



38NM65Z

Preliminary

Power MOSFET

38A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

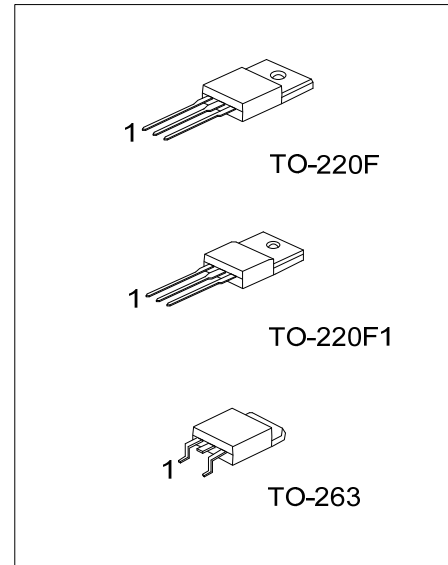
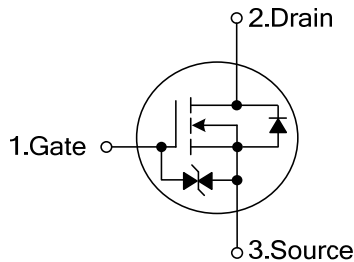
DESCRIPTION

The **UTC 38NM65Z** is a Super Junction MOSFET Structure and is 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 AC-DC converters for power applications.

FEATURES

- * $R_{DS(ON)} \leq 90 \text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=9.5\text{A}$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL



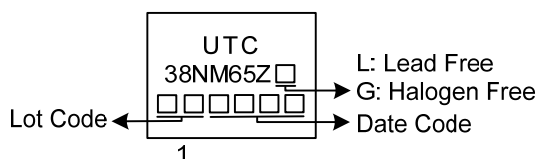
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
38NM65ZL-TF1-T	38NM65ZG-TF1-T	TO-220F1	G	D	S	Tube
38NM65ZL-TF3-T	38NM65ZG-TF3-T	TO-220F	G	D	S	Tube
38NM65ZL-TQ2-T	38NM65ZG-TQ2-T	TO-263	G	D	S	Tube
38NM65ZL-TQ2-R	38NM65ZG-TQ2-R	TO-263	G	D	S	Tape Reel

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

38NM65ZG-TF1-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF3: TO-220F, TQ2: TO-263 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



■ **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}	± 20	V
Drain Current	Continuous	I_D	38	A
	Pulsed (Note 2)	I_{DM}	152	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	1013	mJ
Peak Diode Recovery dv/dt		dv/dt	2.3	V/ns
Power Dissipation	TO-220F/TO-220F1	P_D	40	W
	TO-263		130	W
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 maximum junction temperature.

3. $L = 100\text{mH}$, $I_{AS} = 4.5\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1	θ_{JC}	3.125	$^{\circ}\text{C}/\text{W}$
	TO-263		0.96	$^{\circ}\text{C}/\text{W}$

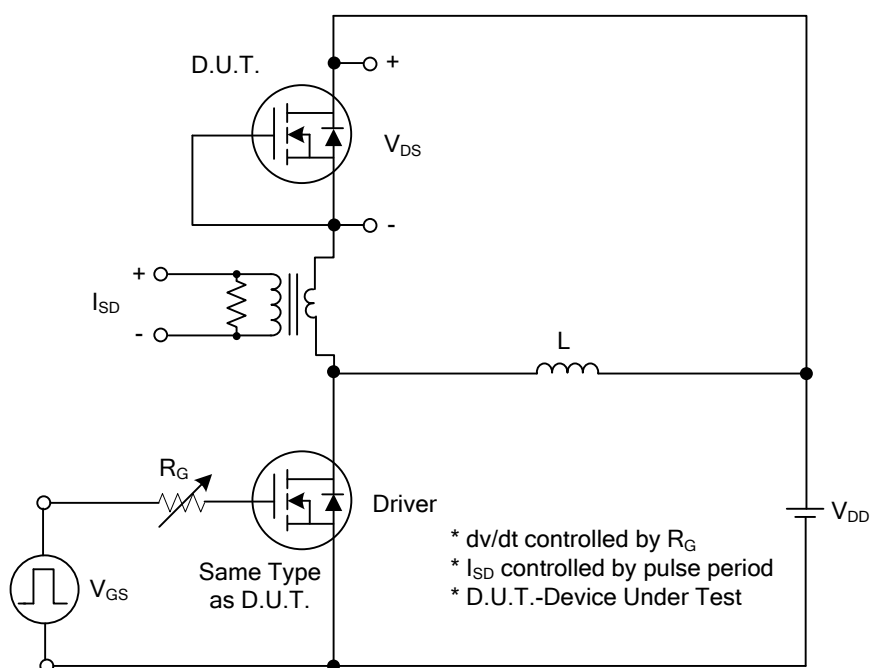
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+20V, V _{DS} =0V			+10	μA
	Reverse		V _{GS} =-20V, V _{DS} =0V			-10	μA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =9.5A			90	mΩ
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1.0MHz		2568		pF
Output Capacitance		C _{OSS}			250		pF
Reverse Transfer Capacitance		C _{RSS}			7.0		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =520V, V _{GS} =10V, I _D =38A (Note1, 2)		132		nC
Gate to Source Charge		Q _{GS}			27.5		nC
Gate to Drain Charge		Q _{GD}			58		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =38A, R _G =3Ω (Note1, 2)		15		ns
Rise Time		t _R			27		ns
Turn-OFF Delay Time		t _{D(OFF)}			96		ns
Fall-Time		t _F			33		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				38	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =38A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =30A, V _{GS} =0V,		430		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs (Note 1)		7.0		μC

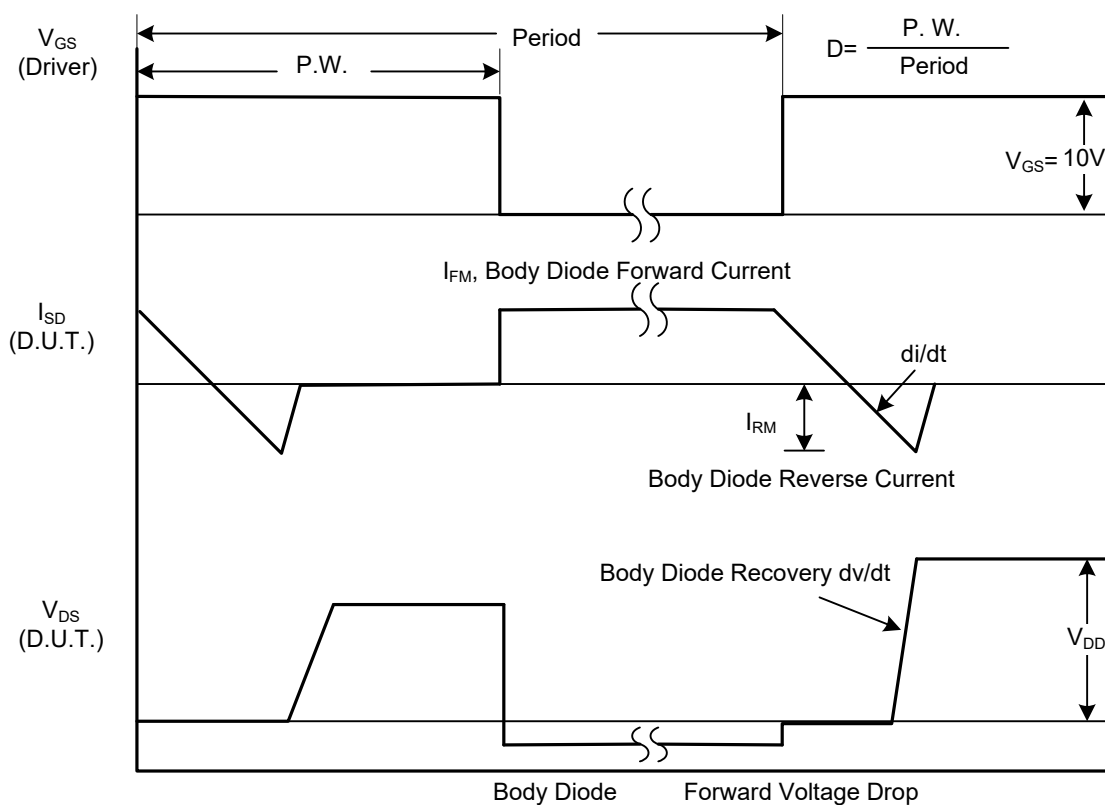
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

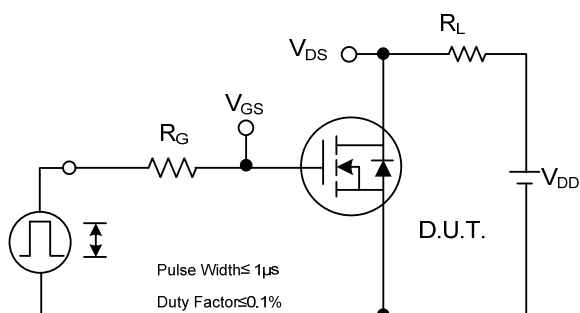


Peak Diode Recovery dv/dt Test Circuit

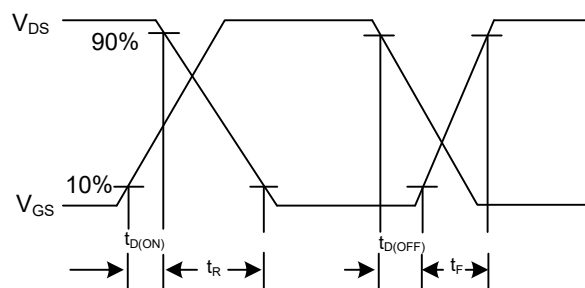


Peak Diode Recovery dv/dt Waveforms

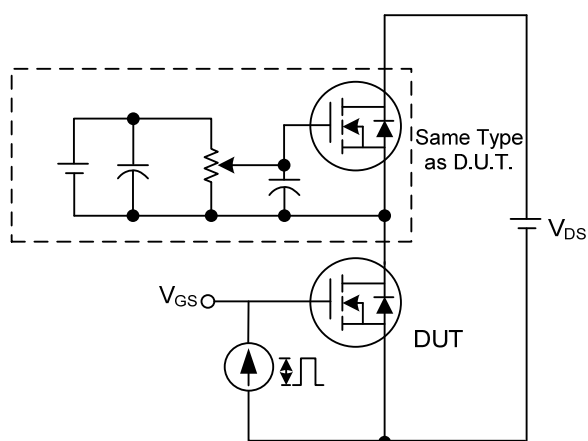
■ TEST CIRCUITS AND WAVEFORMS



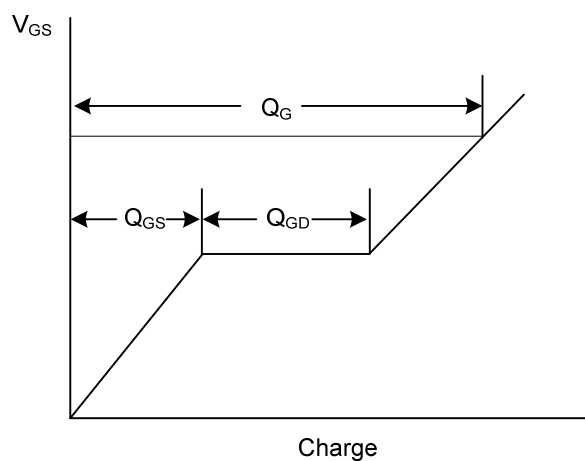
Switching Test Circuit



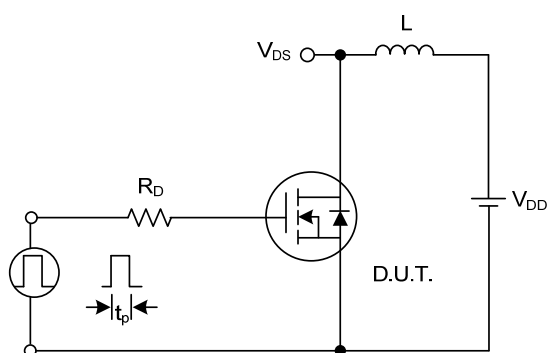
Switching Waveforms



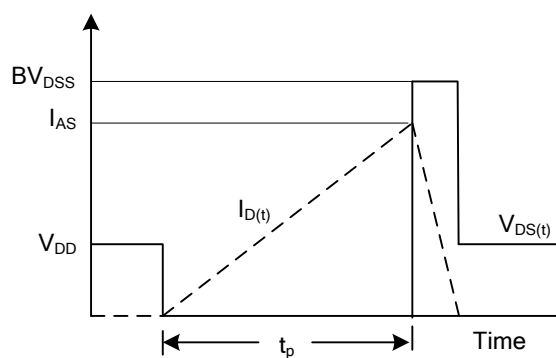
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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