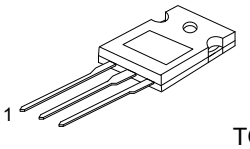
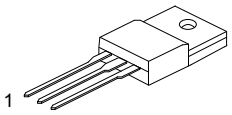
15A, 600V N-CHANNEL POWER MOSFET



TO-247



TO-220F1

■ DESCRIPTION

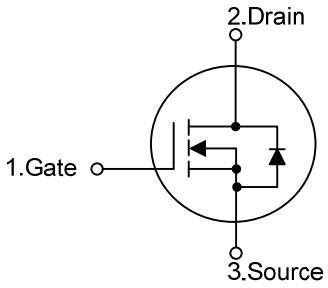
The UTC **15N60** is an N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the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

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

■ FEATURES

* $R_{DS(ON)}$=0.65Ω @ 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

15N60L -TF1 - T
(1) Packing Type
(2) Package Type
(3) Lead Free

(1) T: Tube
(2) TF1: TO-220F1, T47: TO-247
(3) G: Halogen Free, L: Lead Free

■ ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		V_{DSS}	600	V
Gate to Source Voltage		V_{GSS}	±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	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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=5.23mH, I_{AS}=15A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C
4. I_{SD} ≤15A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

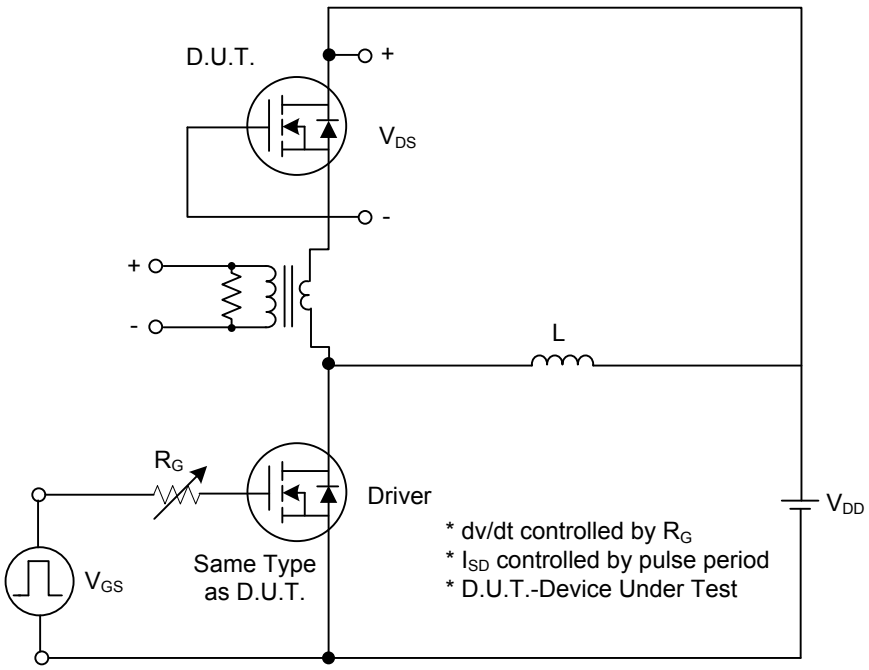
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	°C/W
	TO-247		40	
Junction to Case	TO-220F1	θ_{JC}	3.3	°C/W
	TO-247		0.4	

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

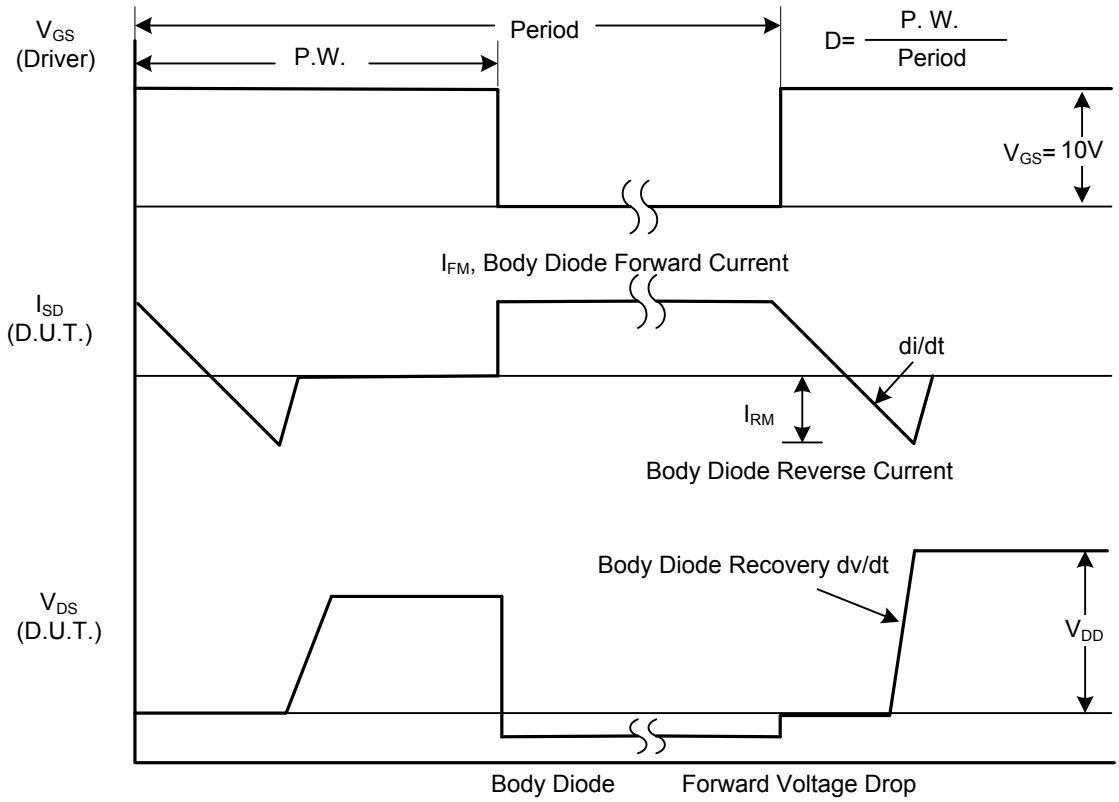
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA, T_J=25°C	600			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA,Referenced to 25°C		0.65		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=600V, V_{GS}=0V			1	μA
			V_{DS}=520V, T_C=125°C			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	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=250μA	2.0		4.0	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=7.5A		0.5	0.65	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V,f=1.0MHz		2380	3095	pF
Output Capacitance		C_{OSS}			295	385	pF
Reverse Transfer Capacitance		C_{RSS}			23.6	35.5	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q_G	V_{DS}=520V, V_{GS}=10V, I_D=15A (Note 1, 2)		48.5	63.0	nC
Gate-Source Charge		Q_{GS}			14.0		nC
Gate-Drain Charge		Q_{GD}			21.2		nC
Turn-ON Delay Time		$t_{D(ON)}$	V_{DD}=325V, I_D=15A, R_G=21.7Ω (Note 1, 2)		65	140	ns
Turn-ON Rise Time		t_R			125	260	ns
Turn-OFF Delay Time		$t_{D(OFF)}$			105	220	ns
Turn-OFF Fall Time		t_F			65	140	ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				15	A
Maximum Body-Diode Pulsed Current		I_{SM}				60	A
Drain-Source Diode Forward Voltage		V_{SD}	I_S =15A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time		t_{rr}	V_{GS}=0V, I_S=15A, dI_F/dt=100A/μs (Note 1)		496		ns
Body Diode Reverse Recovery Charge		Q_{RR}			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

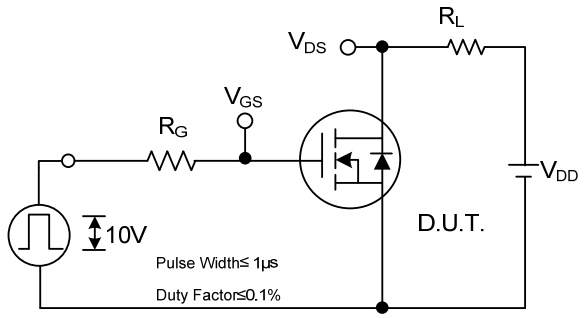


Peak Diode Recovery dv/dt Test Circuit

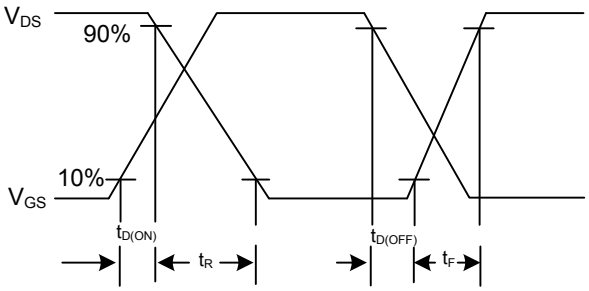


Peak Diode Recovery dv/dt Waveforms

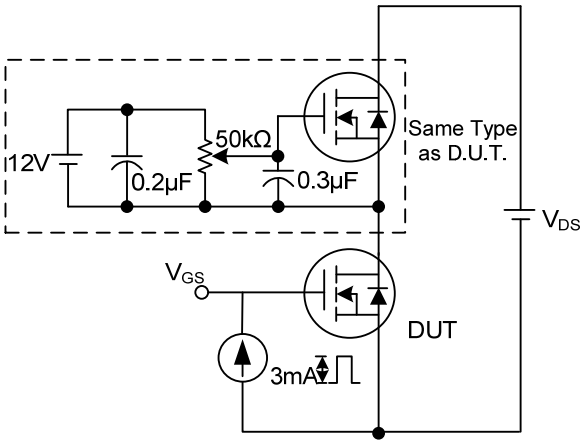
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



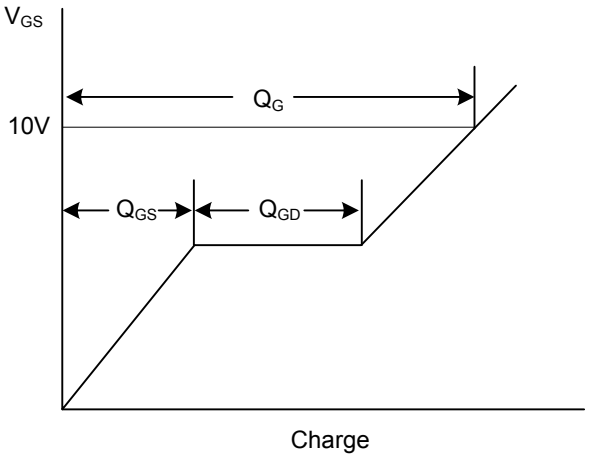
Switching Test Circuit



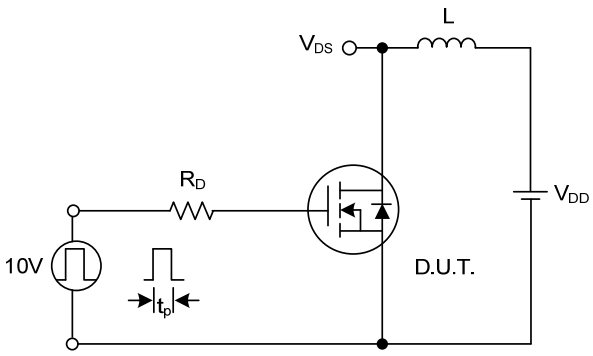
Switching Waveforms



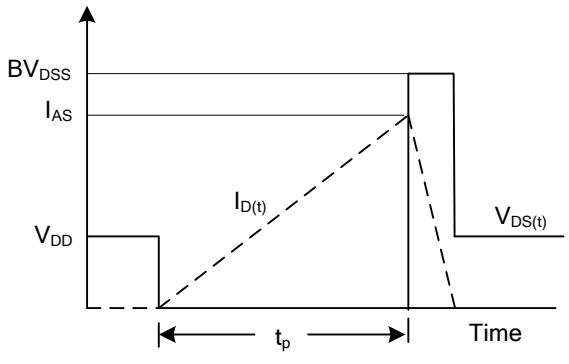
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms