



23N50Q

Power MOSFET

23A, 500V N-CHANNEL POWER MOSFET

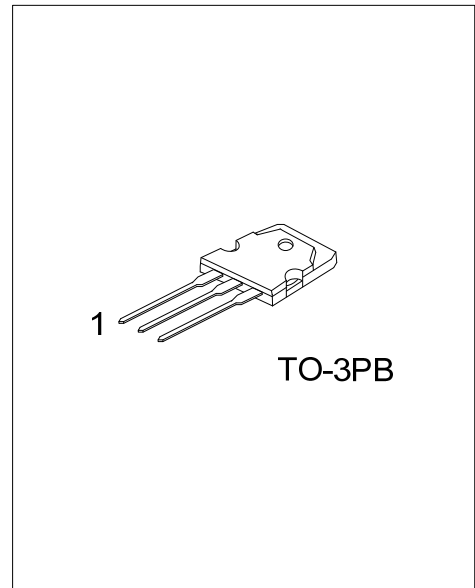
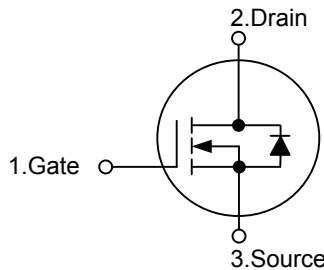
■ DESCRIPTION

The **23N50Q** uses advanced UTC technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with low gate voltages. This device is suitable for use as a load switch, in PWM applications, motor controls, inverters, choppers, audio amplifiers and high energy pulse circuits.

■ FEATURES

- * $R_{DS(ON)} \leq 0.32\Omega$ @ $V_{GS}=10V, I_D=11.5A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability

■ SYMBOL



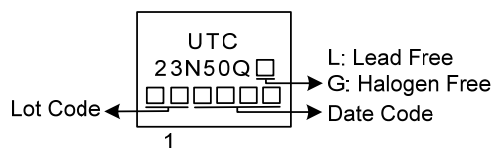
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
23N50QL-T3B-T	23N50QG-T3B-T	TO-3PB	G	D	S	Tube

Note: Pin Assignment: G: Gate D: Drain S: Source

<p>23N50QG-TA3-T</p>	<p>(1) T: Tube (2) T3B: TO-3PB (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	500	V
Gate-Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current	Continuous ($V_{GS}=0V$)	I_D	± 23	A
Pulsed Drain Current	Pulsed (Note 2)	I_{DM}	± 46	A
Avalanche Energy	Single Pulsed(Note3)	E_{AS}	578	mJ
Peak Diode Recovery dv/dt (Note4)		dv/dt	5.4	V/ns
Power Dissipation		P_D	416	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^{\circ}\text{C}$

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by maximum junction temperature.

3. $L=1\text{mH}$, $I_{AS}=34\text{A}$, $V_{DD}=50\text{V}$, $R_G=50\Omega$, Starting $T_J=25^{\circ}\text{C}$

4. $I_{SD}\leq I_D$, $di/dt\leq 100\text{A}/\mu\text{s}$, $V_{DD}\leq 500\text{V}$, $T_J\leq 150^{\circ}\text{C}$, Suggested= 2.35Ω .

■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient		θ_{JA}	30	$^{\circ}\text{C}/\text{W}$
Junction to Case		θ_{JC}	0.3	$^{\circ}\text{C}/\text{W}$

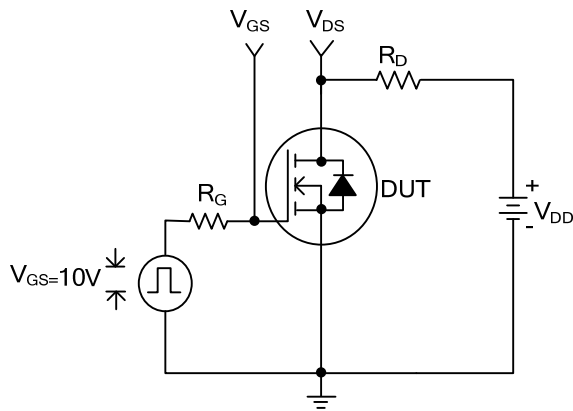
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =250μA, V _{GS} =0V	500			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =500V, V _{GS} =0V			10	μA
Gate- Source Leakage Current	Forward	I _{GSS} V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =11.5A			0.32	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		2450		pF
Output Capacitance	C _{OSS}			275		pF
Reverse Transfer Capacitance	C _{RSS}			16.5		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =100V, V _{GS} =10V, I _D =20A I _G = 1mA (Note1, 2)		53		nC
Gate to Source Charge	Q _{GS}			11		nC
Gate to Drain Charge	Q _{GD}			13		nC
Turn-ON Delay Time (Note 1)	t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =20A, R _G =25Ω (Note1, 2)		32		ns
Rise Time	t _R			30		ns
Turn-OFF Delay Time	t _{D(OFF)}			162		ns
Fall-Time	t _F			70		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				23	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				46	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =23A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =23A, V _{GS} =0V, V _R =400V dI _F /dt=100A/μs (Note 1)		412		ns
Reverse Recovery Charge	Q _{rr}				6.5	

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

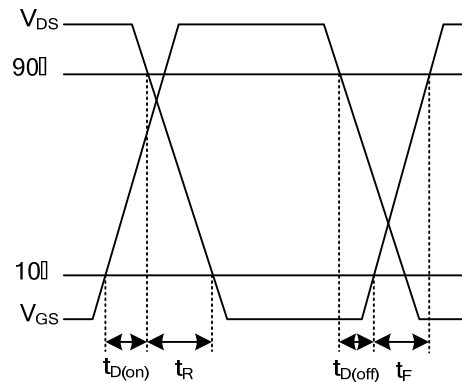
2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

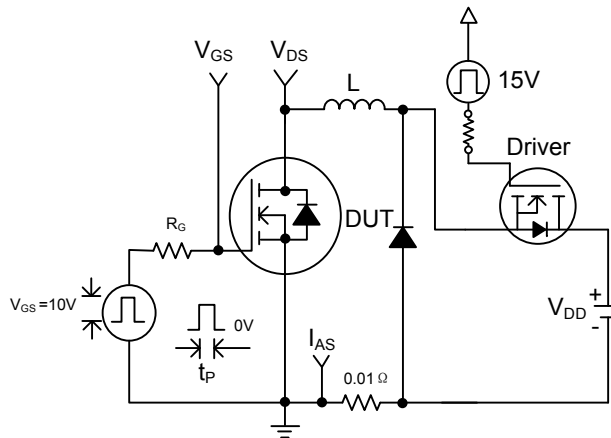


Pulse Width $\leq 1\mu s$ Duty Cycle ≤ 0.1

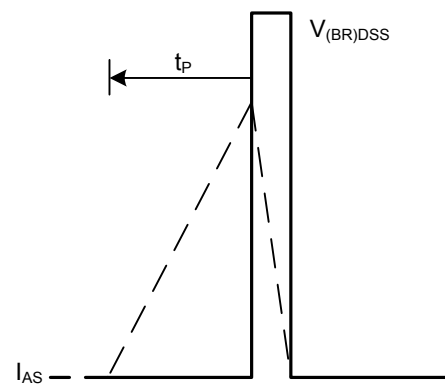
Switching Time Test Circuit



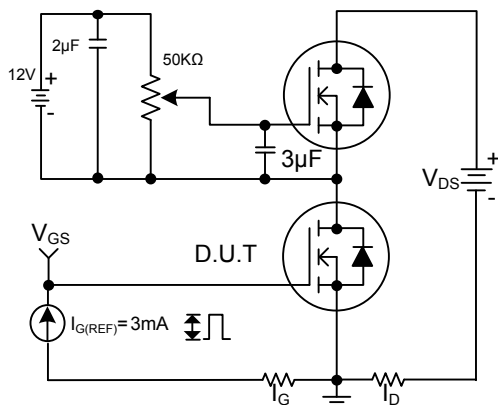
Switching Time Waveforms



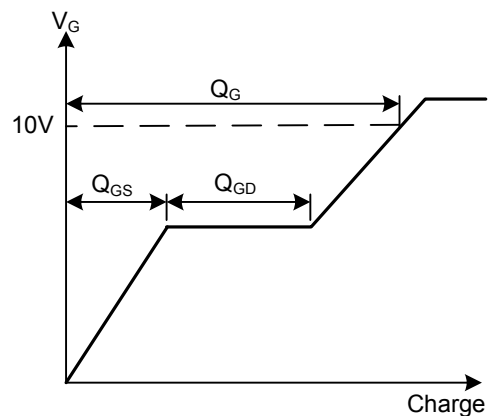
Unclamped Inductive Test Circuit



Unclamped Inductive Waveforms

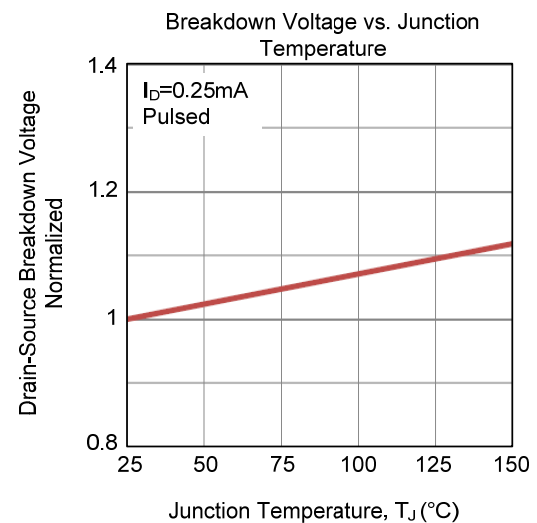
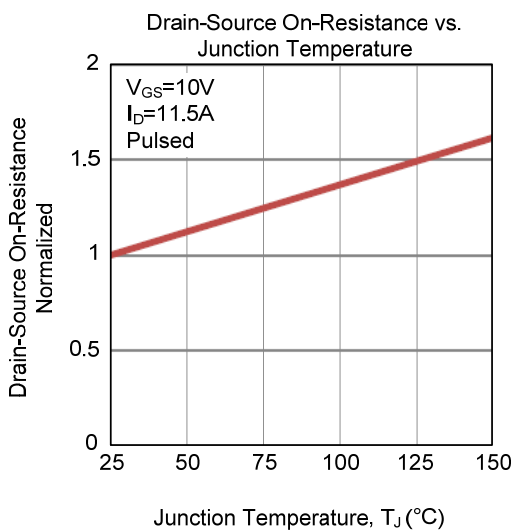
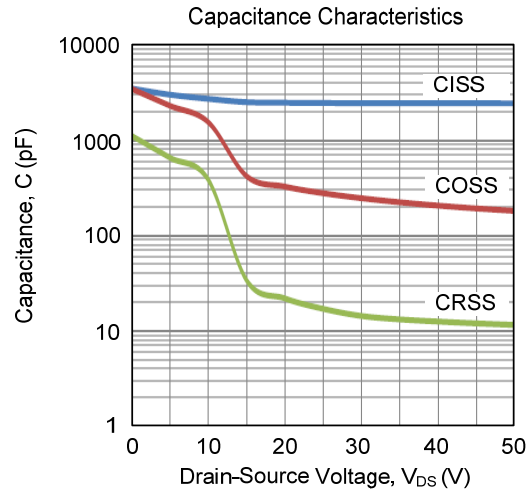
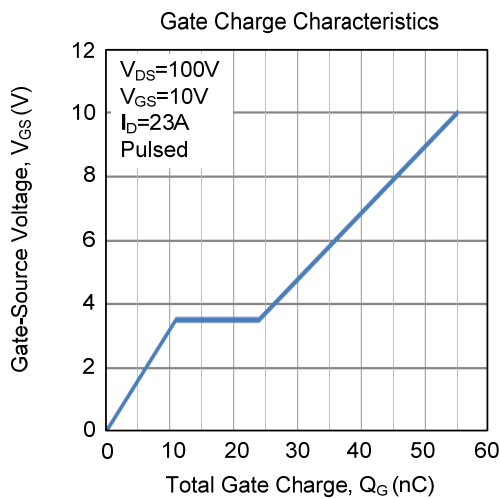
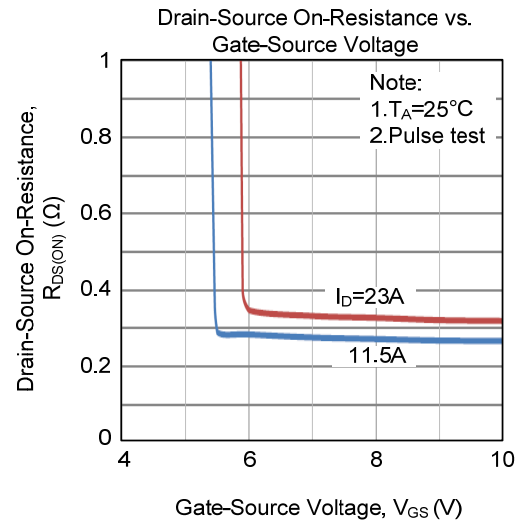
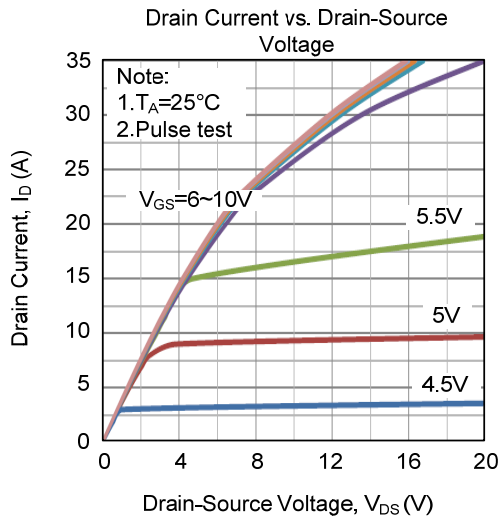


Gate Charge Test Circuit

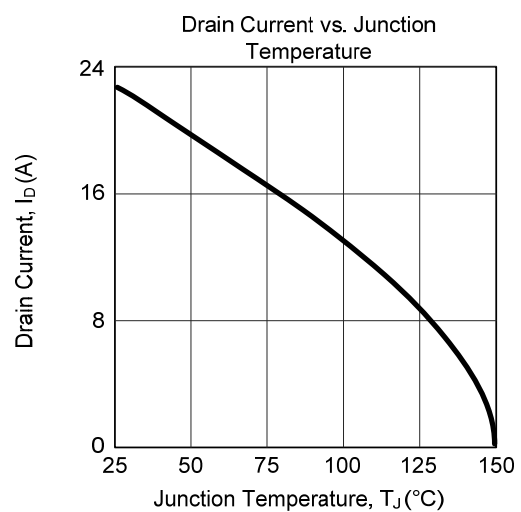
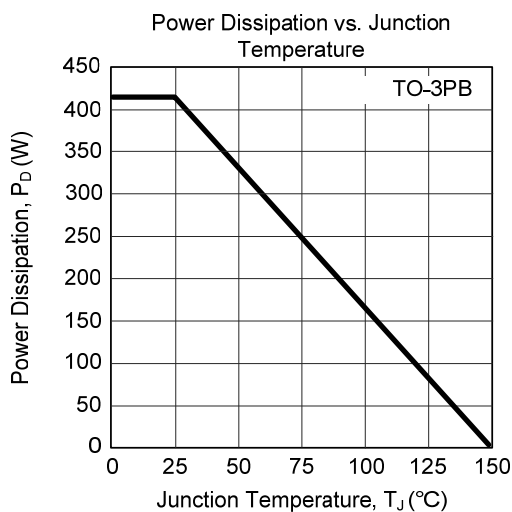
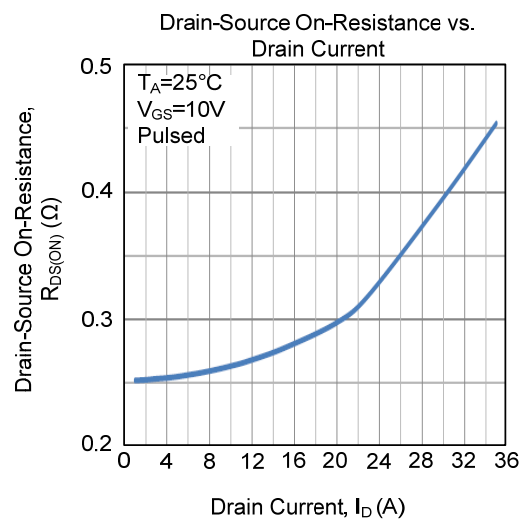
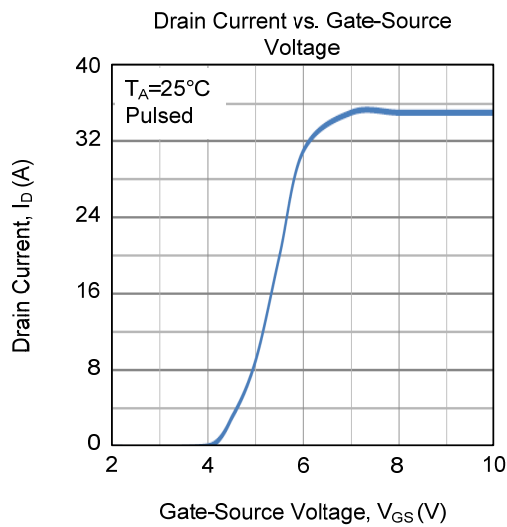
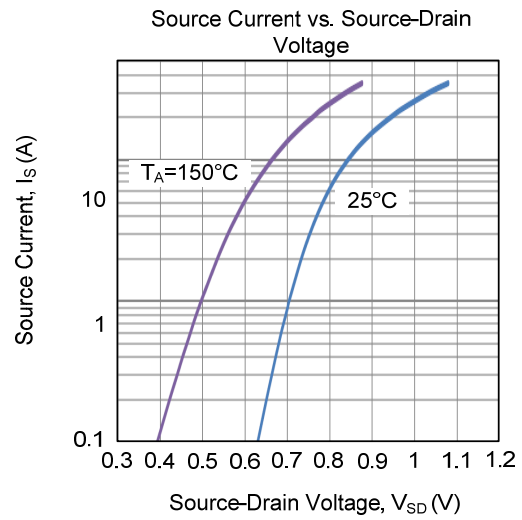
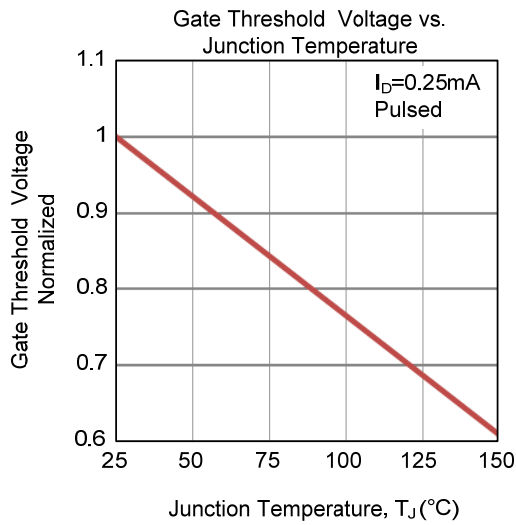


Basic Gate Charge Waveform

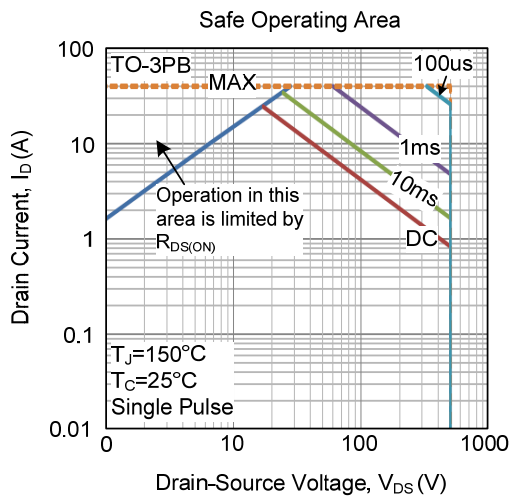
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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