



# 15N60

*Power MOSFET*

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

### DESCRIPTION

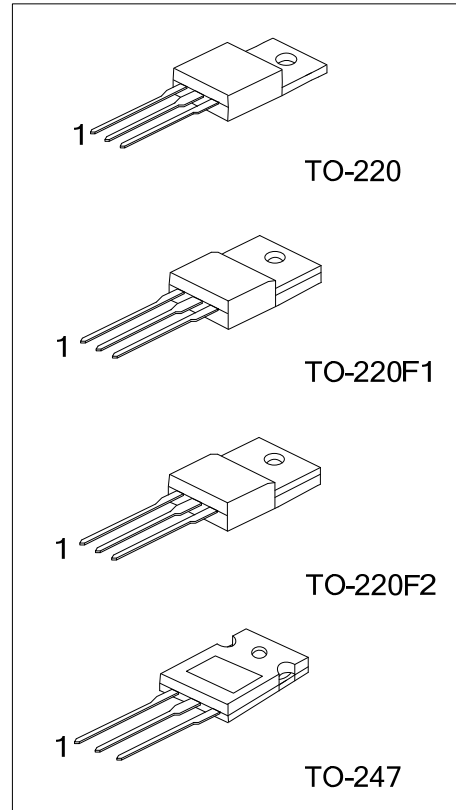
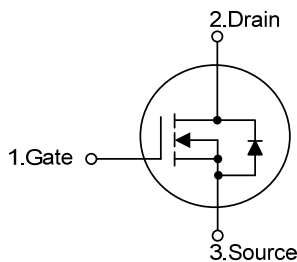
The UTC **15N60** is an N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the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

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

### FEATURES

- \*  $R_{DS(ON)} < 0.65\Omega @ V_{GS}=10V, I_D=7.5A$
- \* High switching speed
- \* Improved dv/dt capability

### SYMBOL



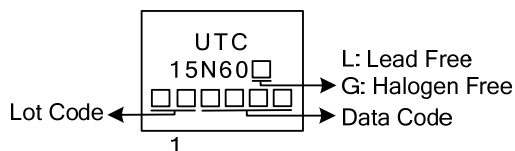
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
15N60L-TF1-T	15N60G-TF1-T	TO-220	G	D	S	Tube
15N60L-TF1-T	15N60G-TF1-T	TO-220F1	G	D	S	Tube
15N60L-TF2-T	15N60G-TF2-T	TO-220F2	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) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube</p> <p>(2) TF1: TO-220F1, TF2: TO-220F2, T47: TO-247</p> <p>(3) L: Lead Free, G: Halogen Free and 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 to Source Voltage		$V_{DSS}$	600	V
Gate to Source Voltage		$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	Continuous	$I_D$	15	A
	Pulsed (Note 2)	$I_{DM}$	60	A
Avalanche Current (Note 2)		$I_{AR}$	6.4	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	205	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.45	V/ns
Power Dissipation	TO-220	$P_D$	250	W
	TO-220F1		54	W
	TO-220F2		52	W
	TO-247		312	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.  $L=10\text{mH}$ ,  $I_{AS}=6.4\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , 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 RESISTANCES CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-220F2			
	TO-247			
Junction to Case	TO-220	$\theta_{JC}$	0.5	$^\circ\text{C}/\text{W}$
	TO-220F1		2.3	$^\circ\text{C}/\text{W}$
	TO-220F2		2.4	$^\circ\text{C}/\text{W}$
	TO-247		0.4	$^\circ\text{C}/\text{W}$

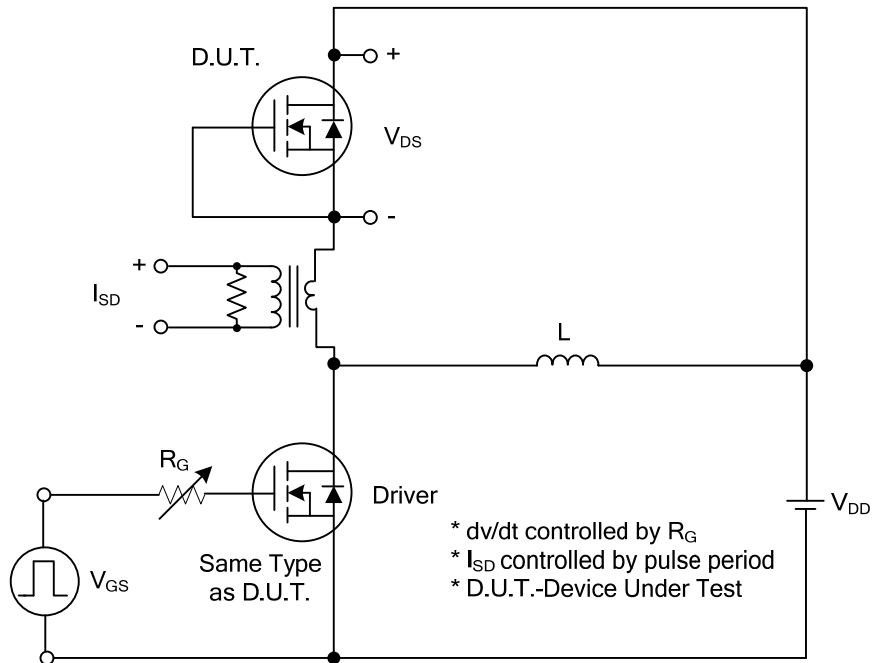
■ ELECTRICAL CHARACTERISTICS (T<sub>c</sub>=25°C, unless otherwise specified)

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	600			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V			1	μA
Gate- Source Leakage Current	Forward	I <sub>GSS</sub>			+100	nA
	Reverse				-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			0.65	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		2600		pF
Output Capacitance	C <sub>OSS</sub>			260		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			22		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =1.3A, I <sub>G</sub> = 100μA (Note 1, 2)		155		nC
Gate-Source Charge	Q <sub>GS</sub>			14		nC
Gate-Drain Charge	Q <sub>GD</sub>			28		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		105		ns
Turn-ON Rise Time	t <sub>R</sub>			115		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			600		ns
Turn-OFF Fall Time	t <sub>F</sub>			120		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 (Note 1)	I <sub>SM</sub>				60	A
Drain-Source Diode Forward Voltage (Note 1)	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>	I <sub>S</sub> =15A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs (Note 1)		510		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>				8.2	

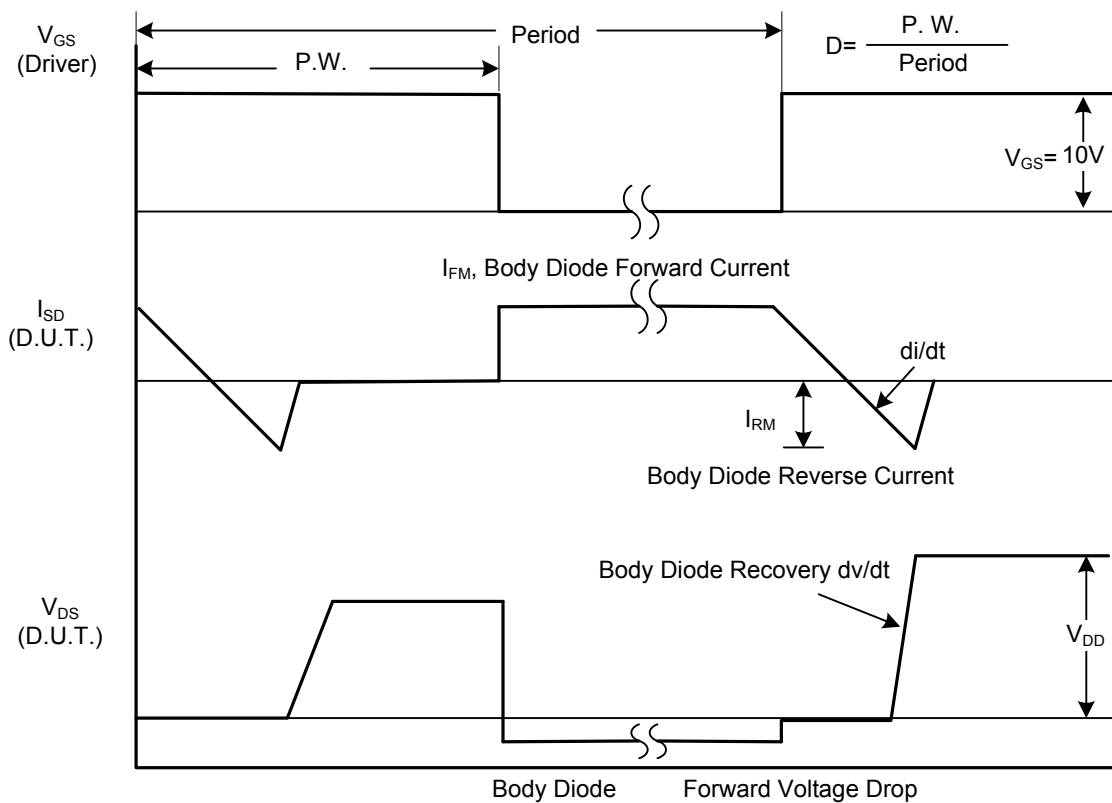
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

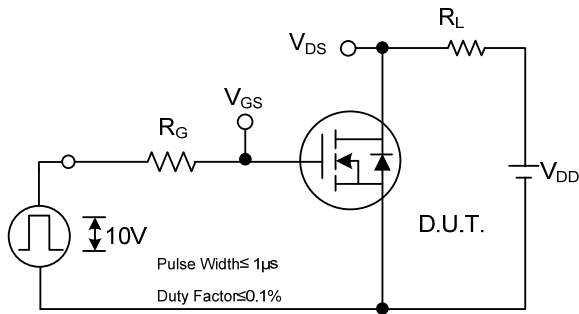


Peak Diode Recovery dv/dt Test Circuit

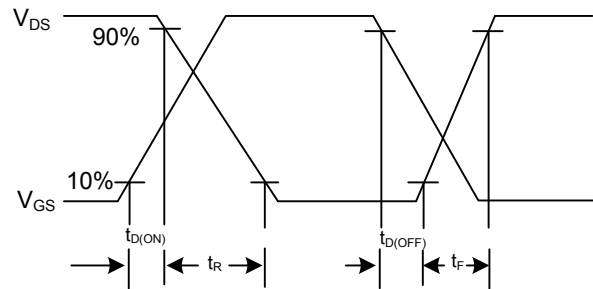


Peak Diode Recovery dv/dt Waveforms

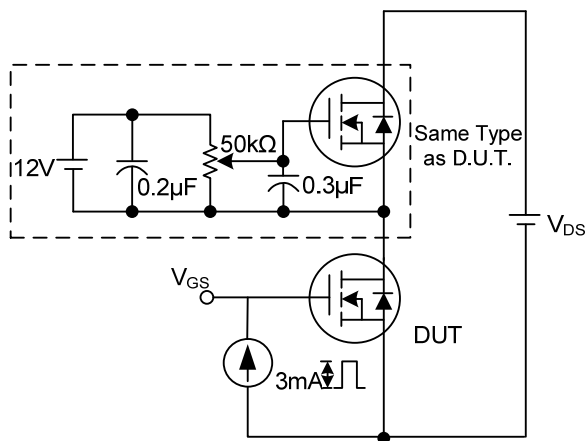
## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



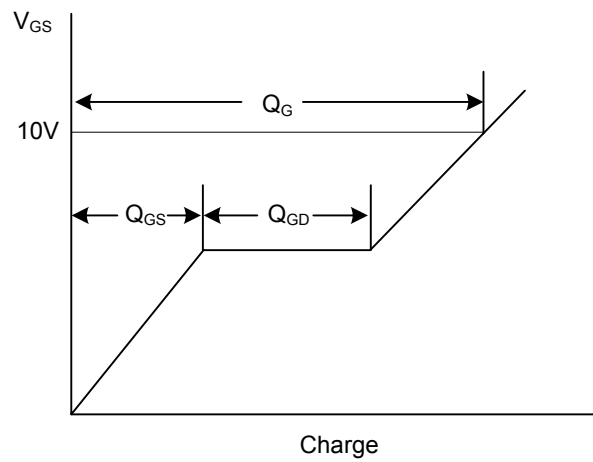
**Switching Test Circuit**



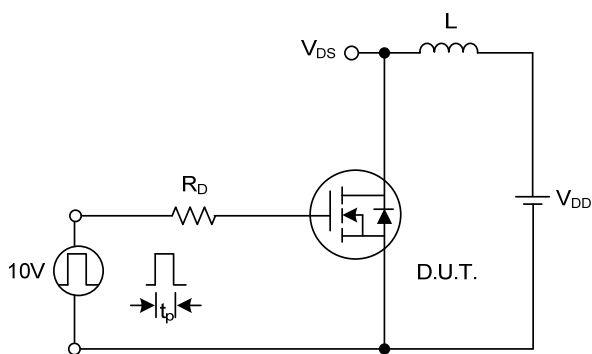
**Switching Waveforms**



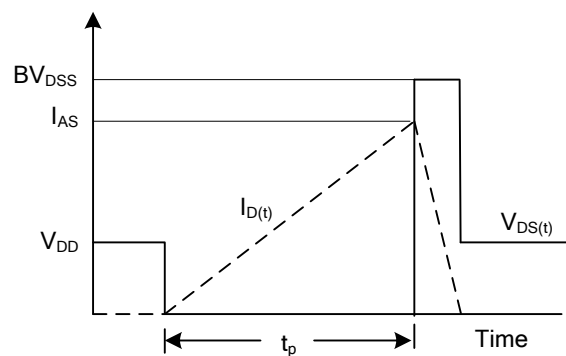
**Gate Charge Test Circuit**



**Gate Charge Waveform**

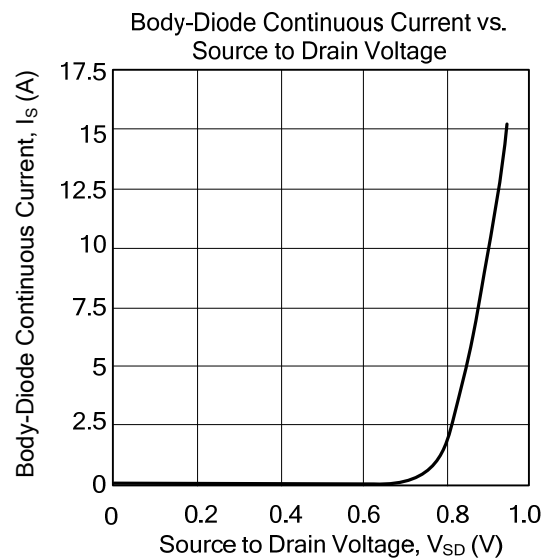
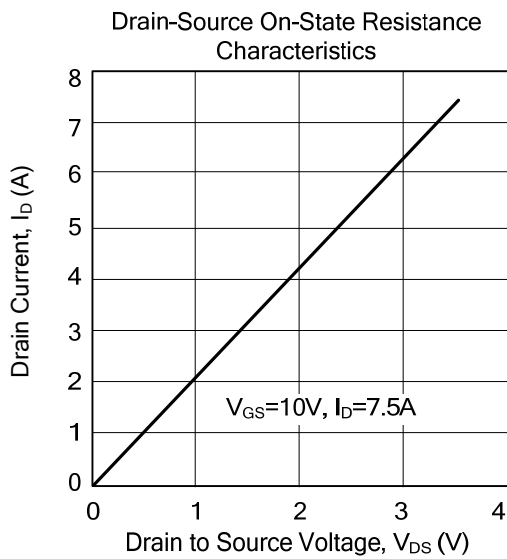
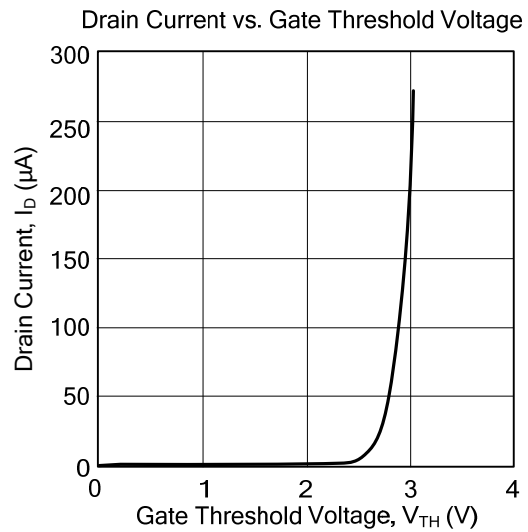
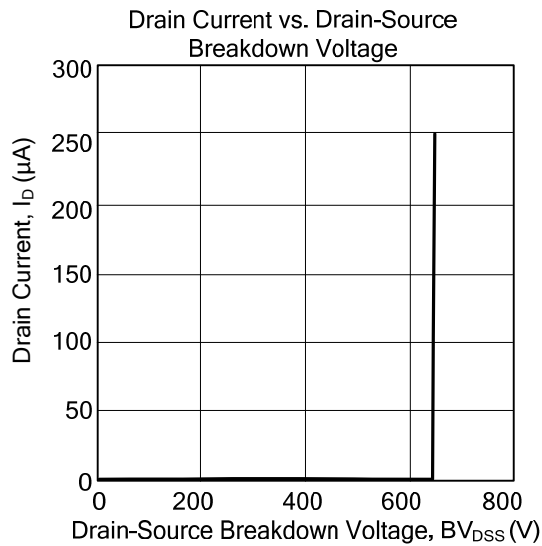


**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

■ TYPICAL CHARACTERISTICS



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