

UTC UNISONIC TECHNOLOGIES CO., LTD

4N65Z-E **Power MOSFET**

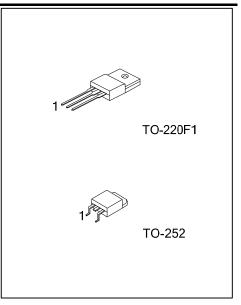
4A, 650V N-CHANNEL POWER MOSFET

DESCRIPTION

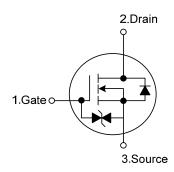
The UTC 4N65Z-E is a high voltage power MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristic. This power MOSFET is usually used in high speed switching applications including power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} = 3.1\Omega$ @ $V_{GS}=10V$, $I_{D}=2.2A$
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness



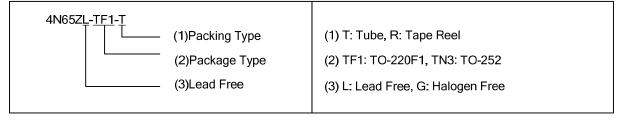
SYMBOL



ORDERING INFORMATION

Ordering Number		Dookogo	Pin Assignment			Dooking	
Lead Free	Halogen Free	Package	1	2	3	- Packing	
4N65ZL- TF1-T	4N65ZG-TF1-T	TO-220F1	G	D	S	Tube	
4N65ZL- TN3-T	4N65ZG-TN3-T	TO-252	G	D	S	Tube	
4N65ZL- TN3-R	4N65ZG-TN3-R	TO-252	G	D	S	Tape Reel	

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



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	±20	V
Avalanche Current (Note 2)		I_{AR}	4.4	Α
Drain Current	Continuous	I _D	4.0	Α
	Pulsed (Note 2)	I_{DM}	16	Α
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	200	mJ
	Repetitive (Note 2)	E_{AR}	10.6	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-220F1	0	36	W
	TO-252	P_{D}	50	W
Junction Temperature		T_J	+150	°C
Operating Temperature		T _{OPR}	-55 ~ +150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°C

Note: 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 = 30mH, I_{AS} = 4A, V_{DD} = 50V, R_{G} = 25 Ω , Starting T_{J} = 25°C
- 4. $I_{SD}\leq4.4A$, di/dt $\leq200A/\mu s$, $V_{DD}\leq BV_{DSS}$, Starting $T_{J}=25^{\circ}C$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	0	62.5	°C/W
	TO-252	θ_{JA}	83	°C/W
Junction to Case	TO-220F1	0	3.47	°C/W
	TO-252	$ heta_{ extsf{Jc}}$	2.5	°C/W

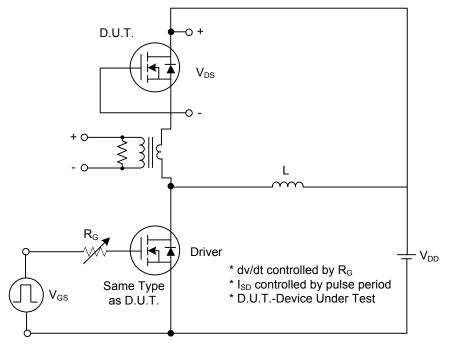
■ **ELECTRICAL CHARACTERISTICS** (T_C =25°C, unless otherwise specified)

DADAMETED		CVMDO	TEST COMPITIONS	NAINI	TVD	NANY	LINIT
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	IYP	MAX	UNII
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	650			V
Drain-Source Leakage Current		I _{DSS}	$V_{DS} = 650 \text{ V}, V_{GS} = 0 \text{ V}$			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	$V_{GS} = 20 \text{ V}, V_{DS} = 0 \text{ V}$			5	μA
	Reverse		$V_{GS} = -20 \text{ V}, V_{DS} = 0 \text{ V}$			-5	μA
Breakdown Voltage Temperature Coefficient		$\triangle BV_{DSS}/\triangle T_{J}$	I _D =250μA, Referenced to 25°C		0.6		V/°C
ON CHARACTERISTICS			,				
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 Re	esistance	R _{DS(ON)}	$V_{GS} = 10 \text{ V}, I_D = 2.2 \text{A}$		2.6	3.1	Ω
DYNAMIC CHARACTERISTICS	3						
Input Capacitance		C _{ISS}			550	650	pF
Output Capacitance		Coss	$V_{DS} = 25V, V_{GS} = 0V,$		57	77	pF
Reverse Transfer Capacitance		C _{RSS}	f = 1MHz		11	15	pF
SWITCHING CHARACTERISTI	CS						
Turn-On Delay Time		t _{D(ON)}			50	70	ns
Turn-On Rise Time		t _R	$V_{DD} = 30V, I_D = 0.5A,$		275	310	ns
Turn-Off Delay Time		t _{D(OFF)}	$R_G = 25\Omega$ (Note 1, 2)		150	180	ns
Turn-Off Fall Time		t _F			325	355	ns
Total Gate Charge		Q_G	1, 50,41 4.04		60		nC
Gate-Source Charge		Q_{GS}	V _{DS} = 50V,I _D =1.3A,		16		nC
Gate-Drain Charge		Q_{GD}	V _{GS} = 10V (Note 1, 2)		18		nC
SOURCE- DRAIN DIODE RATI	NGS AND C	HARACTERIS	TICS				
Drain-Source Diode Forward Vo	ltage	V_{SD}	V _{GS} = 0 V, I _S = 4.4A			1.4	V
Maximum Continuous Drain-Sou	urce Diode					4.4	
Forward Current		I _S				4.4	Α
Maximum Pulsed Drain-Source Diode		I _{SM}				17.0	^
Forward Current						17.6	Α
Reverse Recovery Time		t _{rr}	$V_{GS} = 0V, I_S = 4.4A,$		250		ns
Reverse Recovery Charge		Q_{RR}	dl _F /dt = 100 A/µs (Note 1)		1.5		μC
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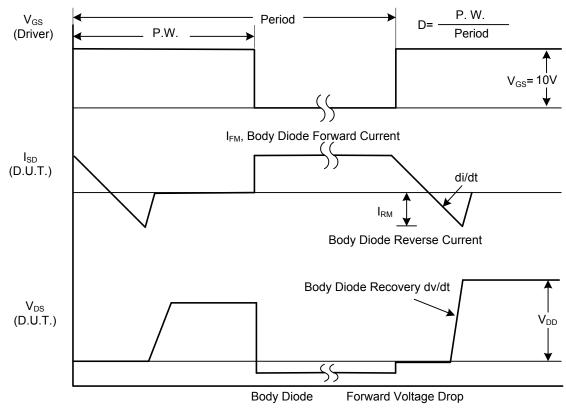
Note: 1. Pulse Test: Pulse width≤300µs, Duty cycle≤2%

^{2.} Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

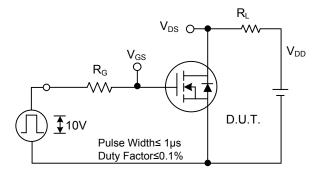


Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

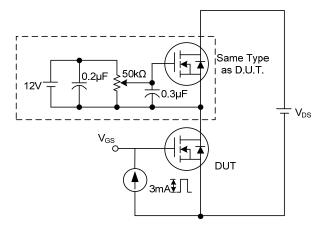


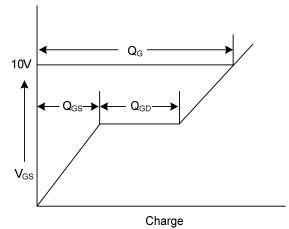
 $V_{GS} \xrightarrow{t_{D(OR)}} t_{R} \rightarrow | t_{D(OFP)} t_{F} \rightarrow |$

90%

Switching Test Circuit

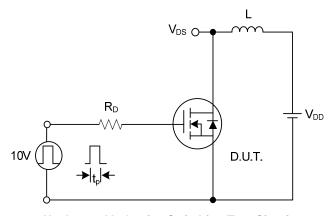
Switching Waveforms

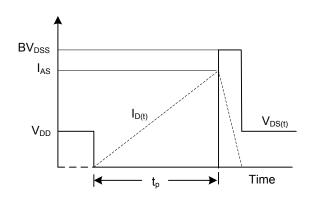




Gate Charge Test Circuit

Gate Charge Waveform





Unclamped Inductive Switching Test Circuit

Unclamped Inductive Switching Waveforms

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