



**15N60**

Preliminary

**Power MOSFET**

**15A, 600V N-CHANNEL  
POWER MOSFET**

■ DESCRIPTION

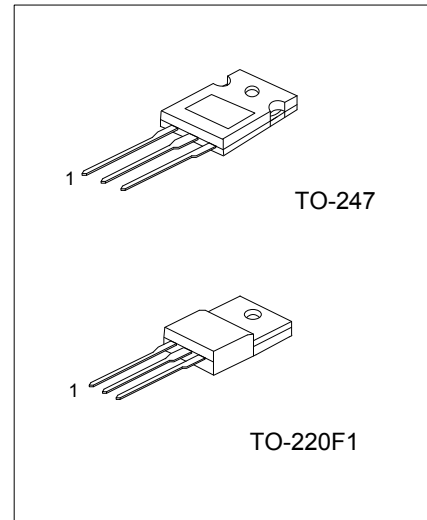
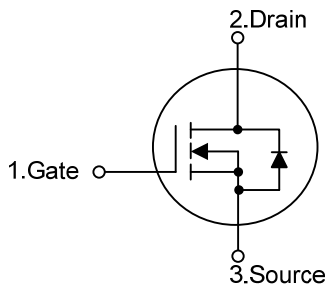
The UTC **15N60** is an N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **15N60** is universally applied in active power factor correction and high efficient switched mode power supplies.

■ FEATURES

- \*  $R_{DS(ON)}=0.65\Omega @ V_{GS}=10V$
- \* Typically 23.6pF low  $C_{RSS}$
- \* High switching speed
- \* Improved dv/dt capability

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
15N60L-TF1-T	15N60G-TF1-T	TO-220F1	G	D	S	Tube
15N60L-T47-T	15N60G-T47-T	TO-247	G	D	S	Tube

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

<p>15N60L-TF1-T</p>	<p>(1) T: Tube (2) TF1: TO-220F1, T47: TO-247 (3) G: Halogen Free, L: Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS ( $T_c=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		$V_{DSS}$	600	V
Gate to Source Voltage		$V_{GSS}$	$\pm 30$	V
Avalanche Current (Note 2)		$I_{AR}$	15	A
Continuous Drain Current	Continuous	$I_D$	15	A
	Pulsed (Note 2)	$I_{DM}$	60	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	637	mJ
	Repetitive (Note 2)	$E_{AR}$	25.0	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220F1	$P_D$	38.5	W
	TO-247		312	
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.  $L=5.23\text{mH}$ ,  $I_{AS}=15\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$

4.  $I_{SD}\leq 15\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-247		40	
Junction to Case	TO-220F1	$\theta_{JC}$	3.3	$^\circ\text{C}/\text{W}$
	TO-247		0.4	

■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified)

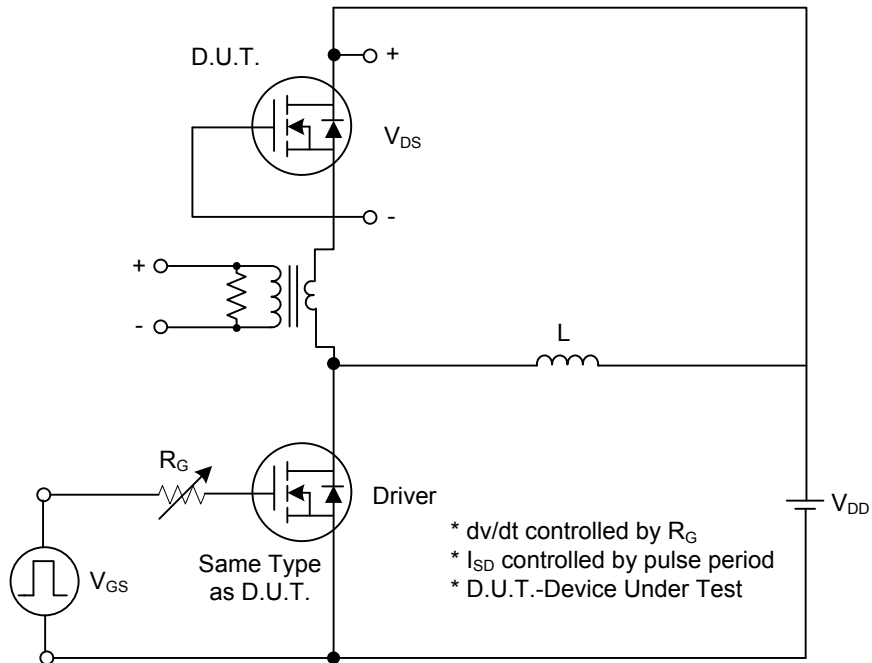
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA, T <sub>J</sub> =25°C	600			V
Breakdown Voltage Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> =250μA, Referenced to 25°C		0.65		V/°C
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V			1	μA
		V <sub>DS</sub> =520V, T <sub>C</sub> =125°C			10	μA
Gate- Source Leakage Current	Forward	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V			+100	nA
	Reverse	V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0		4.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =7.5A		0.5	0.65	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		2380	3095	pF
Output Capacitance	C <sub>OSS</sub>			295	385	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			23.6	35.5	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =520V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A (Note 1, 2)		48.5	63.0	nC
Gate-Source Charge	Q <sub>GS</sub>			14.0		nC
Gate-Drain Charge	Q <sub>GD</sub>			21.2		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =325V, I <sub>D</sub> =15A, R <sub>G</sub> =21.7Ω (Note 1, 2)		65	140	ns
Turn-ON Rise Time	t <sub>R</sub>			125	260	ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			105	220	ns
Turn-OFF Fall Time	t <sub>F</sub>			65	140	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				15	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				60	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =15A,		496		ns
Body Diode Reverse Recovery Charge	Q <sub>RR</sub>	dI <sub>F</sub> /dt=100A/μs (Note 1)		5.69		μC

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

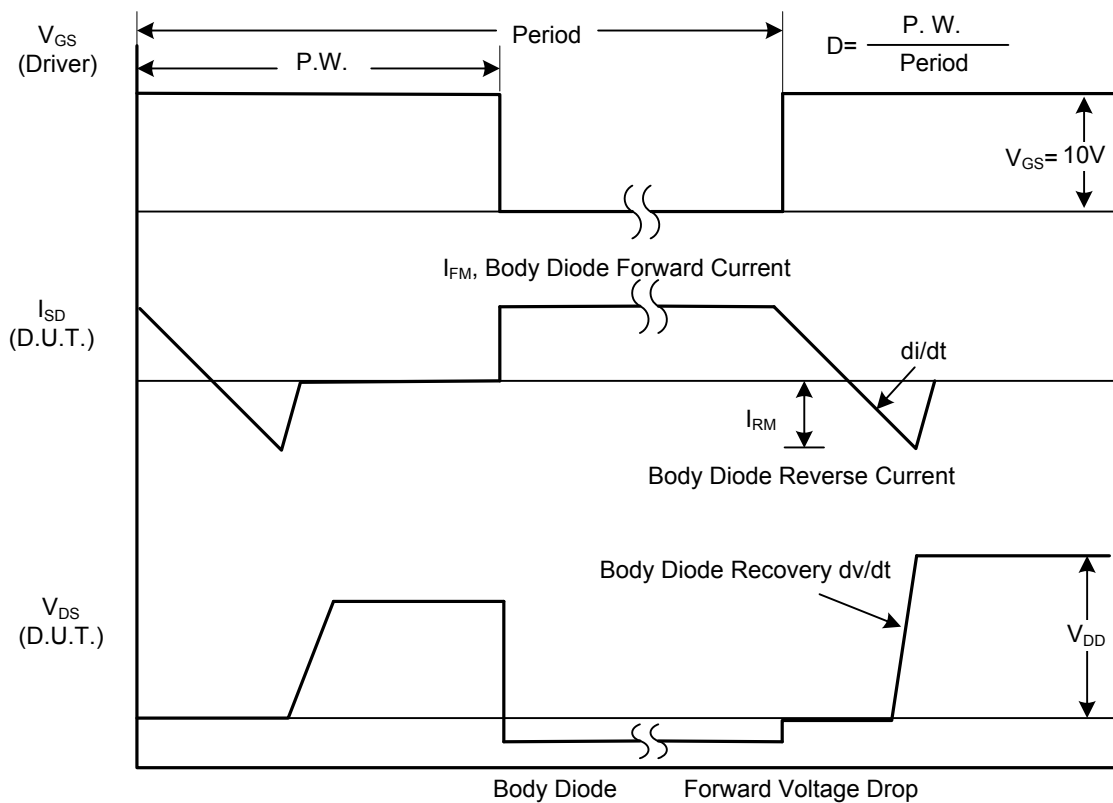
2. Essentially independent of operating temperature

3. Drain current limited by maximum junction temperature

■ TEST CIRCUITS AND WAVEFORMS

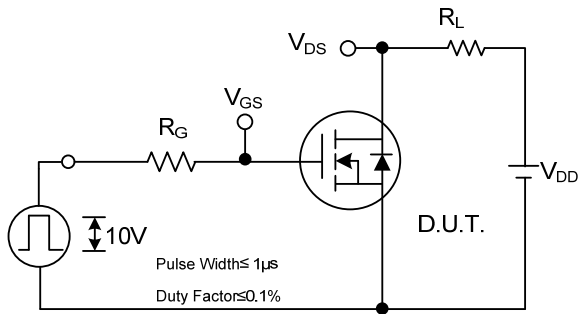


Peak Diode Recovery  $dv/dt$  Test Circuit

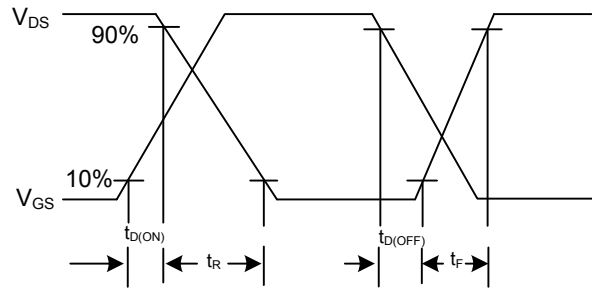


Peak Diode Recovery  $dv/dt$  Waveforms

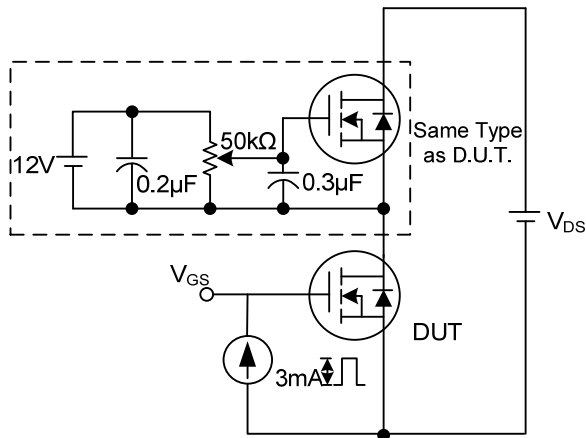
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



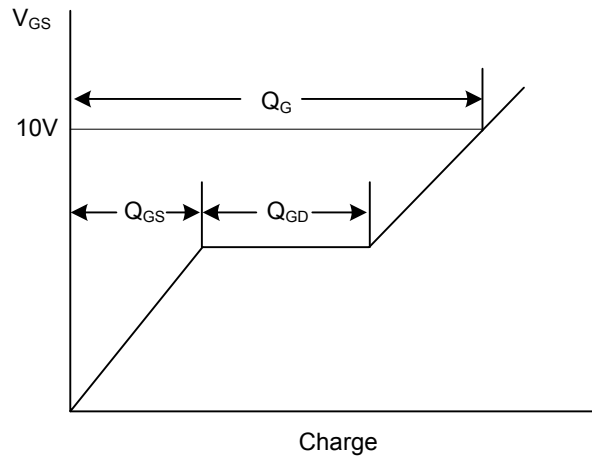
Switching Test Circuit



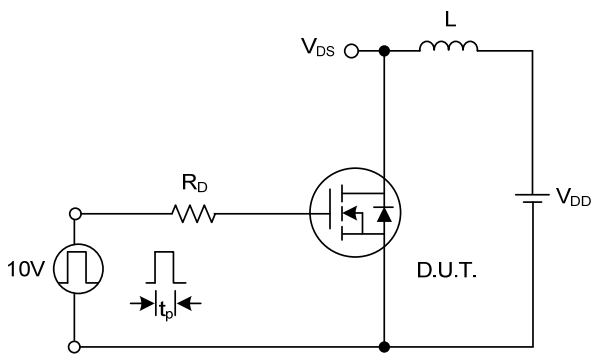
Switching Waveforms



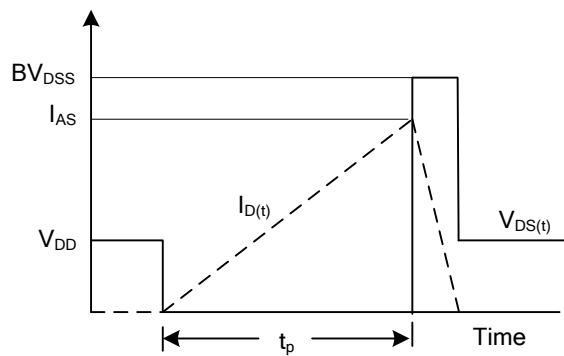
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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