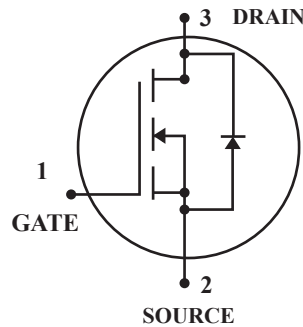


## N-Channel Enhancement Mode Power MOSFET

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

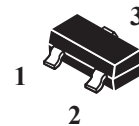


**DRAIN CURRENT  
3 AMPERS**

**DRAIN SOURCE VOLTAGE  
60 VOLTAGE**

### Features:

- \*Super High Dense Cell Design For Low  $R_{DS(ON)}$   
 $R_{DS(ON)} < 90m\Omega @ V_{GS}=10V$
- \*Rugged and Reliable
- \*Simple Drive Requirement
- \*SOT-23 Package



**SOT-23**

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

Rating	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current <sup>3</sup> , $V_{GS}@10V(T_A=25^\circ\text{C})$ $V_{GS}@10V(T_A=70^\circ\text{C})$	$I_D$	3.0	A
		2.3	
Pulsed Drain Current <sup>1,2</sup>	$I_{DM}$	10	
Total Power Dissipation ( $T_A=25^\circ\text{C}$ )	$P_D$	1.38	W
Maximum Junction-ambient <sup>3</sup>	$R\theta_{JA}$	90	$^\circ\text{C}/\text{W}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	$-55 \sim +150$	$^\circ\text{C}$

### Device Marking

WTC2310=2310

## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ Unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### Static

Drain-Source Breakdown Voltage $V_{GS}=0, I_D=250\mu\text{A}$	$V_{(BR)DSS}$	60	-	-	V
Gate-Source Threshold Voltage $V_{DS}=V_{GS}, I_D=250\mu\text{A}$	$V_{GS(Th)}$	1.0	-	3.0	
Gate-Source Leakage Current $V_{GS} = \pm 20\text{V}$	$I_{GSS}$	-	-	$\pm 100$	nA
Drain-Source Leakage Current ( $T_j=25^\circ\text{C}$ ) $V_{DS}=60\text{V}, V_{GS}=0$	$I_{DSS}$	-	-	10	$\mu\text{A}$
Drain-Source Leakage Current ( $T_j=70^\circ\text{C}$ ) $V_{DS}=48\text{V}, V_{GS}=0$		-	-	25	
Drain-Source On-Resistance $V_{GS}=10\text{V}, I_D=3\text{A}$ $V_{GS}=4.5\text{V}, I_D=2\text{A}$	$R_{DS(on)}$	-	-	90 120	$\text{m}\Omega$
Forward Transconductance $V_{DS}=5\text{V}, I_D=3\text{A}$	$g_{fs}$	-	5.0	-	S

### Dynamic

Input Capacitance $V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1.0\text{MHz}$	$C_{iss}$	-	490	780	pF
Output Capacitance $V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1.0\text{MHz}$	$C_{oss}$	-	55	-	
Reverse Transfer Capacitance $V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1.0\text{MHz}$	$C_{rss}$	-	40	-	

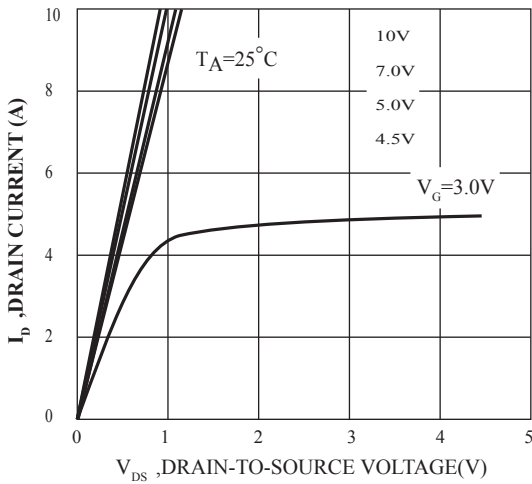
## Switching

Turn-on Delay Time <sup>2</sup> $V_{DS}=30V, V_{GS}=10V, I_D=1A, R_D=30\Omega, R_G=3.3\Omega$	$t_{d(on)}$	-	6	-	ns
Rise Time $V_{DS}=30V, V_{GS}=10V, I_D=1A, R_D=30\Omega, R_G=3.3\Omega$	$t_r$	-	5	-	
Turn-off Delay Time $V_{DS}=30V, V_{GS}=10V, I_D=1A, R_D=30\Omega, R_G=3.3\Omega$	$t_{d(off)}$	-	16	-	
Fall Time $V_{DS}=30V, V_{GS}=10V, I_D=1A, R_D=30\Omega, R_G=3.3\Omega$	$t_f$	-	3	-	
Total Gate Charge <sup>2</sup> $V_{DS}=48V, V_{GS}=4.5V, I_D=3A$	$Q_g$	-	6	10	nC
Gate-Source Charge $V_{DS}=48V, V_{GS}=4.5V, I_D=3A$	$Q_{gs}$	-	1.6	-	
Gate-Drain Charge $V_{DS}=48V, V_{GS}=4.5V, I_D=3A$	$Q_{gd}$	-	3	-	

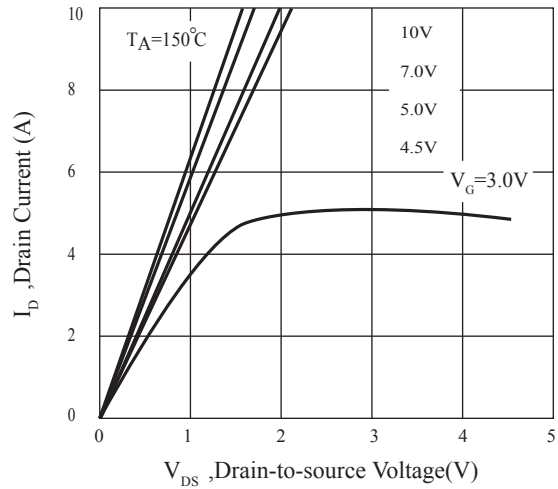
## Source-Drain Diode Characteristics

Forward On Voltage <sup>2</sup> $V_{GS}=0V, I_S=1.2A$	$V_{SD}$	-	-	1.2	V
Reverse Recovery Time $V_{GS}=0V, I_S=3A, di/dt=100A/\mu s$	$T_{rr}$	-	25	-	ns
Reverse Recovery Charge $V_{GS}=0V, I_S=3.9A, di/dt=100A/\mu s$	$Q_{rr}$	-	26	-	nC

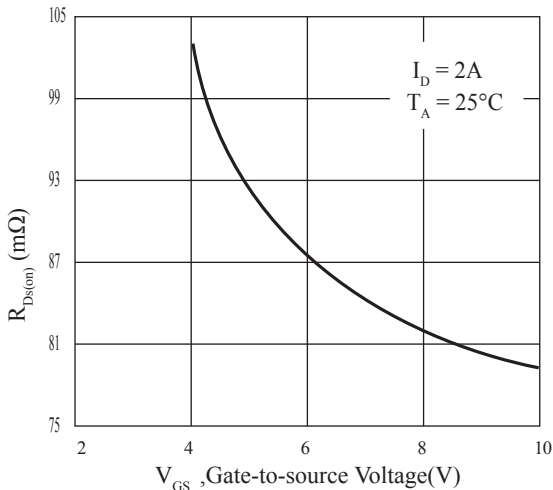
- Note: 1. Pulse width limited by max. junction temperature.  
 2. pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .  
 3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 270°C/W when mounted on min. copper pad.



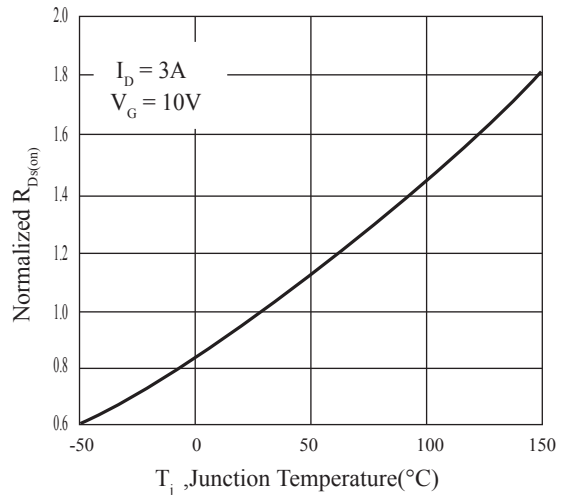
**FIG.1 Typical Output Characteristics**



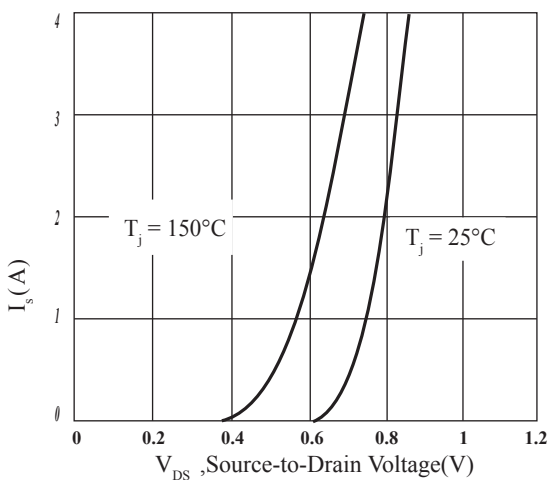
**Fig.2 Typical Output Characteristics**



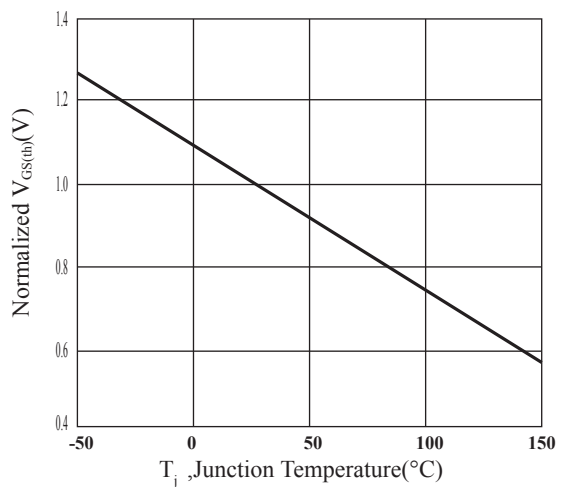
**Fig.3 On-Resistance v.s. Gate Voltage**



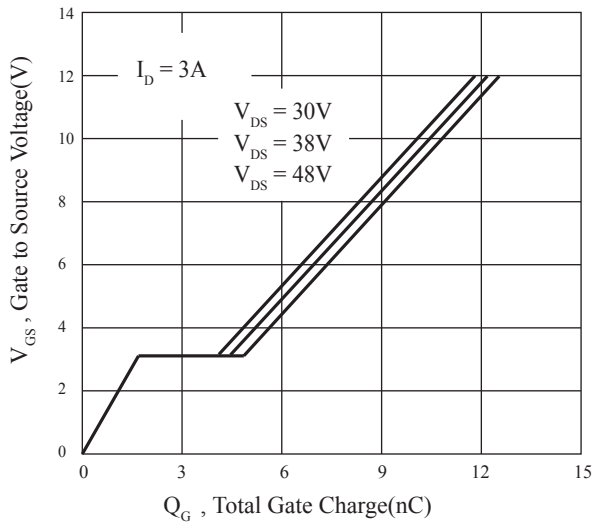
**Fig.4 Normalized OnResistance**



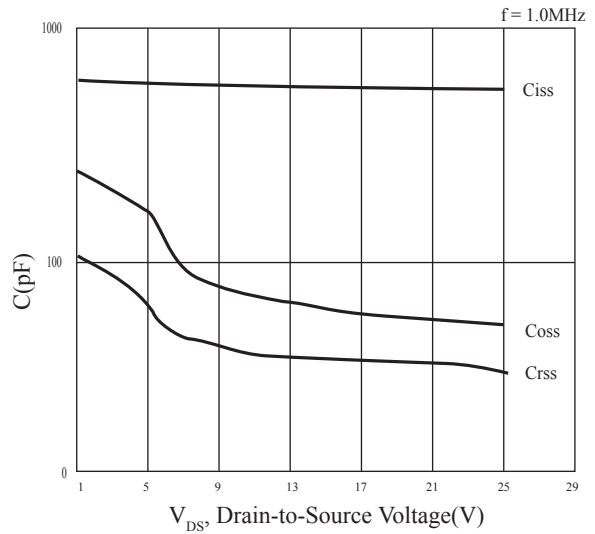
**Fig.5 Forward Characteristics of Reverse Diode**



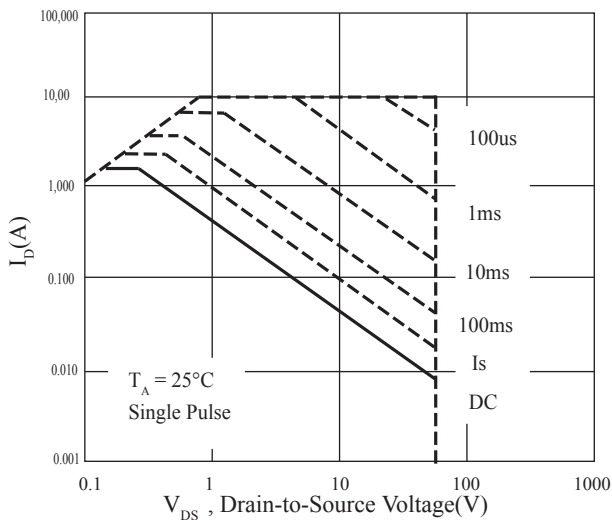
**Fig.6 Gate Threshold Voltage v.s. Junction Temperature**



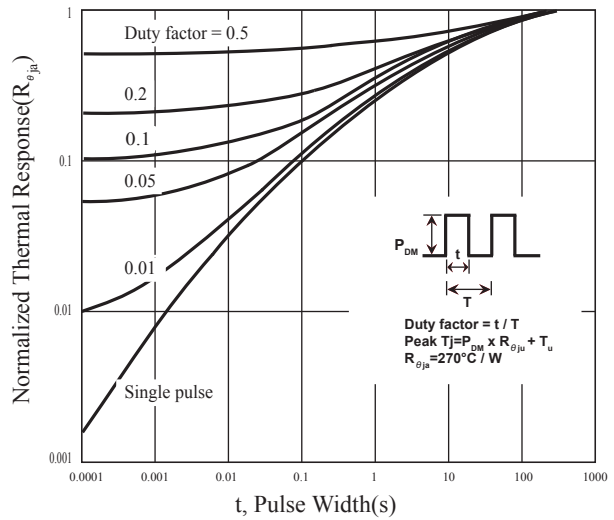
**Fig 7. Gate Charge Characteristics**



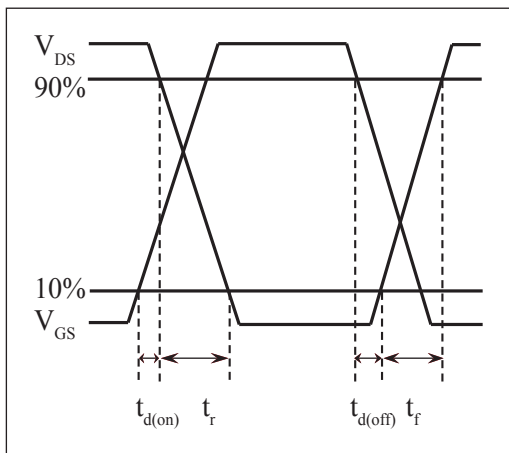
**Fig 8. Typical Capacitance Characteristics**



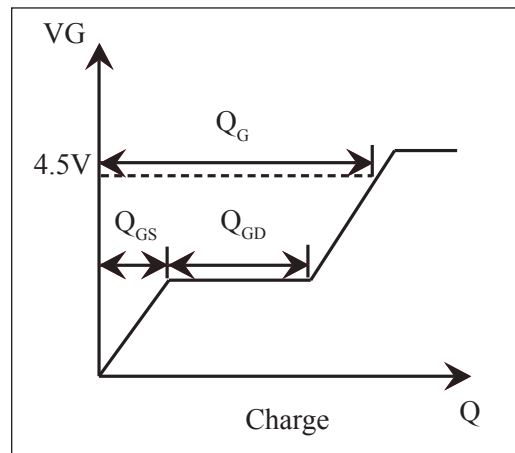
**Fig 9. Maximum Safe Operation Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Switching Time Circuit**



**Fig 12 Gate Charge Waveform**

**SOT-23 Outline Dimension**

