GX3409
30V P-Channel MOSFET

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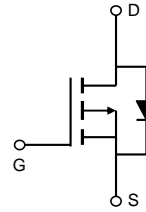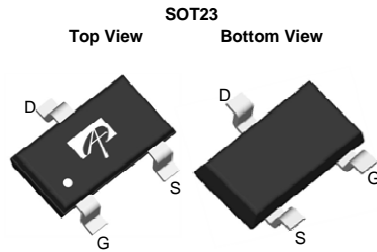SHENZHEN GUOXIN JIAPIN SEMICONDUCTOR CO.LTD

General Description

The GX3409 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications.

Product Summary

V_{DS}	-30V
I_D (at V_{GS}=-10V)	-2.6A
$R_{DS(ON)}$ (at V_{GS}=-10V)	< 110mΩ
$R_{DS(ON)}$ (at V_{GS}=-4.5V)	< 180mΩ

Green Product

SOT23
Top View   Bottom View

Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_A=25℃	I_D	-2.6	A
	T_A=70℃		-2.2	
Pulsed Drain Current [C]		I_{DM}	-20	
Power Dissipation [B]	T_A=25℃	P_D	1.4	W
	T_A=70℃		1	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{θJA}$	70	90	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		100	125	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{θJL}$	63	80	℃/W

Electrical Characteristics (T$_J$=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV$_{DSS}$	Drain-Source Breakdown Voltage	I$_D$=-250μA, V$_{GS}$=0V		-30			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=-30V, V$_{GS}$=0V				-1	μA
			T$_J$=55℃			-5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$= ±20V				±100	nA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$ I$_D$=-250μA		-1.4	-1.9	-2.4	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=-10V, V$_{DS}$=-5V		-20			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=-10V, I$_D$=-2.6A			77	110	mΩ
			T$_J$=125℃		100	140	
		V$_{GS}$=-4.5V, I$_D$=-2A			125	180	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=-5V, I$_D$=-2.6A			5		S
V$_{SD}$	Diode Forward Voltage	I$_S$=-1A,V$_{GS}$=0V			-0.8	-1	V
I$_S$	Maximum Body-Diode Continuous Current					-1.5	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=-15V, f=1MHz			197	240	pF
C$_{oss}$	Output Capacitance				42		pF
C$_{rss}$	Reverse Transfer Capacitance				26	37	pF
R$_g$	Gate resistance	V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz		3.5	7.2	11.0	Ω
SWITCHING PARAMETERS							
Q$_g$(10V)	Total Gate Charge	V$_{GS}$=-10V, V$_{DS}$=-15V, I$_D$=-2.6A			4.3	5.2	nC
Q$_g$(4.5V)	Total Gate Charge				2.2	3	nC
Q$_{gs}$	Gate Source Charge				0.7		nC
Q$_{gd}$	Gate Drain Charge				1.1		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=-10V, V$_{DS}$=-15V, R$_L$=5.8Ω, R$_{GEN}$=3Ω			7.5		ns
t$_r$	Turn-On Rise Time				4.1		ns
t$_{D(off)}$	Turn-Off DelayTime				11.8		ns
t$_f$	Turn-Off Fall Time				3.8		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=-2.6A, dI/dt=100A/μs			11.3	14	ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=-2.6A, dI/dt=100A/μs			4.4		nC

A. The value of R$_{θJA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T$_A$ =25℃. The value in any given application depends on the user's specific board design.

B. The power dissipation P$_D$ is based on T$_{J(MAX)}$=150℃, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T$_{J(MAX)}$=150℃. Ratings are based on low frequency and duty cycles to keep initialT$_J$=25℃.

D. The R$_{θJA}$ is the sum of the thermal impedance from junction to lead R$_{θJL}$ and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T$_{J(MAX)}$=150℃. The SOA curve provides a single pulse ratin g.

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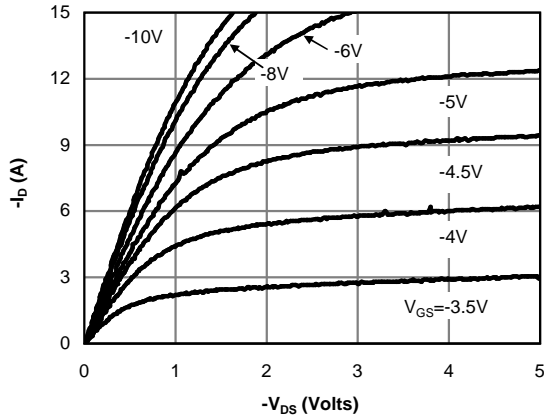
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
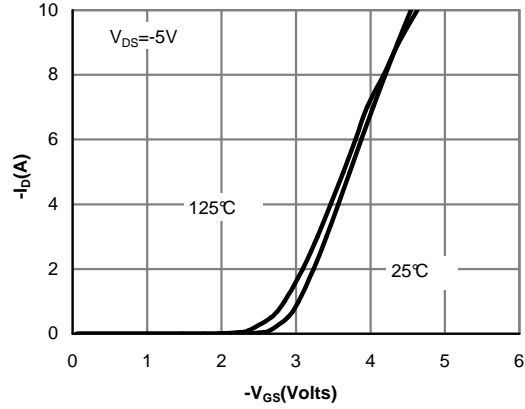
Fig 1: On-Region Characteristics (Note E)

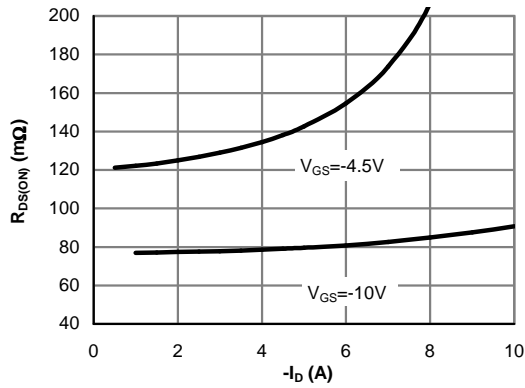Figure 2: Transfer Characteristics (Note E)

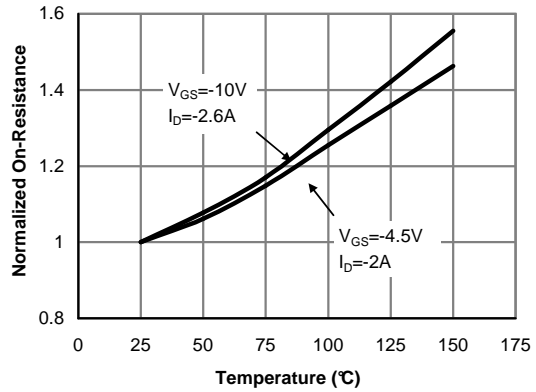Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

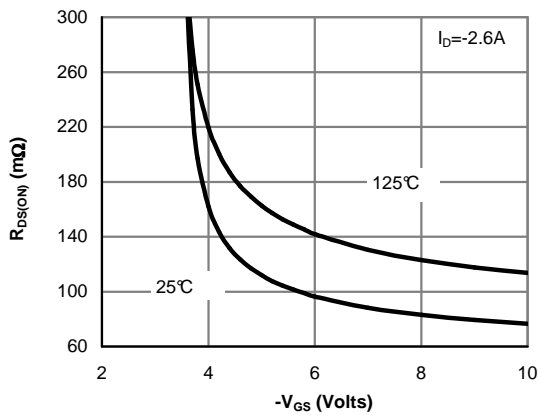Figure 4: On-Resistance vs. Junction Temperature (Note E)

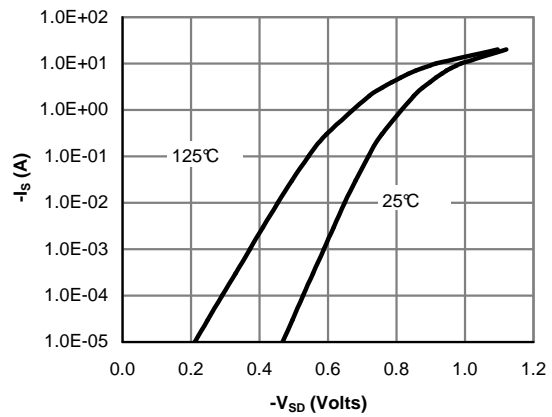Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

Figure 6: Body-Diode Characteristics (Note E)

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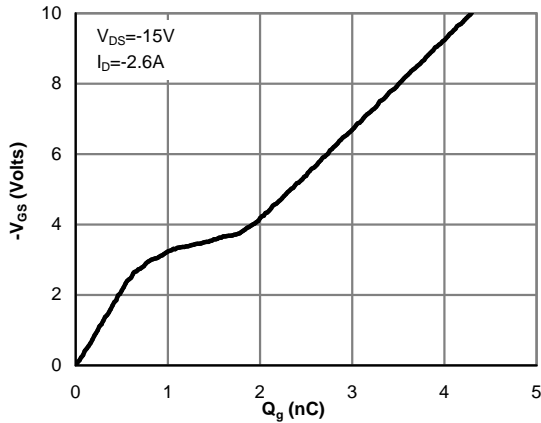
Figure 7: Gate-Charge Characteristics
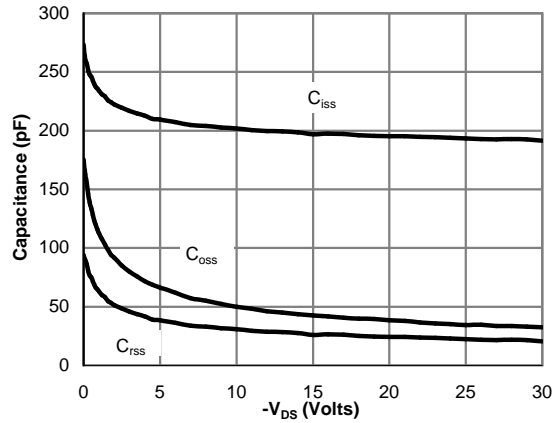
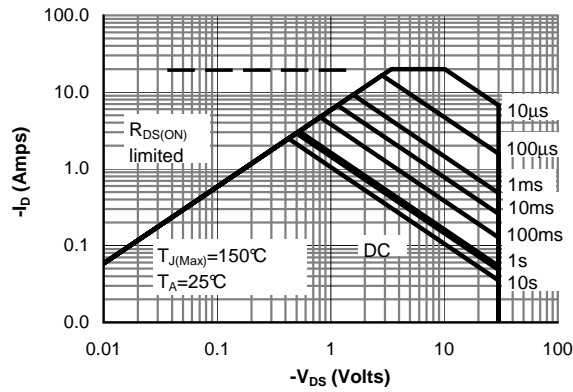Figure 8: Capacitance Characteristics
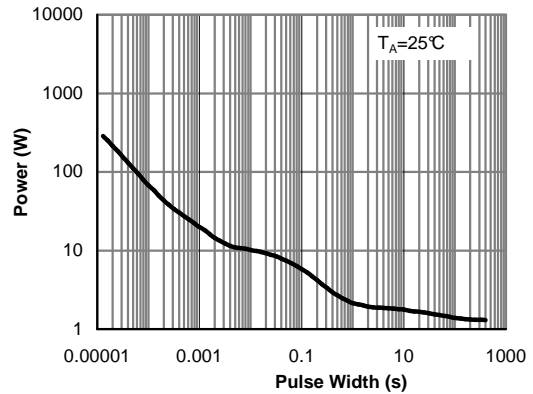
Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

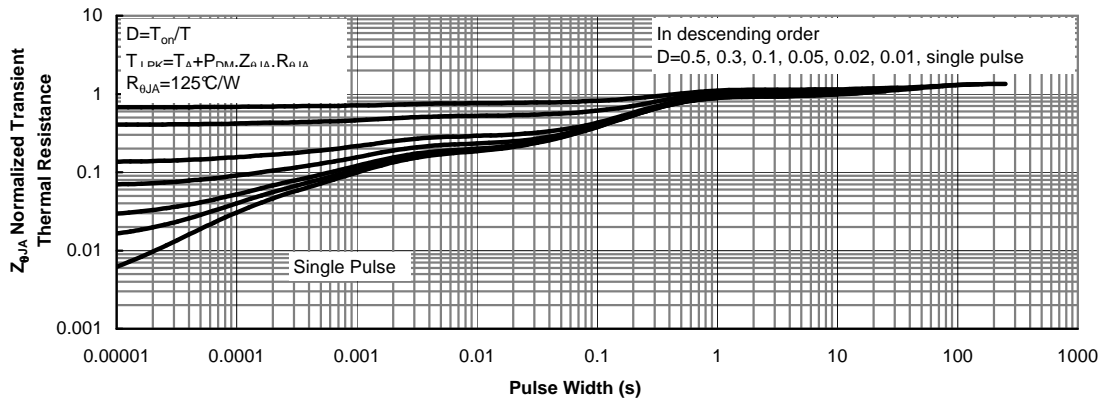Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)
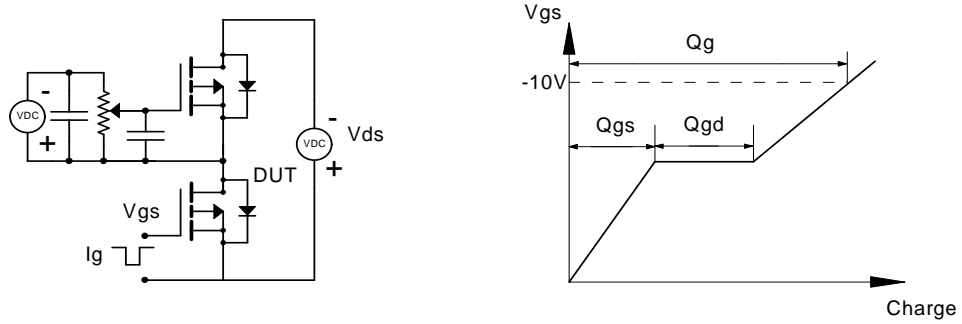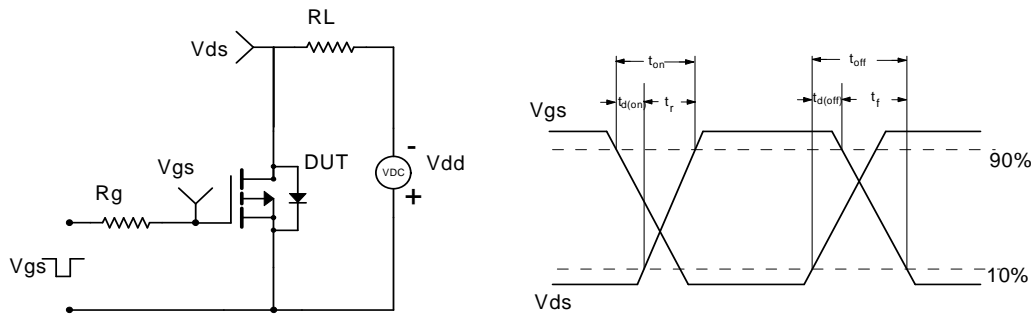
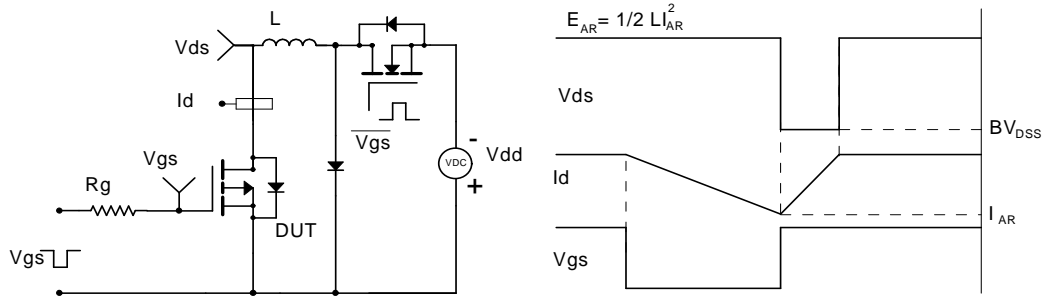Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR}= 1/2\, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int Idt$$