



# 10N65Z

*Power MOSFET*

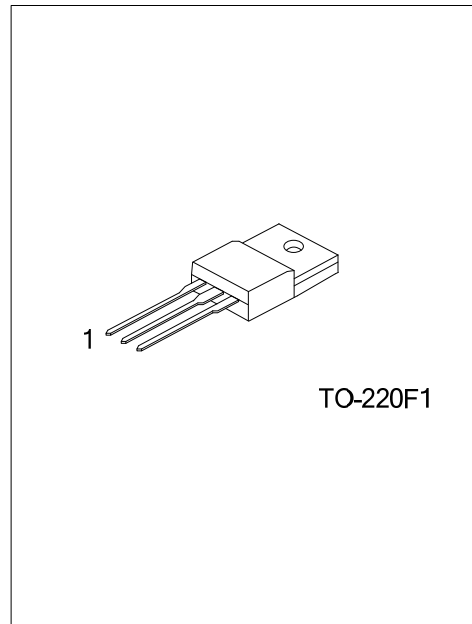
## 10A, 650V N-CHANNEL POWER MOSFET

■ DESCRIPTION

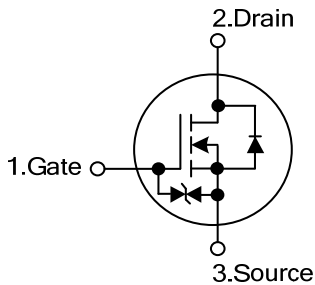
The **UTC 10N65Z** is a high voltage and high current power MOSFET, designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- \*  $R_{DS(ON)} = 0.95\Omega @ V_{GS} = 10V, I_D = 4.75A$
- \* Low gate charge ( typical 44 nC)
- \* Low Crss ( typical 18 pF)
- \* Fast switching
- \* 100% avalanche tested
- \* Improved dv/dt capability



■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10N65ZL-TF1-T	10N65ZG-TF1-T	TO-220F1	G	D	S	Tube

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

<p>10N65ZL-TF1-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Free</p>	<p>(1) T: Tube</p> <p>(2) TF1: TO-220F1</p> <p>(3) L: Lead Free, G: Halogen 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	$V_{DSS}$	650	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Avalanche Current (Note 2)	$I_{AR}$	10	A
Drain Current	Continuous	$I_D$	10
	Pulsed (Note 2)	$I_{DM}$	38
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	110
	Repetitive (Note 2)	$E_{AR}$	15.6
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation	$P_D$	50	W
Junction Temperature	$T_J$	+150	$^\circ\text{C}$
Operating Temperature	$T_{OPR}$	-55 ~ +150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

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.  $L = 14.2\text{mH}$ ,  $I_{AS} = 3.93\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\ \Omega$  Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 9.5\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	$\theta_{JC}$	2.5	$^\circ\text{C}/\text{W}$

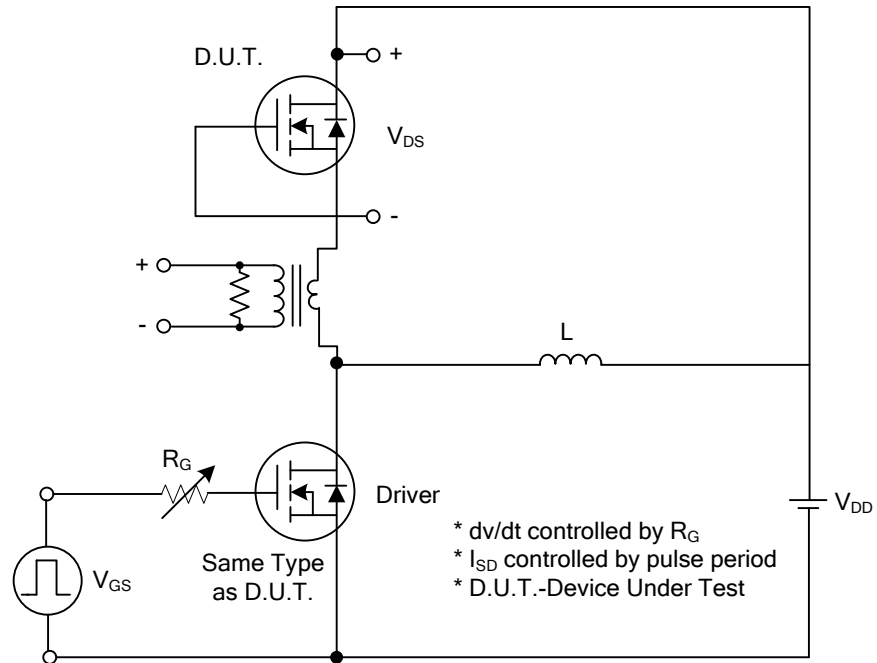
■ ELECTRICAL CHARACTERISTICS(  $T_C=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650			V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$			1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	Forward			5	$\mu A$
		Reverse			-5	$\mu A$
Breakdown Voltage Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	$I_D=250\mu A$ , Referenced to $25^\circ\text{C}$		0.7		$V/^\circ\text{C}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=4.75A$		0.87	0.95	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{ MHz}$		1300	2040	pF
Output Capacitance	$C_{OSS}$			135	215	pF
Reverse Transfer Capacitance	$C_{RSS}$			25	35	pF
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=325V, I_D=10A, R_G=25\Omega$ (Note1, 2)		70	55	ns
Turn-On Rise Time	$t_R$			145	150	ns
Turn-Off Delay Time	$t_{D(OFF)}$			280	300	ns
Turn-Off Fall Time	$t_F$			135	165	ns
Total Gate Charge	$Q_G$	$V_{DS}=520V, I_D=10A, V_{GS}=10V$ (Note1, 2)		124	140	nC
Gate-Source Charge	$Q_{GS}$			26		nC
Gate-Drain Charge	$Q_{GD}$			42		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=10A$			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				10	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				38	A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=10A,$		420		ns
Reverse Recovery Charge	$Q_{RR}$	$di/dt=100A/\mu s$ (Note1)		4.2		$\mu C$

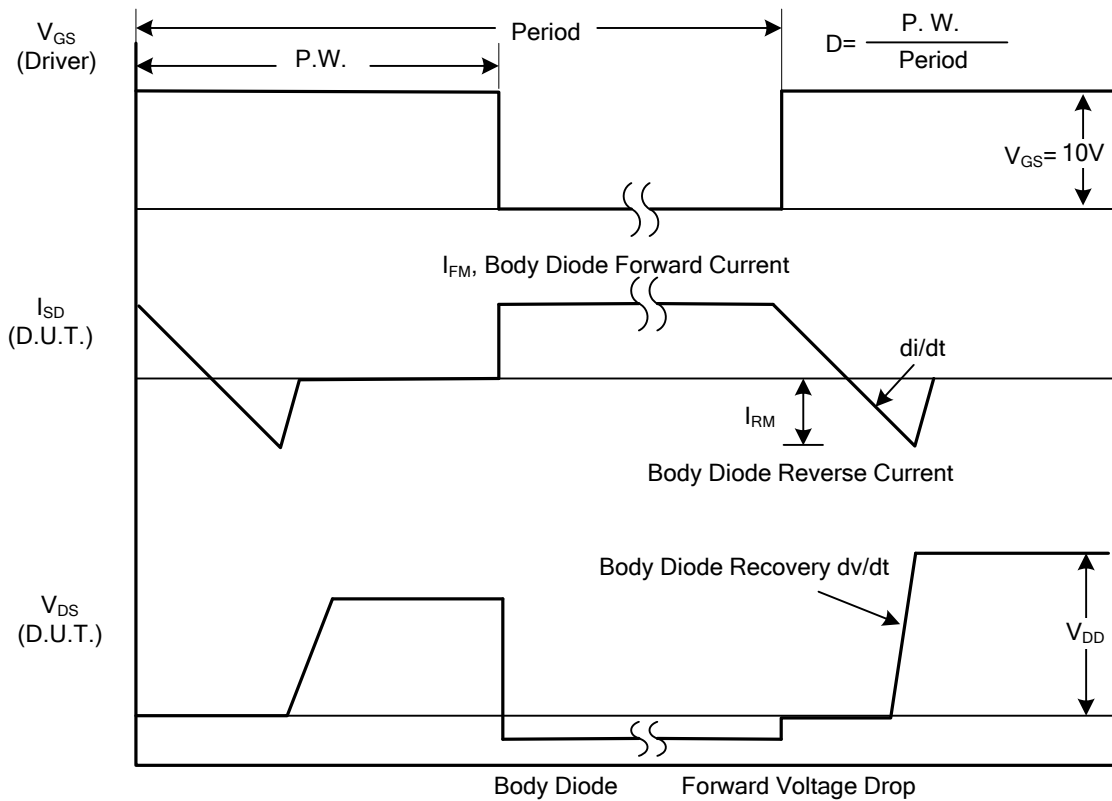
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

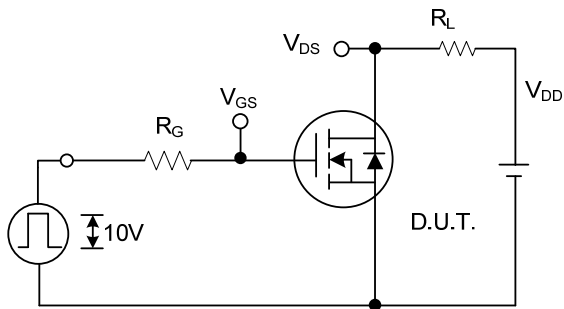


Peak Diode Recovery dv/dt Test Circuit

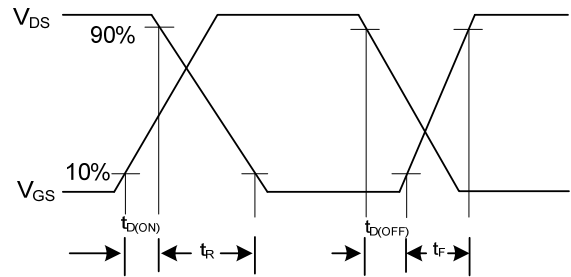


Peak Diode Recovery dv/dt Waveforms

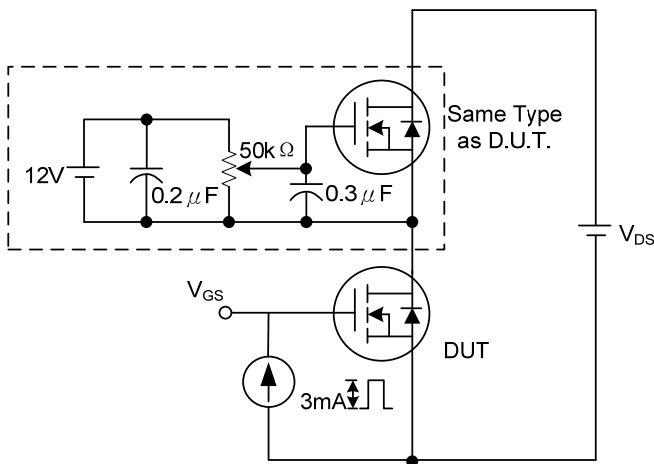
## ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



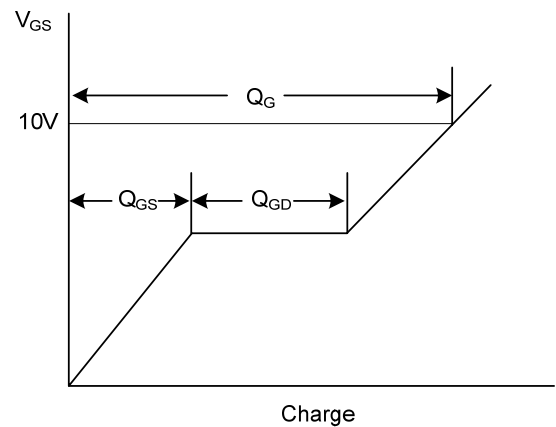
**Switching Test Circuit**



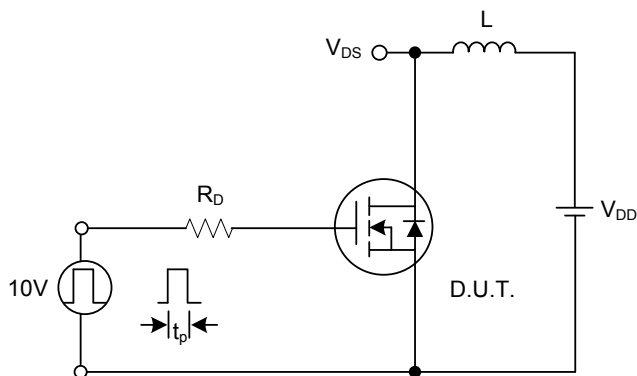
**Switching Waveforms**



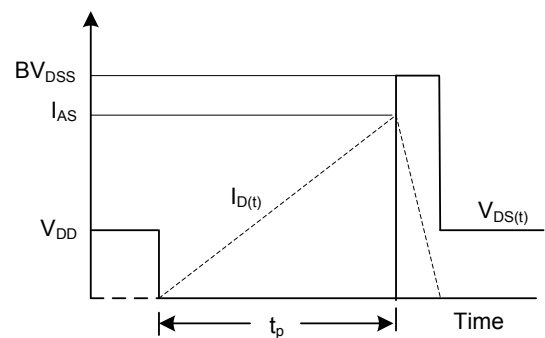
**Gate Charge Test Circuit**



**Gate Charge Waveform**



**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

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