



**9A, 650V N-CHANNEL
POWER MOSFET**

■ DESCRIPTION

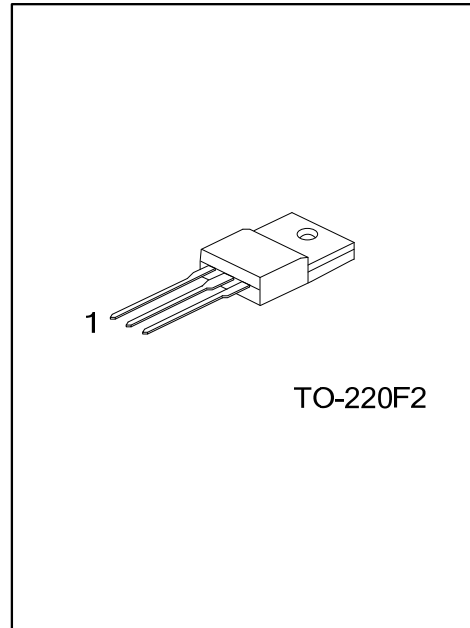
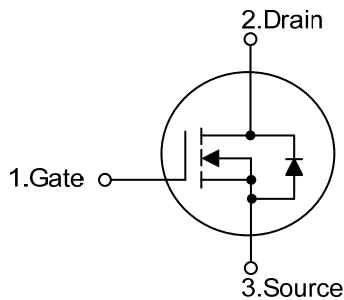
The UTC **9N65K-MT** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **9N65K-MT** is generally applied in high efficiency switch mode power supplies and uninterruptible power supplies.

■ FEATURES

- * $R_{DS(ON)} < 1.1 \Omega @ V_{GS} = 10 V, I_D = 5.1 A$
- * High Switching Speed
- * Improved dv/dt Capability
- * 100% Avalanche Tested

■ SYMBOL



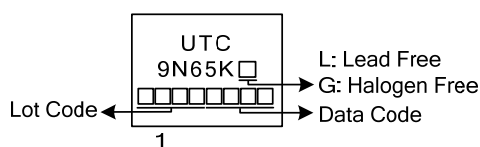
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N65K-L-TF2-T	9N65K-G-TF2-T	TO-220F2	G	D	S	Tube

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

<p>9N65KL-TF2-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube (2) TF2: TO-220F2 (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT	
Drain-Source Voltage		V_{DSS}	650	V	
Gate-Source Voltage		V_{GSS}	± 30	V	
Drain Current	Continuous, $V_{GSS}@10\text{V}$	I_D	@ $T_C=25^\circ\text{C}$	9	A
			@ $T_C=100^\circ\text{C}$	5.4	A
	Pulsed (Note 2)		I_{DM}	36	A
Avalanche Energy	Repetitive (Note 3)		E_{AS}	375	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	2.8	V/ns	
Power Dissipation		P_D	49	W	
Derate above 25°C			0.39	W/ $^\circ\text{C}$	
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 max. junction temperature.

3. $L=9.25\text{mH}$, $I_{AS}=9\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$

4. $I_{SD}\leq 5.2\text{A}$, $di/dt\leq 90\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, $T_J\leq 150^\circ\text{C}$

5. Drain current limited by maximum junction temperature

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
Junction to Case	θ_{JC}	2.54	$^\circ\text{C}/\text{W}$

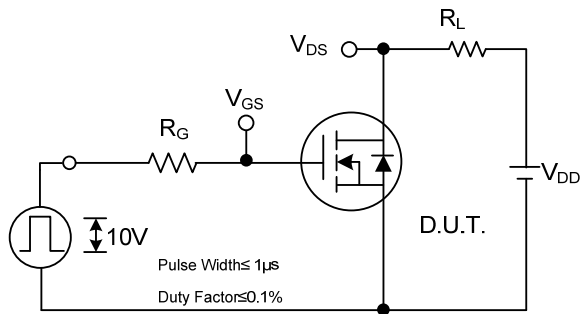
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	650			V
Breakdown Voltage Temperature Coefficient		$\Delta BV_{DSS} / \Delta T_J$	Reference to 25°C , $I_D=1\text{mA}$		0.67		$\text{V}/^\circ\text{C}$
Drain-Source Leakage Current		I_{DSS}	$V_{DS}=650\text{V}$, $V_{GS}=0\text{V}$			25	μA
			$V_{DS}=520\text{V}$, $V_{GS}=0\text{V}$, $T_J=125^\circ\text{C}$			250	
Gate- Source Leakage Current	Forward	I_{GSS}	$V_{GS}=+30\text{V}$			+100	nA
	Reverse		$V_{GS}=-30\text{V}$			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=5.1\text{A}$			1.1	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	$V_{DS}=25\text{V}$, $V_{GS}=0\text{V}$, $f=1.0\text{MHz}$		870		pF
Output Capacitance		C_{OSS}			122		pF
Reverse Transfer Capacitance		C_{RSS}			10		pF
SWITCHING PARAMETERS							
Turn-ON Delay Time		$t_{D(ON)}$	$V_{DD}=30\text{V}$, $I_D=0.5\text{A}$, $R_G=25\Omega$, $R_D=62\Omega$ (Note 1, 2)		65		ns
Rise Time		t_R			80		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			160		ns
Fall-Time		t_F			84		ns
Total Gate Charge		Q_G	$V_{DS}=50\text{V}$, $V_{GS}=10\text{V}$, $I_D=1.3\text{A}$ (Note 1, 2)		29.8		nC
Gate to Source Charge		Q_{GS}			8.6		nC
Gate to Drain ("Miller") Charge		Q_{GD}			7.3		nC
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				9	A
Maximum Body-Diode Pulsed Current (Note 1)		I_{SM}				36	A
Drain-Source Diode Forward Voltage		V_{SD}	$T_J=25^\circ\text{C}$, $I_S=9\text{A}$, $V_{GS}=0\text{V}$ (Note 2)			1.5	V

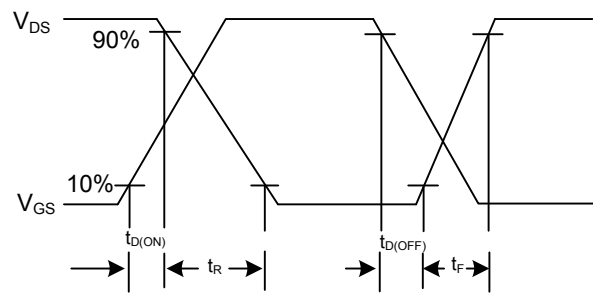
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

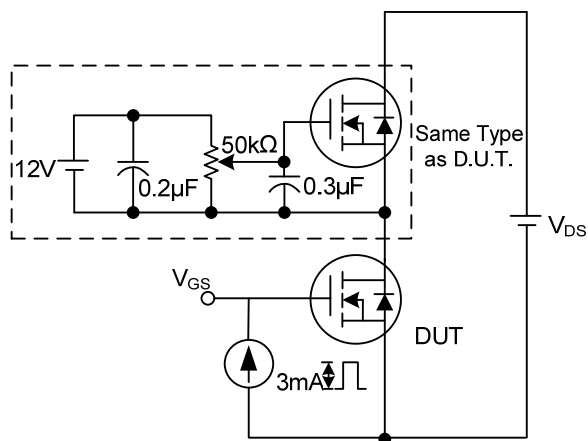
■ TEST CIRCUITS AND WAVEFORMS



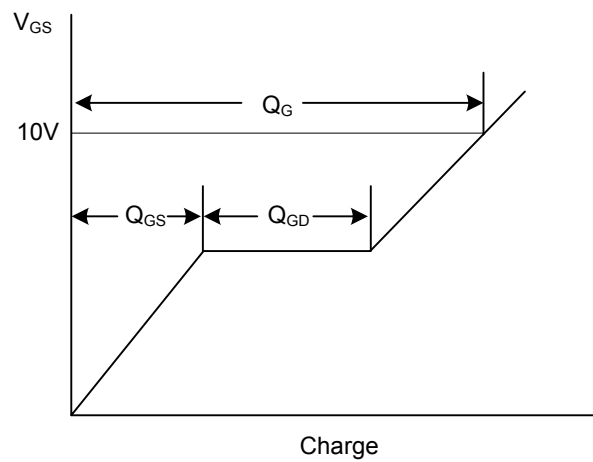
Switching Test Circuit



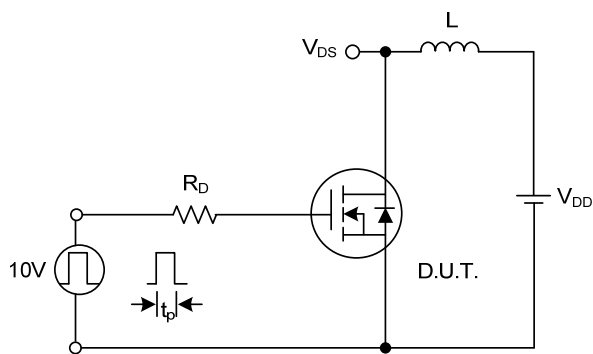
Switching Waveforms



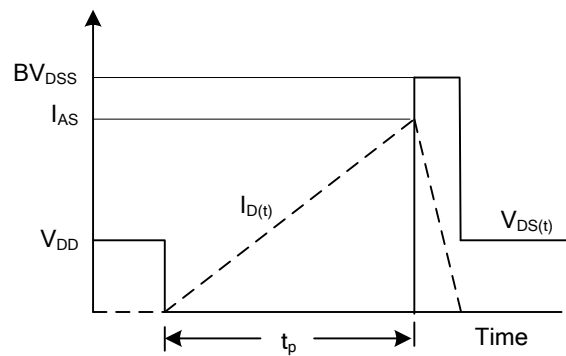
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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