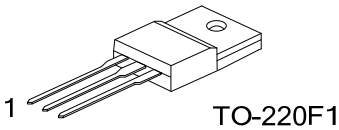
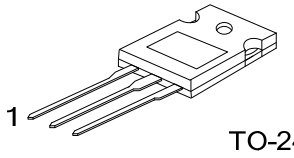
15 Amps, 650 Volts N-CHANNEL MOSFET





■ DESCRIPTION

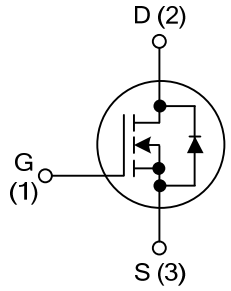
The UTC **15N65** is an N-channel mode Power FET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **15N65** is universally applied in active power factor correction and high efficient switched mode power supplies.

■ FEATURES

* 15A, 650V, $R_{DS(ON)}$=0.44Ω @ 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	
15N65L-TF1-T	15N65G-TF1-T	TO-220F1	G	D	S	Tube
15N65L-T47-T	15N65G-T47-T	TO-247	G	D	S	Tube

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

15N65L - 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}	650	V
Gate to Source Voltage		V_{GSS}	±30	V
Avalanche Current (Note 1)		I_{AR}	15	A
Continuous Drain Current	Continuous	I_D	15	A
	Pulsed (Note 1)	I_{DM}	60	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	637	mJ
	Repetitive (Note 1)	E_{AR}	25.0	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Power Dissipation	TO-220F1	P_D	37	W
	TO-247		312	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	°C/W
	TO-247		40	°C/W
Junction to Case	TO-220F1	θ_{JC}	3.3	°C/W
	TO-247		0.4	°C/W

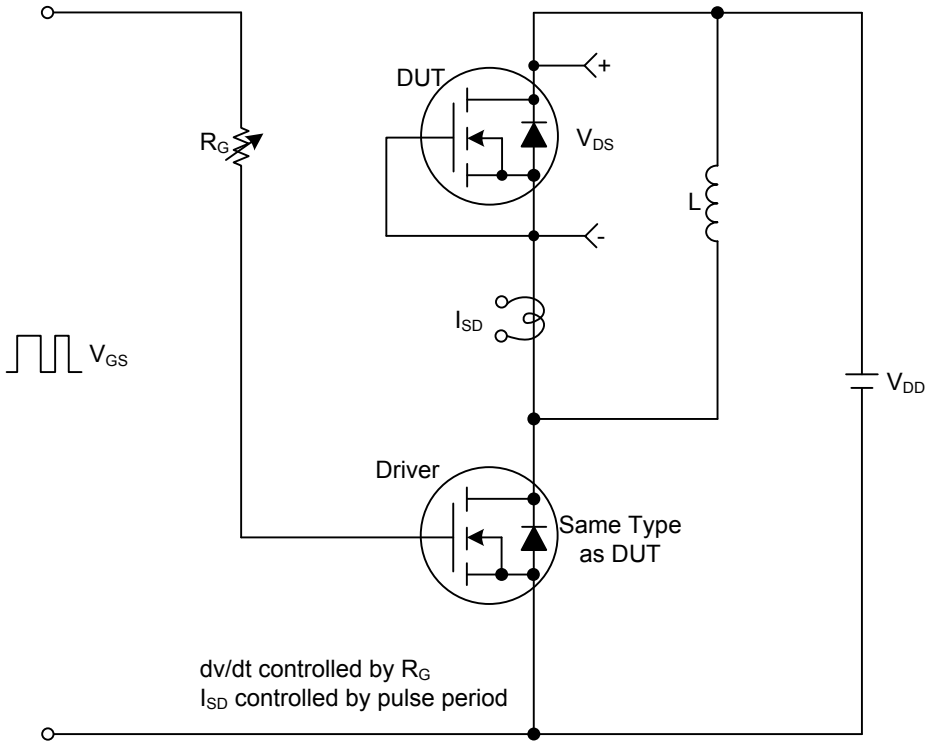
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

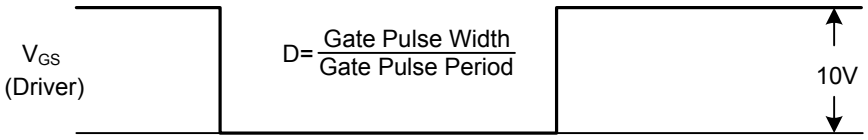
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA, T_J=25°C	650			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS}/\Delta T_J$	I_D=250μA, Referenced to 25°C		0.65		V/°C
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V, 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	3.0		5.0	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=7.5A		0.36	0.44	Ω
Forward Transconductance		g_{FS}	V_{DS}=40V, I_D=7.5A (Note 4)		19.2		S
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 4,5)		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 4,5)		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 4)		496		ns
Body Diode Reverse Recovery Charge		Q_{RR}			5.69		μC

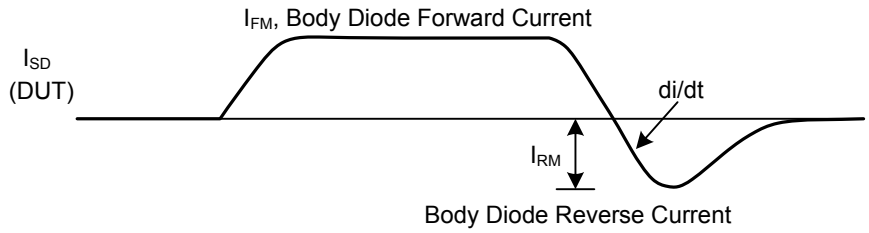
Notes : 1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=5.23mH, I_{AS}=15A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C
3. I_{SD} ≤15A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature
6. Drain current limited by maximum junction temperature

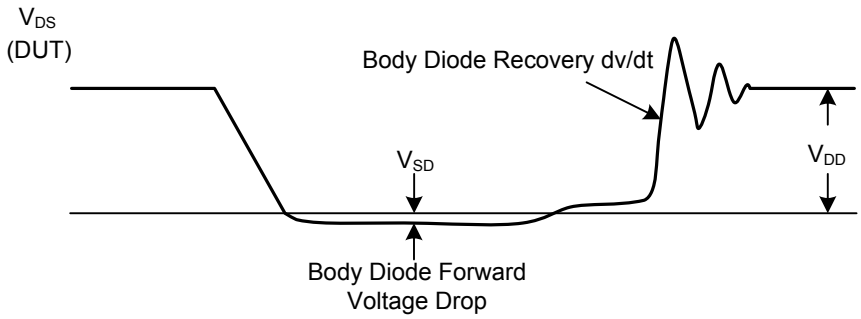
■ TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test Circuit & Waveforms

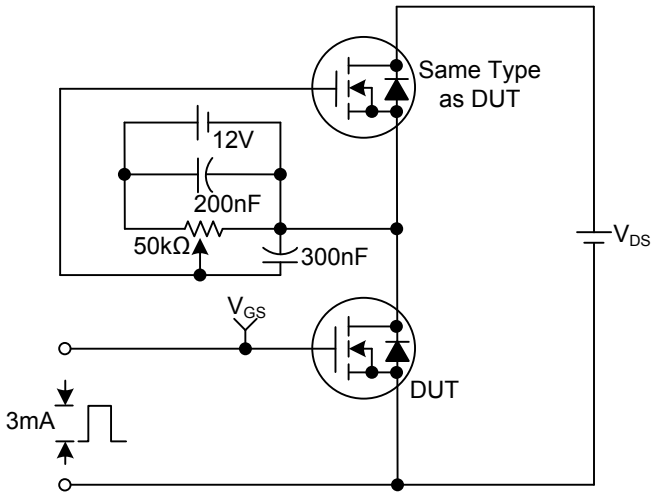




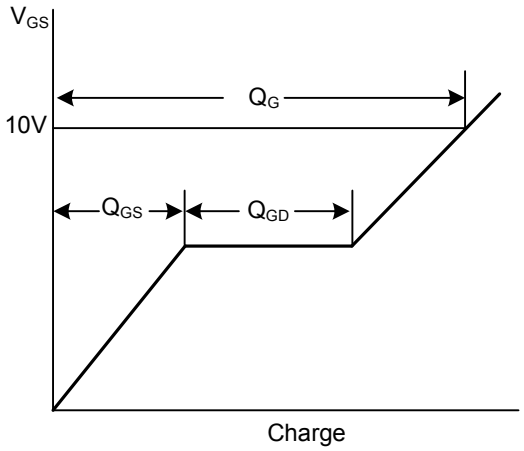




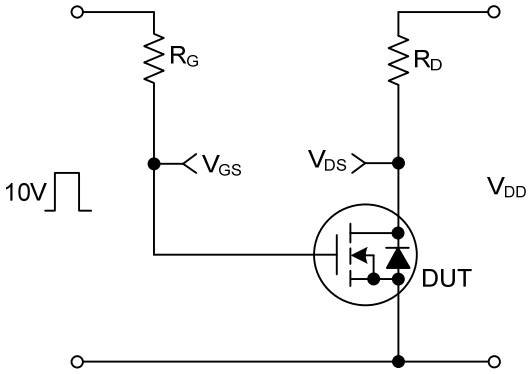
Gate Charge Test Circuit



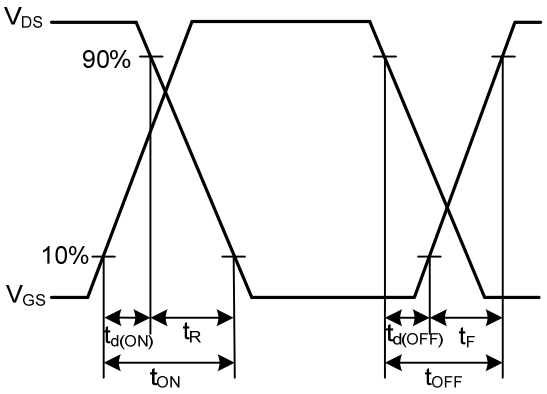
Gate Charge Waveforms



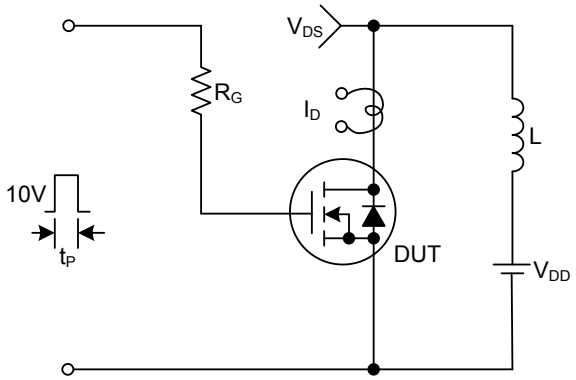
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

$$E_{AS}=\frac{1}{2}LI_{AS}^{2}\frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$