



22N60

Power MOSFET

022A, 600V N-CHANNEL POWER MOSFET

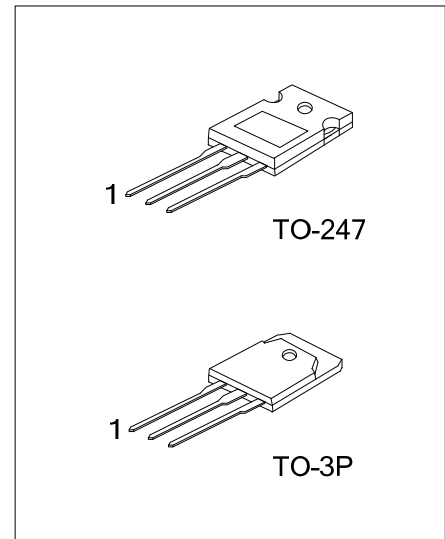
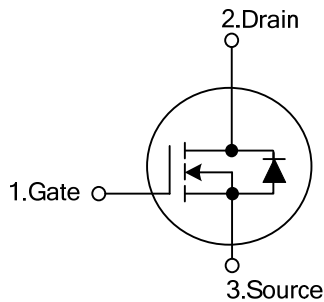
■ DESCRIPTION

As the SMPS MOSFET, the UTC **22N60** uses UTC's advanced 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 or in PWM applications.

■ FEATURES

- * $R_{DS(ON)} < 0.35\Omega @ V_{GS}=10V, I_D=13A$
- * Ultra Low Gate Charge (Typical 150 nC)
- * Low Reverse Transfer Capacitance ($C_{RSS} = \text{Typical } 36 \text{ pF}$)
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
22N60L-T47-T	22N60G-T47-T	TO-247	G	D	S	Tube
22N60L-T3P-T	22N60G-T3P-T	TO-3P	G	D	S	Tube

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

<p>20N60L-T47-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) T47: TO-247, T3P: TO-3P</p> <p>(3) G: Halogen Free and Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	± 30	V
Avalanche Current		I_{AR}	22	A
Continuous Drain Current		I_D	22	A
Pulsed Drain Current (Note 1)		I_{DM}	88	A
Avalanche Energy	Single Pulsed	E_{AS}	380	mJ
	Repetitive	E_{AR}	37	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	18	V/ns
Power Dissipation	TO-247	P_D	416	W
	TO-3P		446	
Junction Temperature		T_J	150	$^\circ\text{C}$
Operating Temperature		T_{OPR}	-55 ~ +150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^\circ\text{C}$

Note: 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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-247	θ_{JA}	40	$^\circ\text{C} / \text{W}$
	TO-3P		30	
Junction to Case	TO-247	θ_{JC}	0.30	$^\circ\text{C} / \text{W}$
	TO-3P		0.28	

■ ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600V, V_{GS}=0V$			50	μA
Gate- Source Leakage Current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 30V$			± 100	nA
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=1mA$, Referenced to 25°C		0.30		$V/^\circ\text{C}$
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=13A$ (Note 4)		0.26	0.35	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1.0MHz$		3570		pF
Output Capacitance	C_{OSS}			350		pF
Reverse Transfer Capacitance	C_{RSS}			36		pF
SWITCHING PARAMETERS						
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=300V, I_D=22A, R_G=6.2\Omega$ $V_{GS}=10V$ (Note 4)		160		ns
Turn-ON Rise Time	t_R			300		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			900		ns
Turn-OFF Fall-Time	t_F			400		ns
Total Gate Charge	Q_G	$V_{DS}=480V, V_{GS}=10V,$ $I_D=22A$ (Note 4)			500	nC
Gate Source Charge	Q_{GS}				46	nC
Gate Drain Charge	Q_{GD}				170	nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=22A$			1.5	V
Continuous Source Current (Body Diode)	I_S	(Note 1)			22	A
Pulsed Source Current (Body Diode)	I_{SM}				88	A
Reverse Recovery Time	t_{rr}	$I_S=22A, di/dt=100A/\mu s$		590	890	ns
Reverse Recovery Charge	Q_{RR}	(Note 4)		7.2	11	μC

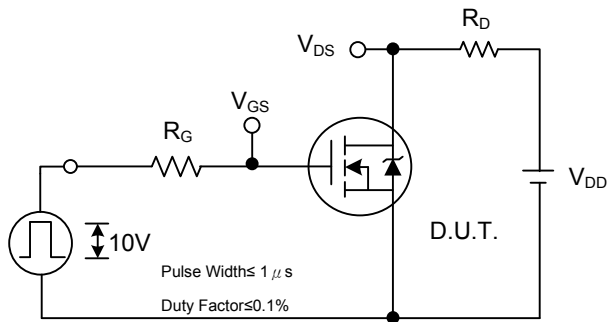
Notes: 1. Repetitive rating; pulse width limited by max. junction temperature

2. $T_J = 25^\circ\text{C}$, $L = 1.5mH$, $R_G=25\Omega$, $I_{AS} = 22A$

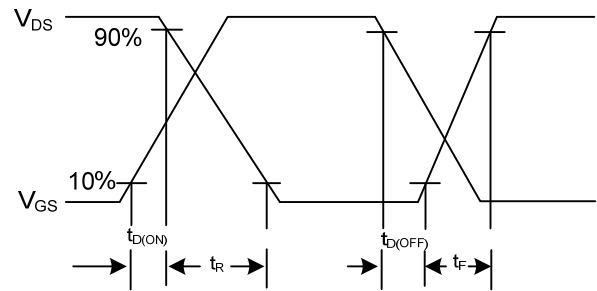
3. $I_{SD} \leq 22A$, $di/dt \leq 540A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$

4. Pulse Width $\leq 300 \mu s$, Duty Cycle $\leq 2\%$

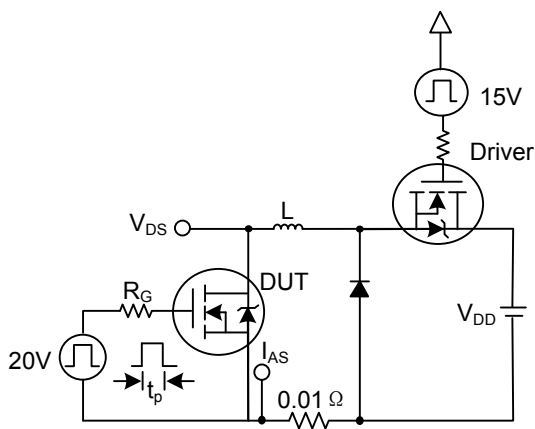
TEST CIRCUITS



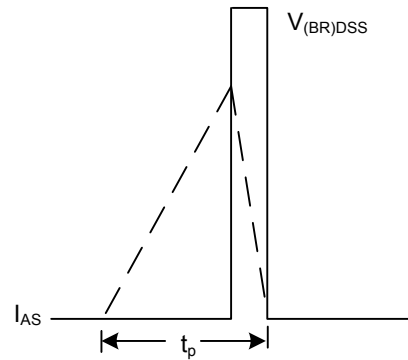
Switching Test Circuit



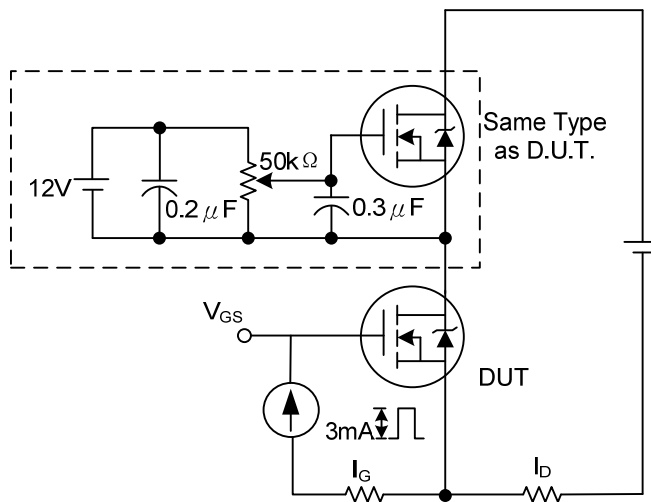
Switching Waveforms



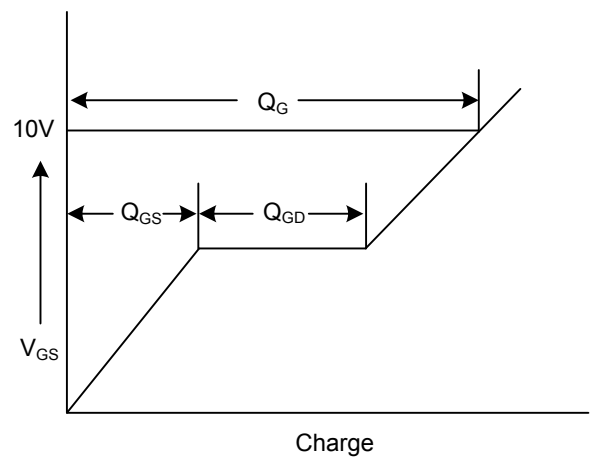
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

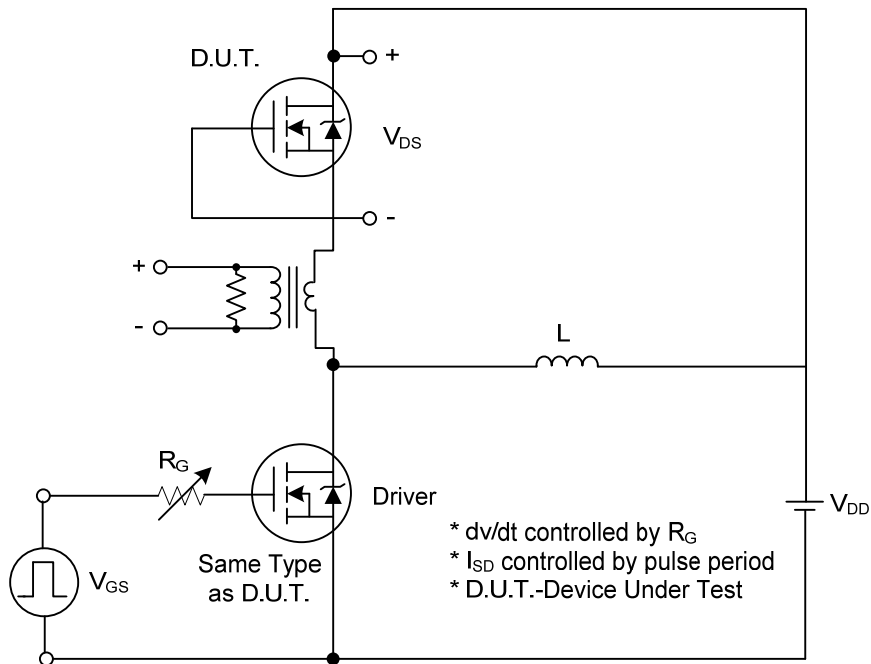


Gate Charge Test Circuit

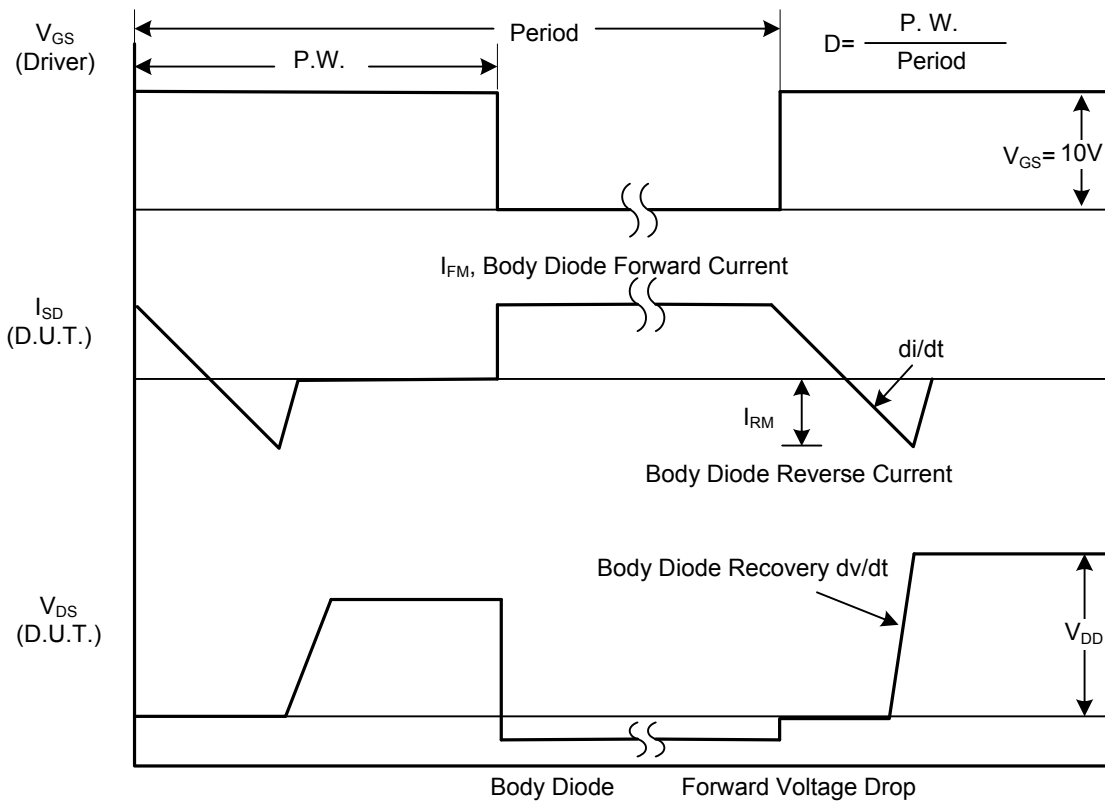


Gate Charge Waveform

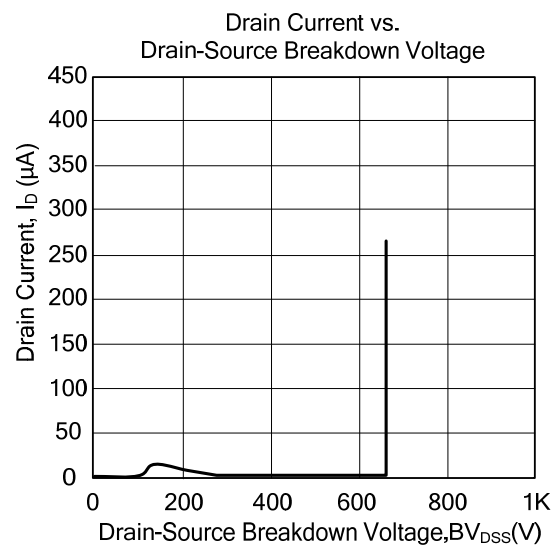
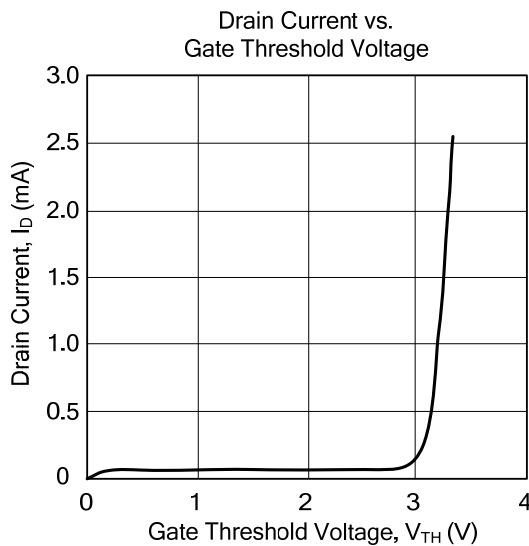
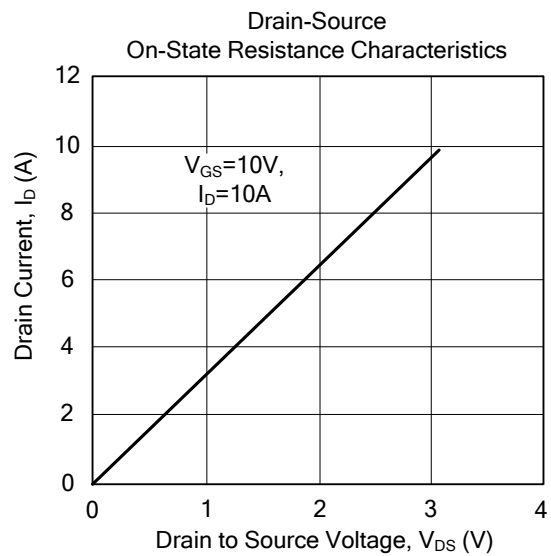
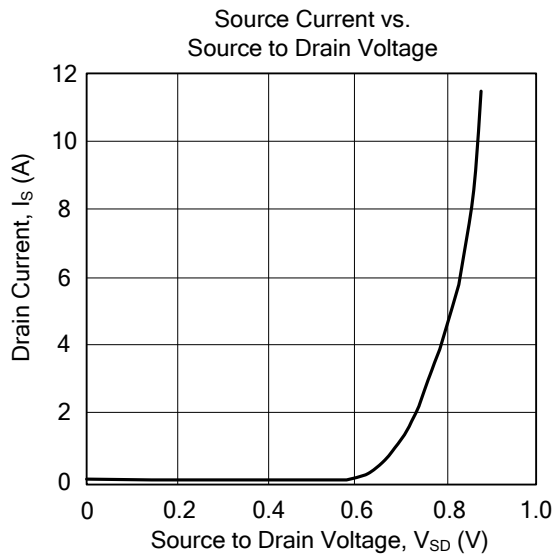
■ TEST CIRCUITS(Cont.)



Peak Diode Recovery dv/dt Test Circuit



TYPICAL CHARACTERISTICS



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