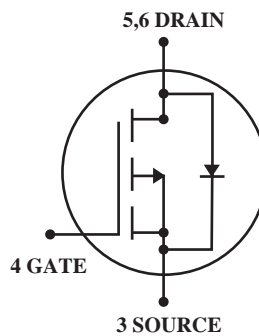
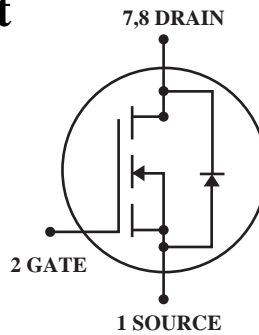


## N AND P-Channel Enhancement Mode POWER MOSFET

**(Pb)** Lead(Pb)-Free

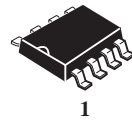
### Features:

- \* Low Gate charge
- \* Low On-Resistance  
 N-CH  $R_{DS(ON)} < 42m\Omega @ V_{GS} = 4.5V$   
 P-CH  $R_{DS(ON)} < 90m\Omega @ V_{GS} = -4.5V$
- \* SOP-8 Package



**N-CHANNEL**  
**DRAIN SOURCE VOLTAGE**  
**30 VOLTAGE**  
**DRAIN CURRENT**  
**7 AMPERES**

**P-CHANNEL**  
**DRAIN SOURCE VOLTAGE**  
**-30 VOLTAGE**  
**DRAIN CURRENT**  
**-5.3 AMPERES**



**SOP-8**

### Maximum Ratings ( $T_A=25^\circ C$ Unless Otherwise Specified)

Rating	Symbol	Value		Unit	
		N-Channl	P-Channl		
Drain-Source Voltage	$V_{DS}$	30	-30	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 16$	V	
Continuous Drain Current <sup>3</sup>	$I_D$	$T_A=25^\circ C$	7	-5.3	A
		$T_A=75^\circ C$	5.8	-4.7	
Pulsed Drain Current <sup>1</sup>	$I_{DM}$	20	-20	A	
Total Power Dissipation	$P_D$	$T_A=25^\circ C$ 2.0		W	
Maximum Junction-ambient <sup>3</sup>	$R_{\theta JA}$	62.5		$^\circ C/W$	
Operating Junction Temperature Range	$T_J$	+150		$^\circ C$	
Storage Temperature Range	$T_{stg}$	-55~+150		$^\circ C$	

### Device Marking

WTK4501=4501SS

## N-Channel Electrical Characteristics (T<sub>A</sub> = 25°C Unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

### OFF Characteristics

Drain-Source Breakdown Voltage V <sub>GS</sub> =0, I <sub>D</sub> =250μA	BV <sub>DSS</sub>	30	-	-	V
Drain-Source Leakage Current T <sub>j</sub> =25°C, V <sub>DS</sub> =30V, V <sub>GS</sub> =0V T <sub>j</sub> =70°C, V <sub>DS</sub> =24V, V <sub>GS</sub> =0V	I <sub>DSS</sub>	-	-	1 25	μA
Gate-Source Leakage current V <sub>GS</sub> =±20V	I <sub>GSS</sub>	-	-	±100	nA

### ON Characteristics

Gate-Source Threshold Voltage V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	V <sub>GS(Th)</sub>	1.0	-	3.0	V
Drain-Source On-Resistance V <sub>GS</sub> =10V, I <sub>D</sub> =7A V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A	R <sub>DS(on)</sub>	-	-	28 42	mΩ
Forward Transconductance V <sub>DS</sub> =10V, I <sub>D</sub> =7A	g <sub>fs</sub>	-	13	-	S

### Dynamic Characteristics

Input Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1.0MHz	C <sub>iss</sub>	-	645	-	pF
Output Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1.0MHz	C <sub>oss</sub>	-	150	-	
Reverse Transfer Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1.0MHz	C <sub>rss</sub>	-	95	-	

### Switching Characteristics

Turn-on Delay Time <sup>2</sup> V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =15Ω	t <sub>d(on)</sub>	-	6	-	ns
Rise Time V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =15Ω	t <sub>r</sub>	-	5.2	-	
Turn-off Delay Time V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =15Ω	t <sub>d(off)</sub>	-	18.8	-	
Fall Time V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =1A, R <sub>G</sub> =3.3Ω, R <sub>D</sub> =15Ω	t <sub>f</sub>	-	4.4	-	
Total Gate Charge <sup>2</sup> V <sub>DS</sub> =24V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A	Q <sub>g</sub>	-	8.4	-	nC
Gate-Source Charge V <sub>DS</sub> =24V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A	Q <sub>gs</sub>	-	2.1	-	
Gate-Source Change V <sub>DS</sub> =24V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A	Q <sub>gd</sub>	-	4.7	-	

### Source-Drain Diode Characteristics

Forward On Voltage <sup>2</sup> I <sub>S</sub> =7A, V <sub>GS</sub> =0V	V <sub>SD</sub>	-	-	1.2	V
Continuous Source Current(Body diode) V <sub>D</sub> =V <sub>G</sub> =0V, V <sub>S</sub> =1.2V	I <sub>S</sub>	-	-	1.67	A

Note: 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>A</sub> = 25°C Unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

### OFF Characteristics

Drain-Source Breakdown Voltage V <sub>GS</sub> =0, I <sub>D</sub> =-250μA	BV <sub>DSS</sub>	-30	-	-	V
Drain-Source Leakage Current T <sub>j</sub> =25°C, V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V T <sub>j</sub> =70°C, V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V	I <sub>DSS</sub>	-	-	-1 -25	μA
Gate-Source Leakage current V <sub>GS</sub> =±16V	I <sub>GSS</sub>	-	-	±100	nA

### ON Characteristics

Gate-Source Threshold Voltage V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA	V <sub>GS(Th)</sub>	-1.0	-	-3.0	V
Drain-Source On-Resistance <sup>2</sup> V <sub>GS</sub> =-10V, I <sub>D</sub> =-5.3A V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.2A	R <sub>DS(on)</sub>	-	-	50 90	mΩ
Forward Transconductance V <sub>DS</sub> =-10V, I <sub>D</sub> =-5.3A	g <sub>fs</sub>	-	8.5	-	S

### Dynamic Characteristics

Input Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1.0MHz	C <sub>iss</sub>	-	790	-	pF
Output Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1.0MHz	C <sub>oss</sub>	-	440	-	
Reverse Transfer Capacitance V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1.0MHz	C <sub>rss</sub>	-	120	-	

### Switching Characteristics

Turn-on Delay Time <sup>2</sup> V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =6Ω, R <sub>D</sub> =15Ω	t <sub>d(on)</sub>	-	12	-	ns
Rise Time V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =6Ω, R <sub>D</sub> =15Ω	t <sub>r</sub>	-	20	-	
Turn-off Delay Time V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =6Ω, R <sub>D</sub> =15Ω	t <sub>d(off)</sub>	-	45	-	
Fall Time V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A, R <sub>G</sub> =6Ω, R <sub>D</sub> =15Ω	t <sub>f</sub>	-	27	-	
Total Gate Charge <sup>2</sup> V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-5.3A	Q <sub>g</sub>	-	20	-	nC
Gate-Source Charge V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-5.3A	Q <sub>gs</sub>	-	3.5	-	
Gate-Source Change V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-5.3A	Q <sub>gd</sub>	-	2	-	

### Source-Drain Diode Characteristics

Forward On Voltage <sup>2</sup> I <sub>S</sub> =-2.6A, V <sub>GS</sub> =0V	V <sub>SD</sub>	-	-	-1.2	V
Continuous Source Current(Body Diode) V <sub>D</sub> =V <sub>G</sub> =0V, V <sub>S</sub> =-1.2V	I <sub>S</sub>	-	-	-1.67	A

Note: 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

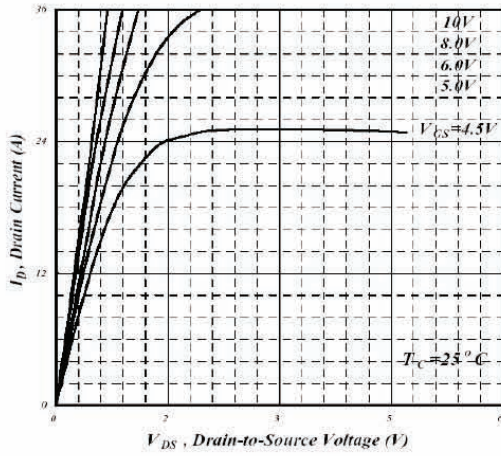


Fig 1. Typical Output Characteristics

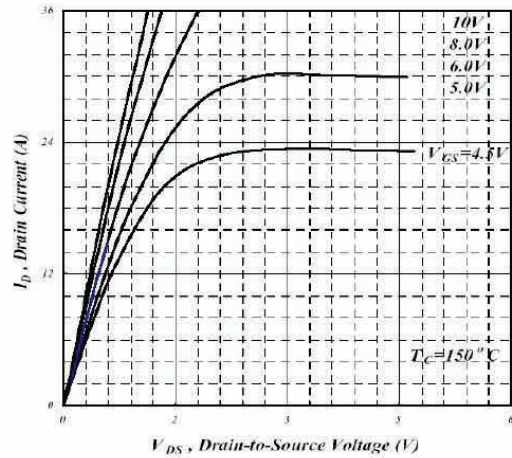


Fig 2. Typical Output Characteristics

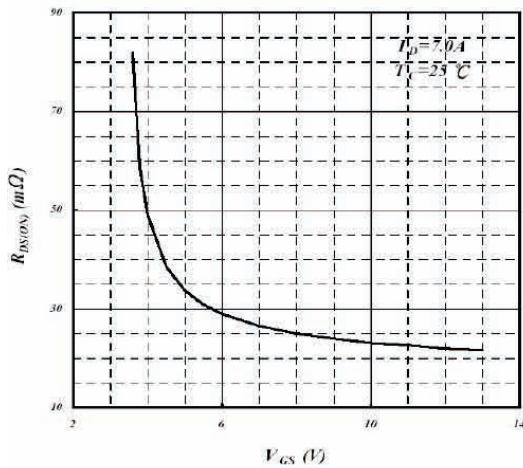


Fig 3. On-Resistance v.s. Gate Voltage

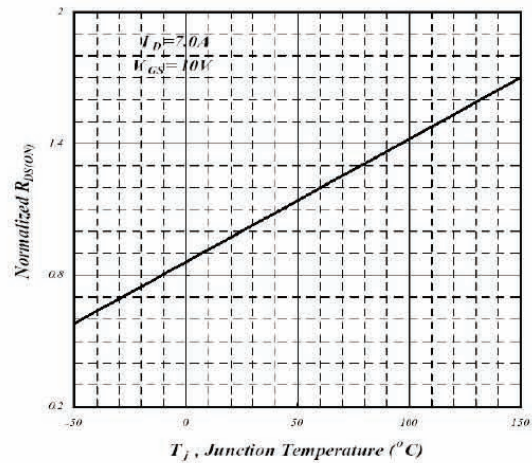


Fig 4. Normalized On-Resistance v.s. Junction Temperature

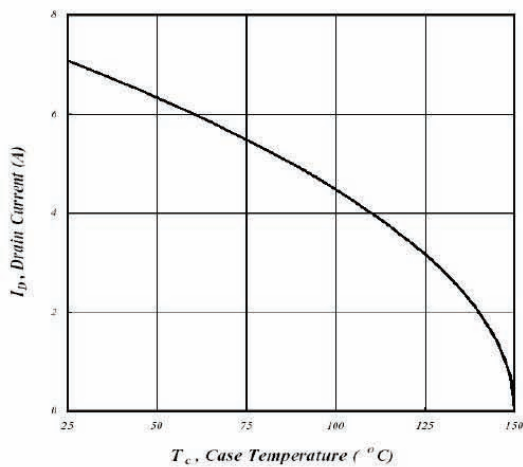


Fig 5. Maximum Drain Current v.s. Case Temperature

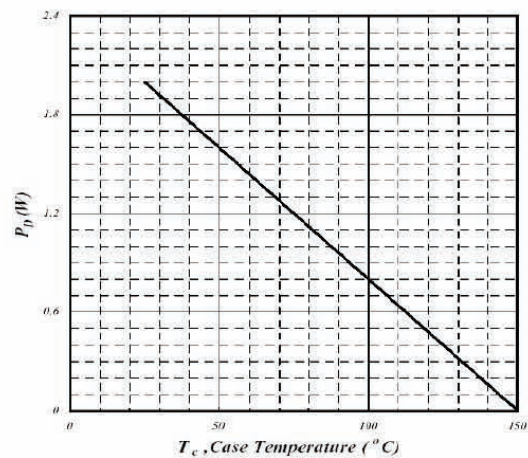


Fig 6. Type Power Dissipation

## N-Channel

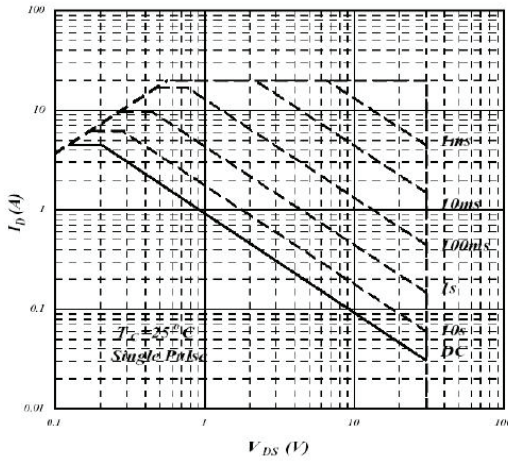


Fig 7. Maximum Safe Operating Area

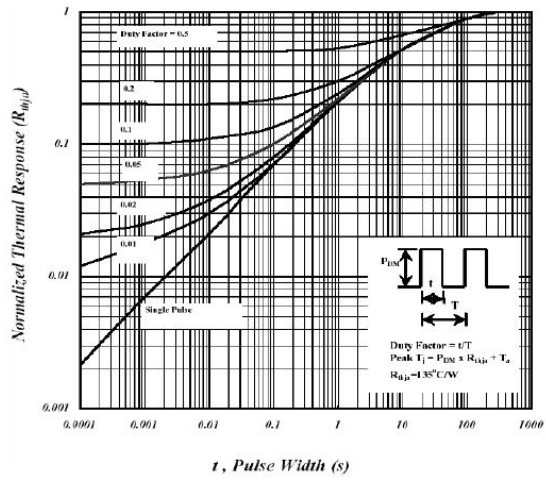


Fig 8. Effective Transient Thermal Impedance

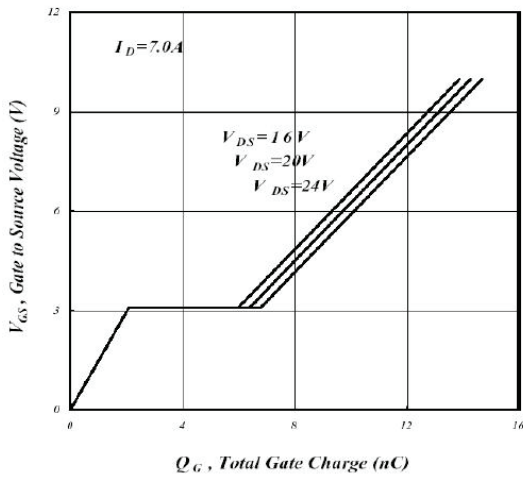


Fig 9. Gate Charge Characteristics

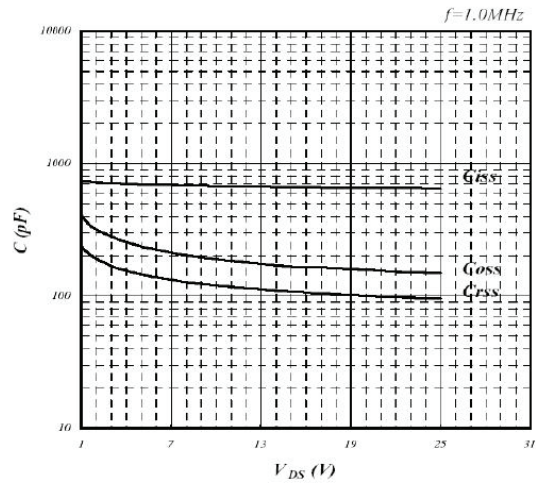


Fig 10. Typical Capacitance Characteristics

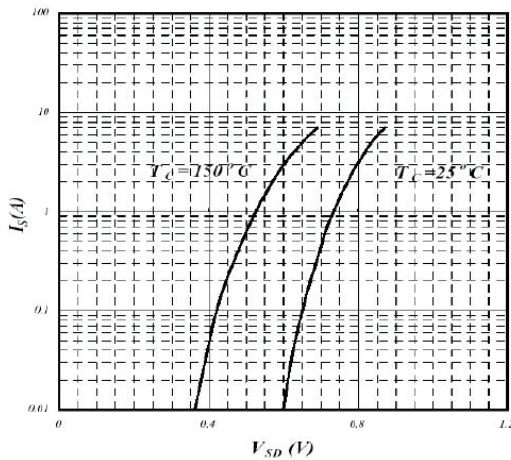


Fig 11. Forward Characteristics of Reverse Diode

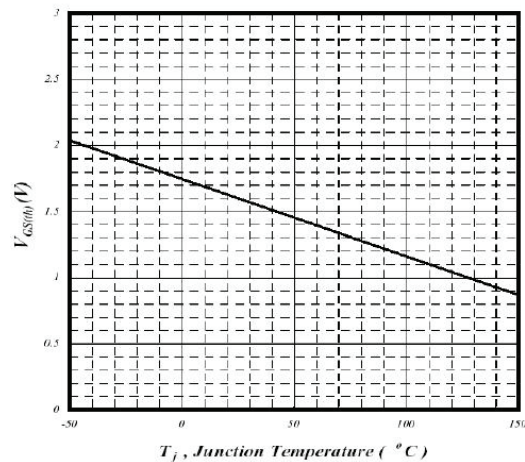


Fig 12. Gate Threshold Voltage v.s. Junction Temperature

N-Channel

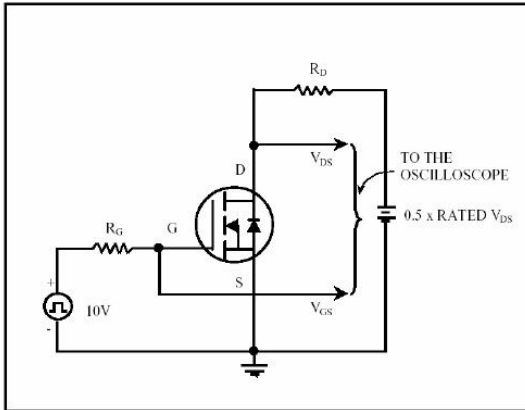


Fig 13. Switching Time Circuit

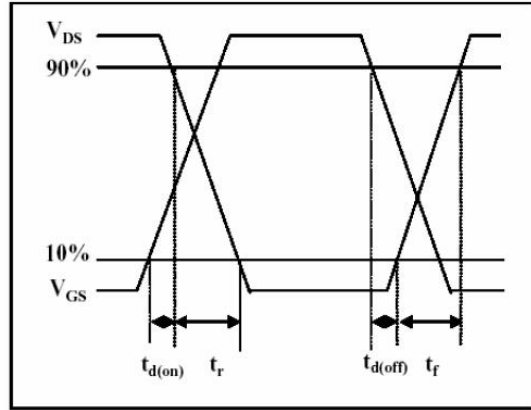


Fig 14. Switching Time Waveform

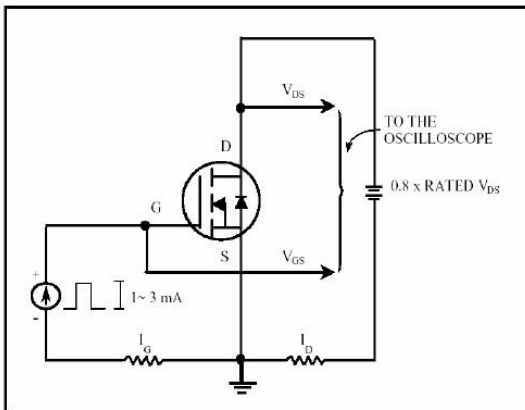


Fig 15. Gate Charge Circuit

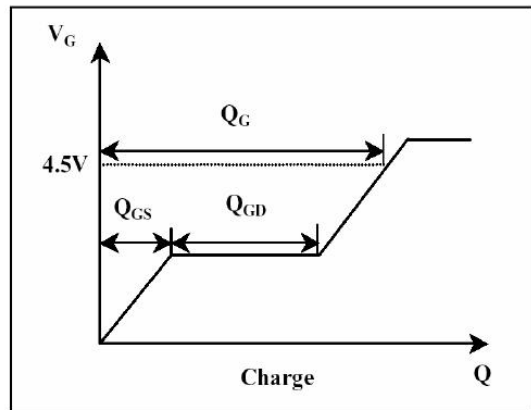


Fig 16. Gate Charge Waveform

## Characteristics Curve P-Channel

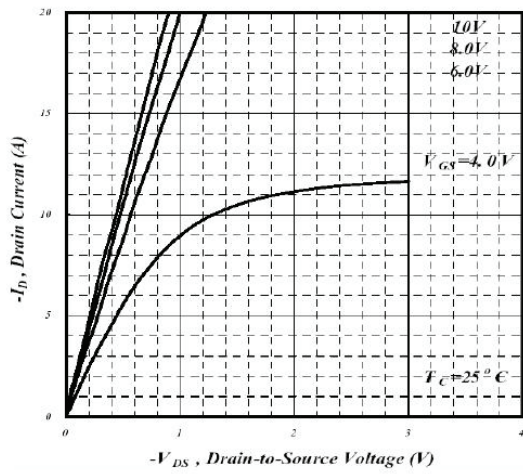


Fig 1. Typical Output Characteristics

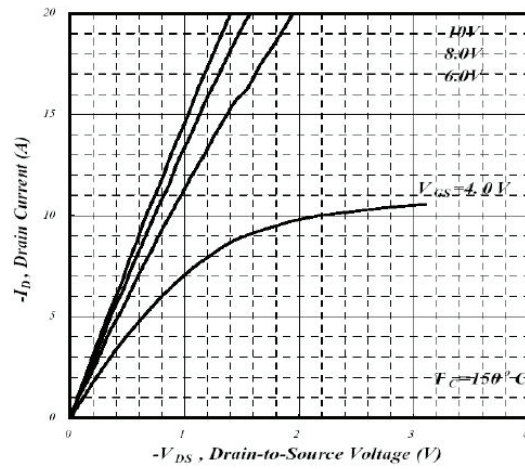


Fig 2. Typical Output Characteristics

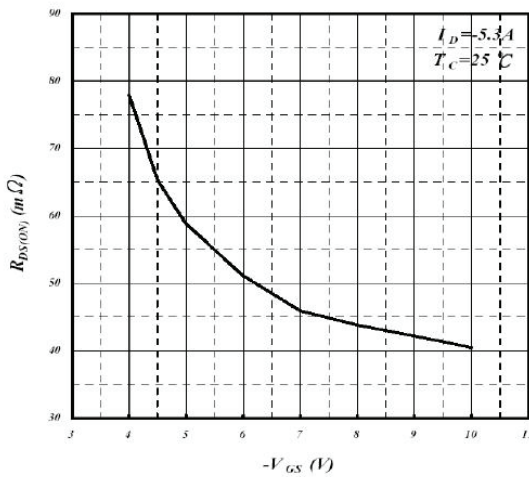


Fig 3. On-Resistance v.s. Gate Voltage

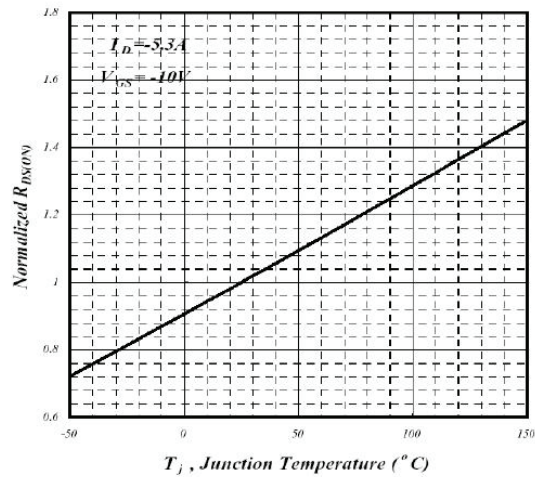


Fig 4. Normalized On-Resistance v.s. Junction Temperature

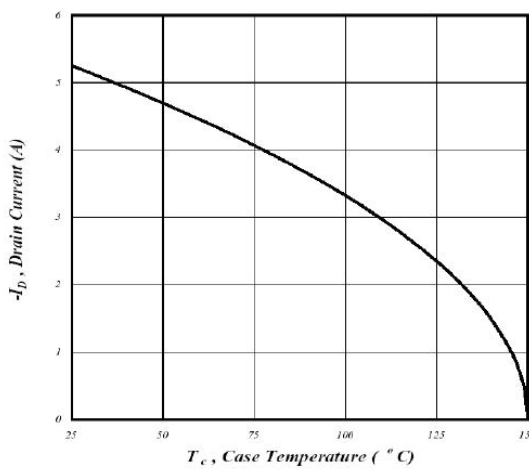


Fig 5. Maximum Drain Current v.s. Case Temperature

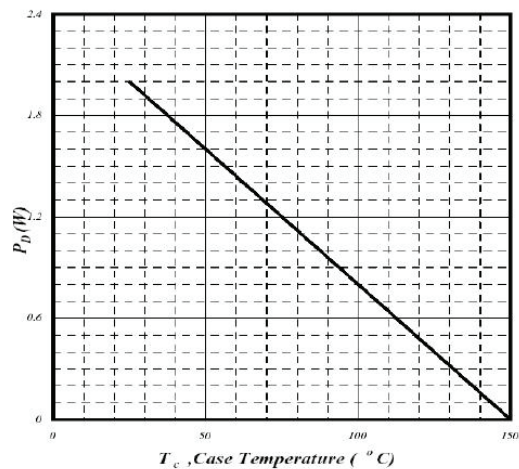


Fig 6. Type Power Dissipation

## P-Channel

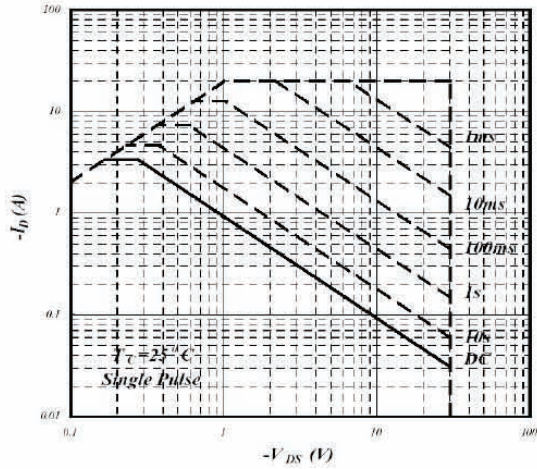


Fig 7. Maximum Safe Operating Area

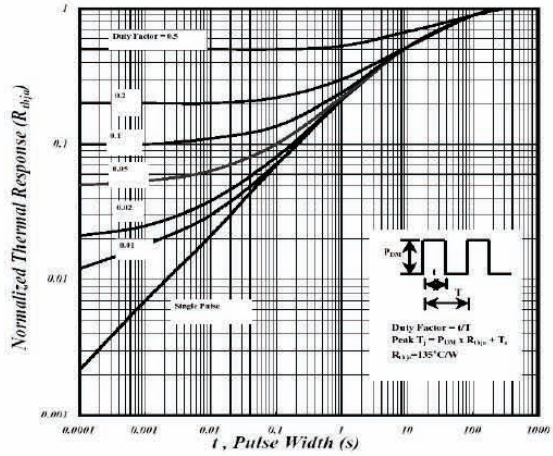


Fig 8. Effective Transient Thermal Impedance

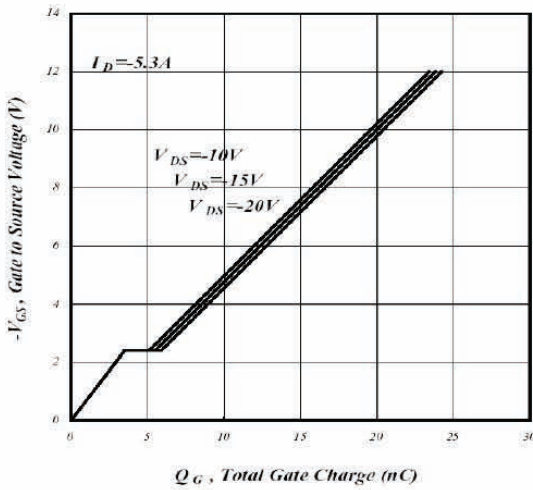


Fig 9. Gate Charge Characteristics

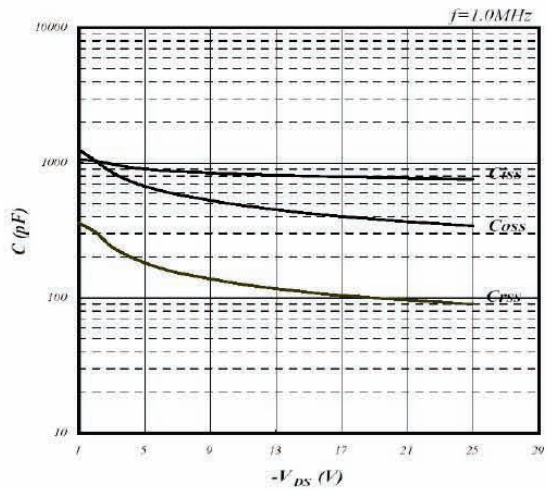


Fig 10. Typical Capacitance Characteristics

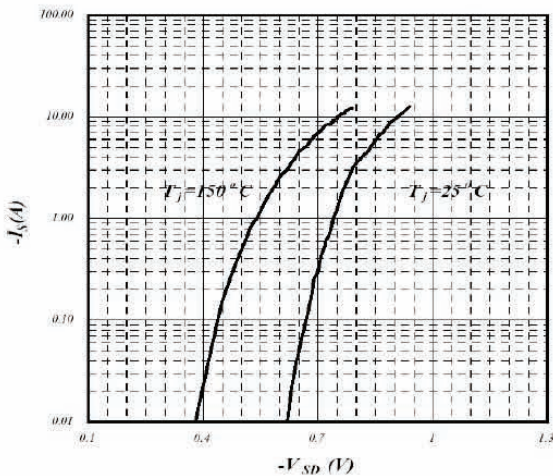


Fig 11. Forward Characteristics of Reverse Diode

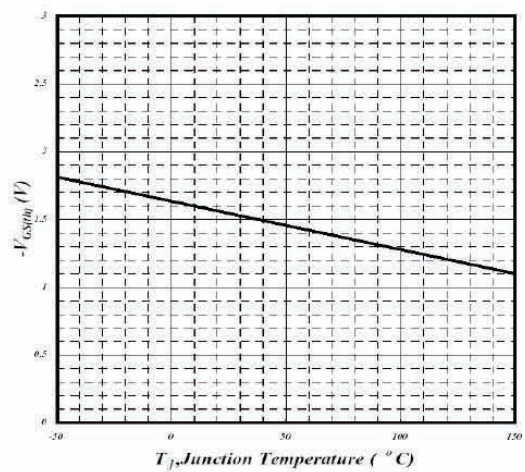


Fig 12. Gate Threshold Voltage v.s. Junction Temperature



P-Channel

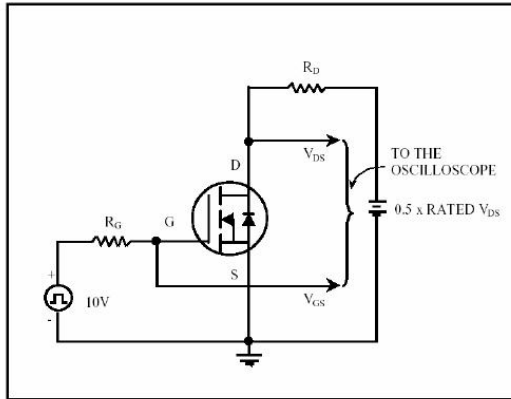


Fig 13. Switching Time Circuit

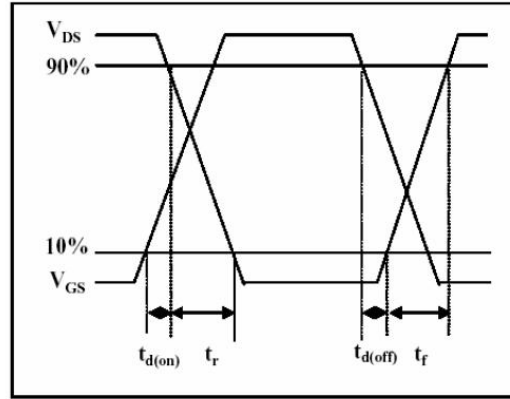


Fig 14. Switching Time Waveform

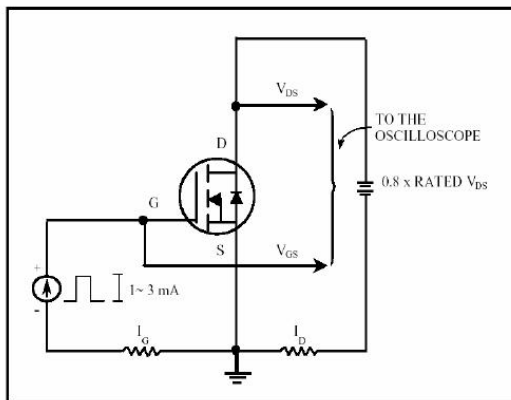


Fig 15. Gate Charge Circuit

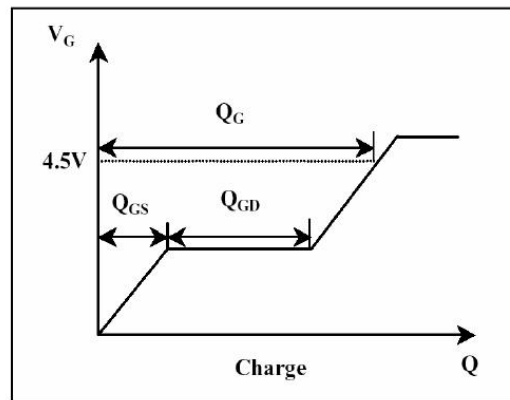
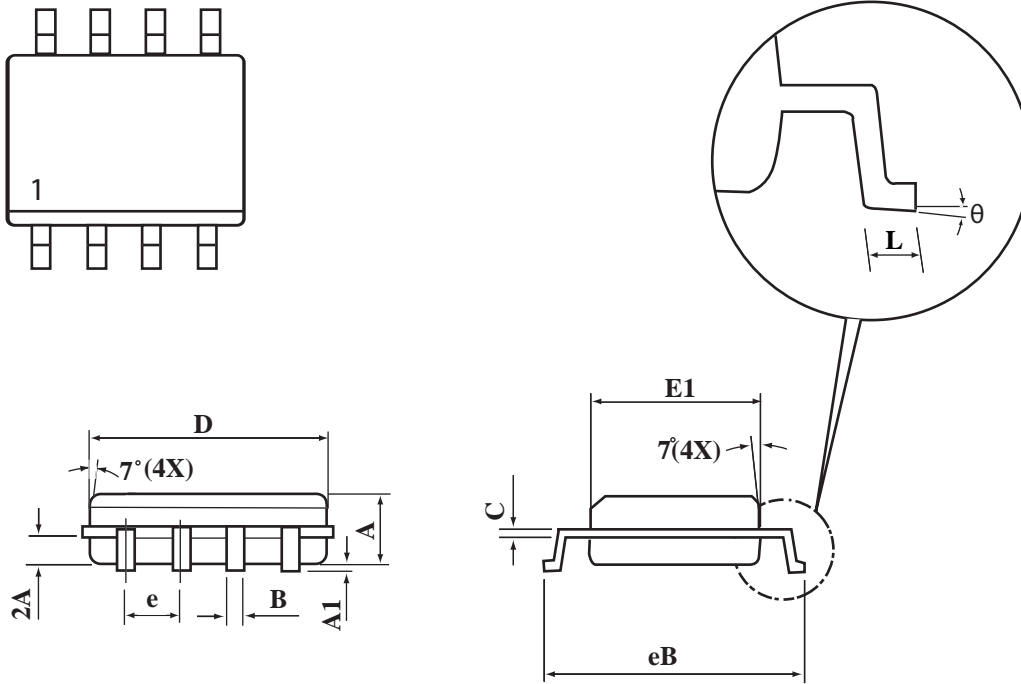


Fig 16. Gate Charge Waveform

**SOP-8 Package Outline Dimensions**

Unit:mm



SYMBOLS	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.20
B	0.35	0.45
C	0.18	0.23
D	4.69	4.98
E1	3.56	4.06
eB	5.70	6.30
e	1.27 BSC	
L	0.60	0.80
θ	0°	8°