T <sub>d(on)</sub>	-	12	-	ns	V <sub>DS</sub> =-15V I <sub>D</sub> =-1A V <sub>GS</sub> =-10V R <sub>G</sub> =6Ω R <sub>D</sub> =15Ω
Rise Time	T <sub>r</sub>	-	20	-		
Turn-off Delay Time	T <sub>d(off)</sub>	-	45	-		
Fall Time	T <sub>f</sub>	-	27	-		
Input Capacitance	C <sub>iss</sub>	-	790	-	pF	V <sub>GS</sub> =0V V <sub>DS</sub> =-15V f=1.0MHz
Output Capacitance	C <sub>oss</sub>	-	440	-		
Reverse Transfer Capacitance	C <sub>rss</sub>	-	120	-		

**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> =-2.6A, V <sub>GS</sub> =0V
Reverse Recovery Time	T <sub>rr</sub>	-	33.4	-	ns	I <sub>S</sub> =-2.6A, V <sub>GS</sub> =0V di/dt=100A/μs
Reverse Recovery Charge	Q <sub>rr</sub>	-	52	-	nC	

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; 135°C/W when mounted on Min. copper pad.

## Characteristics Curve N-Channel

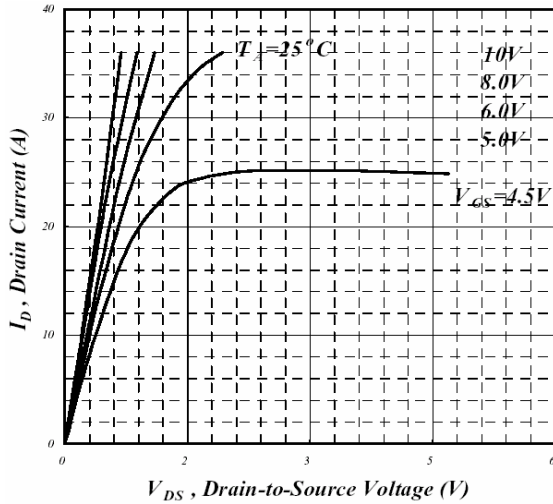


Fig 1. Typical Output Characteristics

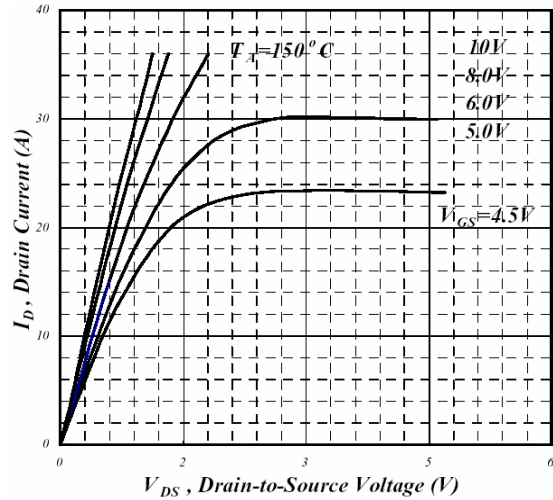


Fig 2. Typical Output Characteristics

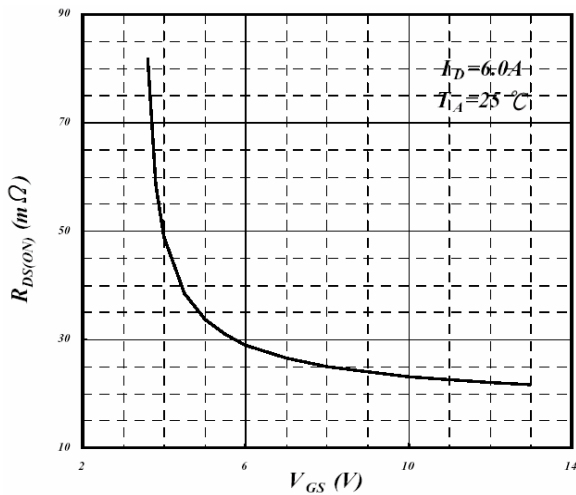


Fig 3. On-Resistance v.s. Gate Voltage

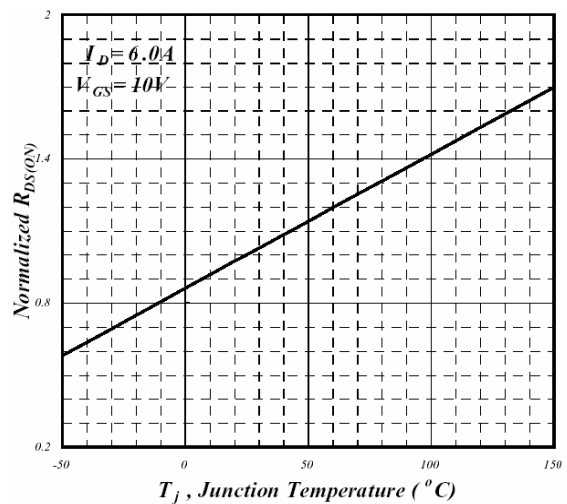


Fig 4. Normalized On-Resistance v.s. Junction Temperature

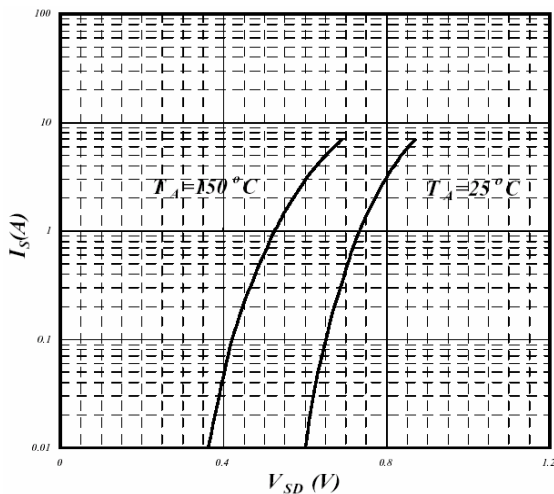


Fig 5. Forward Characteristics of Reverse Diode

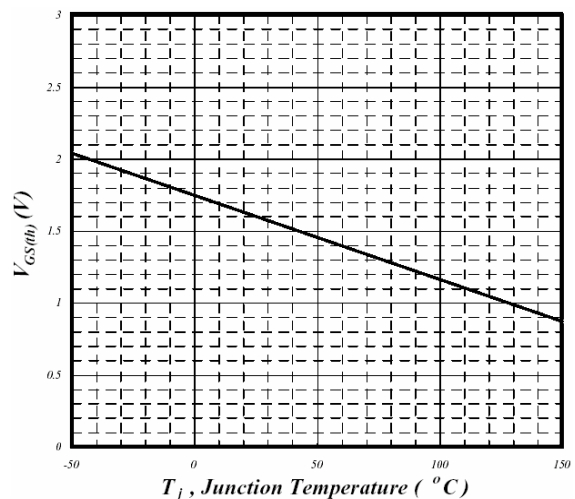
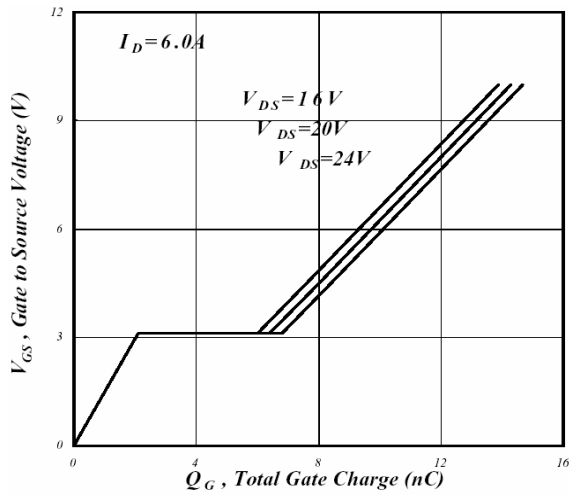
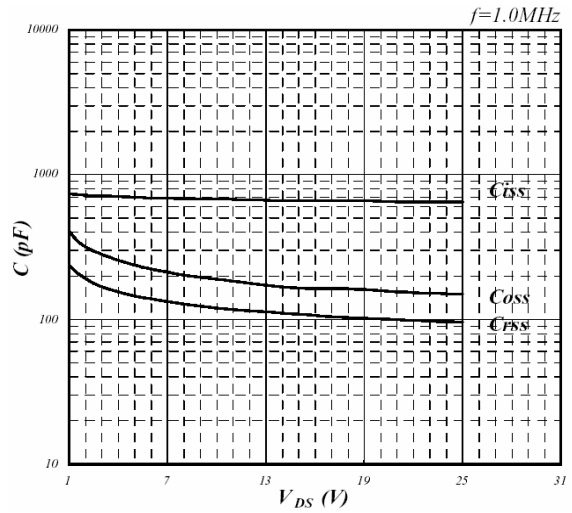


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

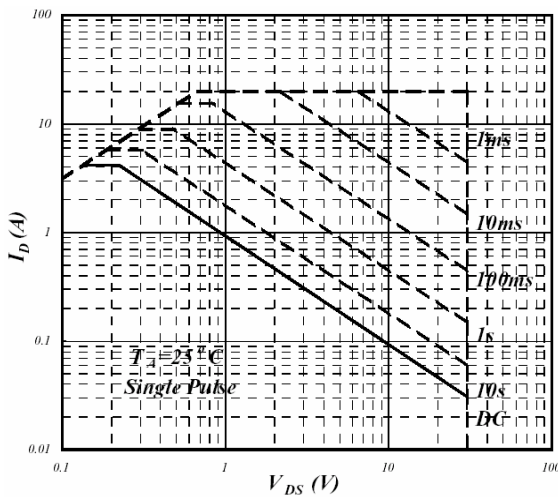
## N-Channel



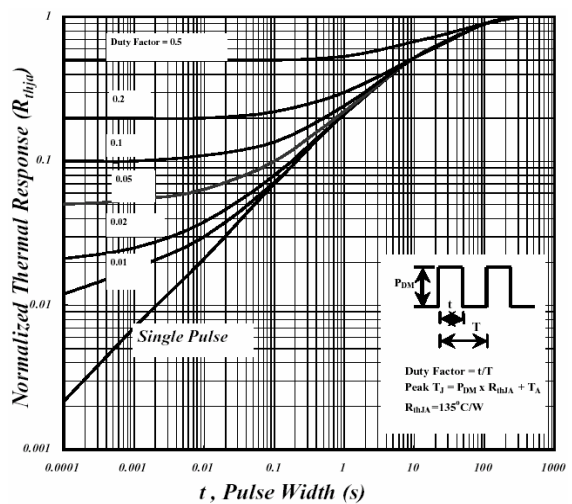
**Fig 7. Gate Charge Characteristics**



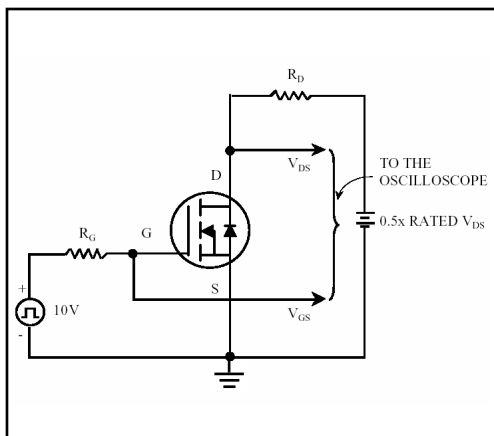
**Fig 8. Typical Capacitance Characteristics**



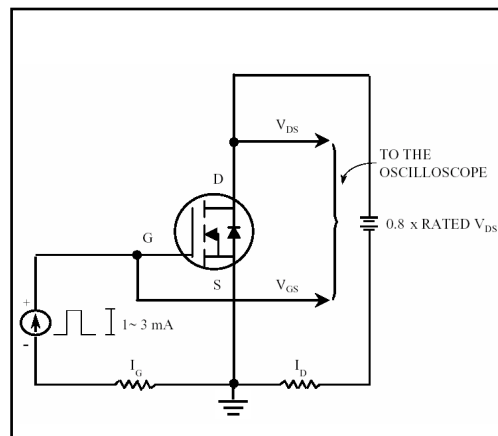
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**

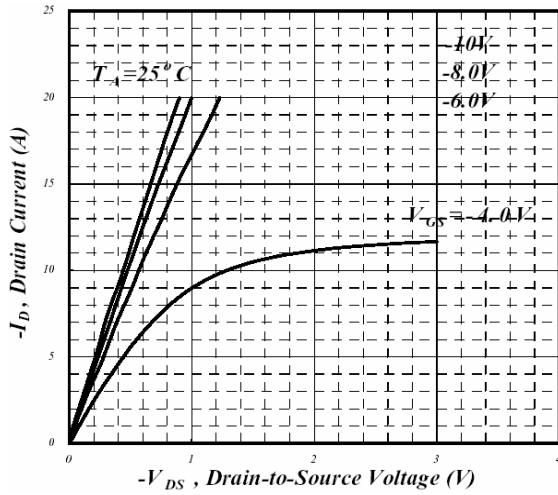


**Fig 11. Switching Time Circuit**

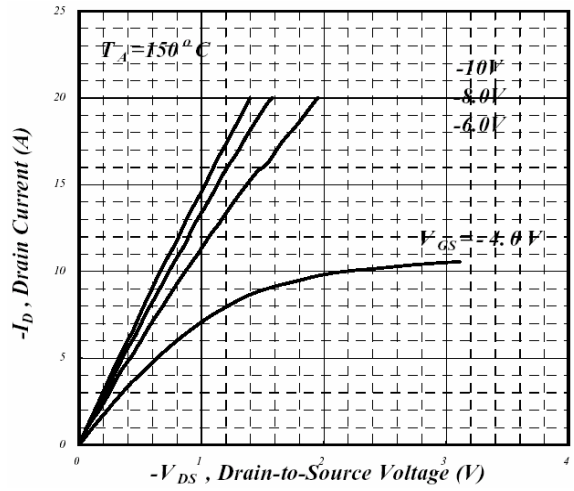


**Fig 12. Gate Charge Circuit**

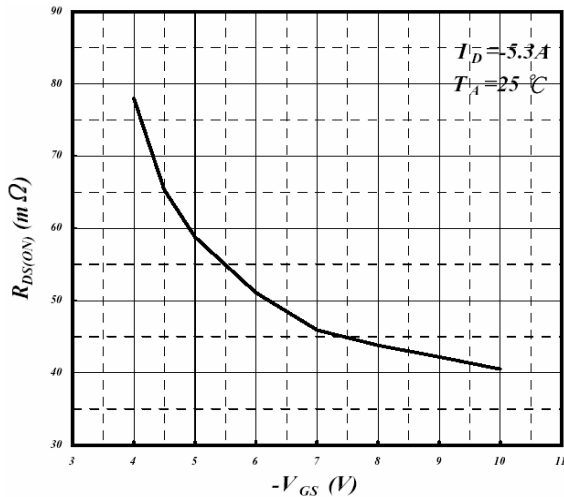
## P-Channel



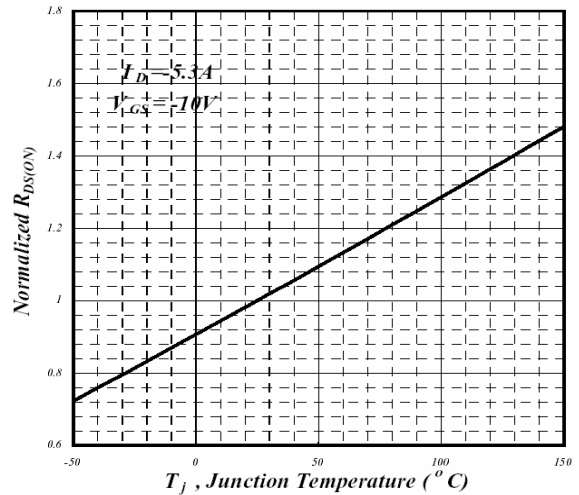
**Fig 1. Typical Output Characteristics**



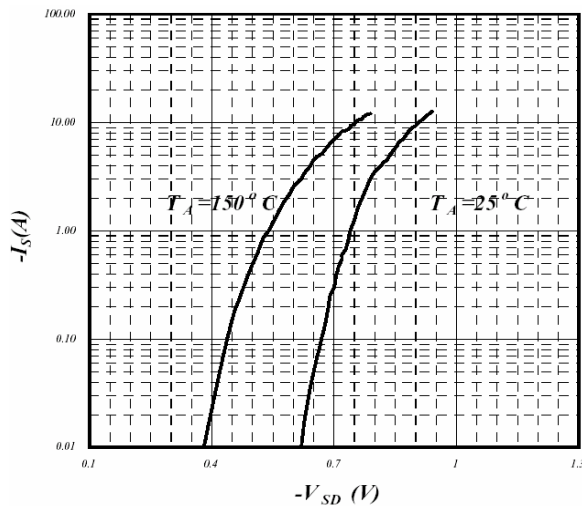
**Fig 2. Typical Output Characteristics**



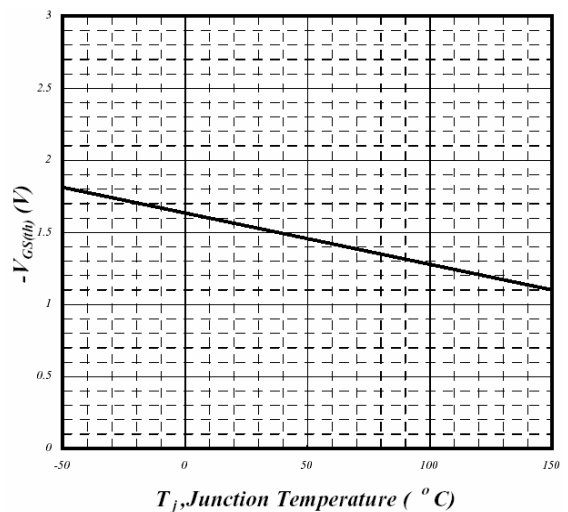
**Fig 3. On-Resistance v.s. Gate Voltage**



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



**Fig 5. Forward Characteristics of Reverse Diode**



**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**

## P-Channel

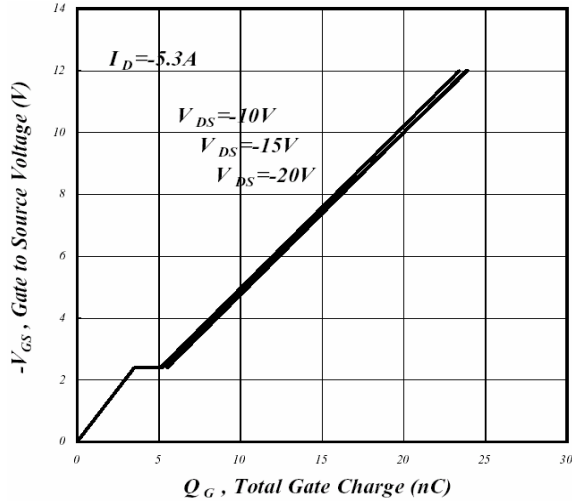


Fig 7. Gate Charge Characteristics

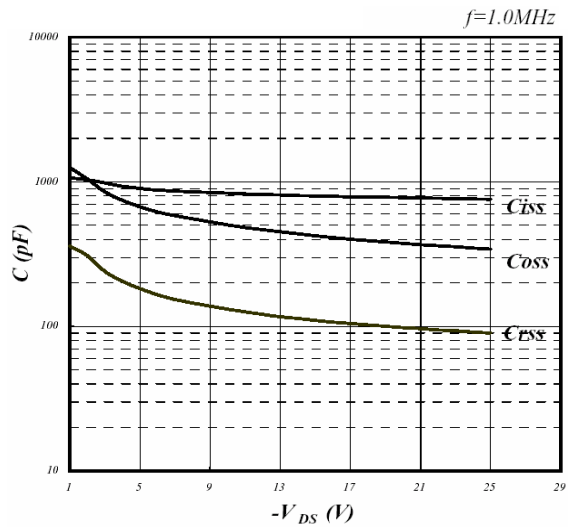


Fig 8. Typical Capacitance Characteristics

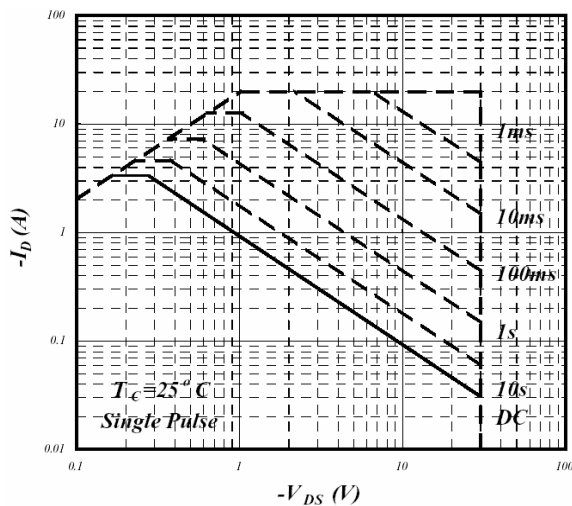


Fig 9. Maximum Safe Operating Area

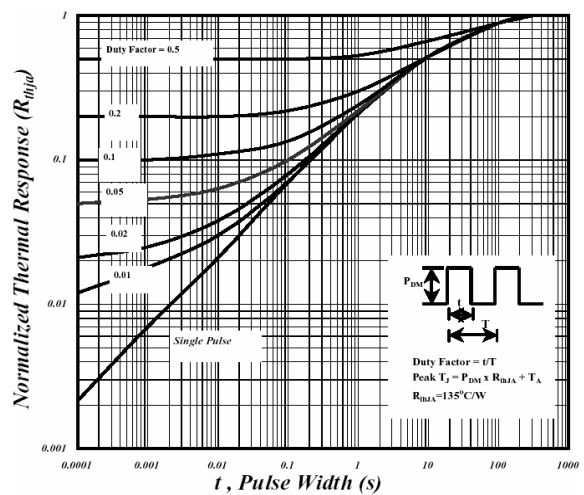


Fig 10. Effective Transient Thermal Impedance

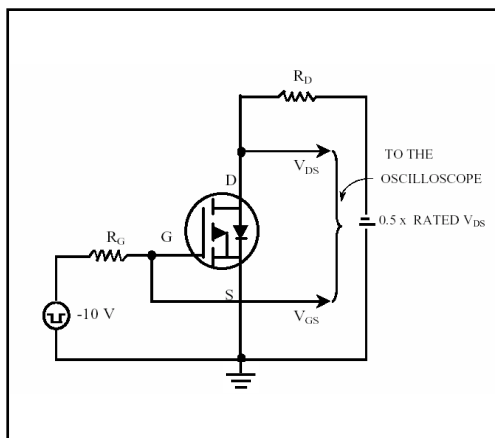


Fig 11. Switching Time Circuit

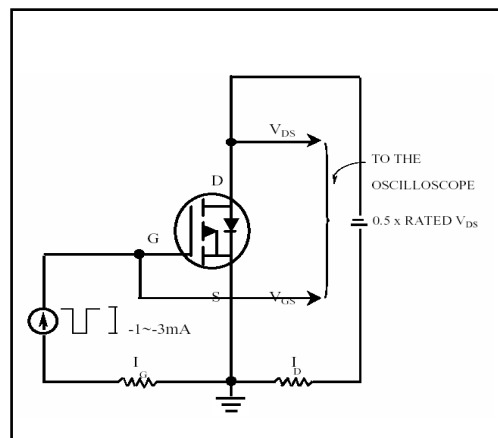


Fig 12. Gate Charge Circuit

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