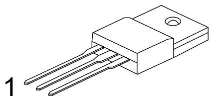
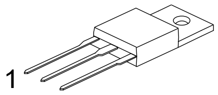
UTC **UNISONIC TECHNOLOGIES CO., LTD**

9NM65Z-U3 **Preliminary** ***Power MOSFET***

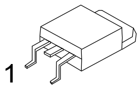
9.0A, 650V N-CHANNEL SUPER-JUNCTION MOSFET



TO-220F1



TO-220WF



TO-252

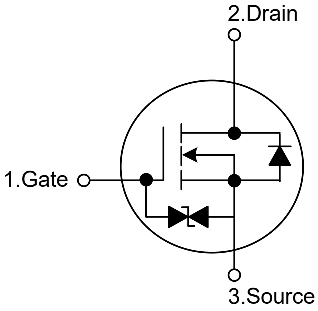
■ DESCRIPTION

The **UTC 9NM65Z-U3** 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

* $R_{DS(ON)} \leq 0.7\ \Omega$ @ V_{GS}=10V, I_D=2.5A
* Fast switching capability
* Avalanche energy tested
* Improved dv/dt capability, high ruggedness
* With ESD protection

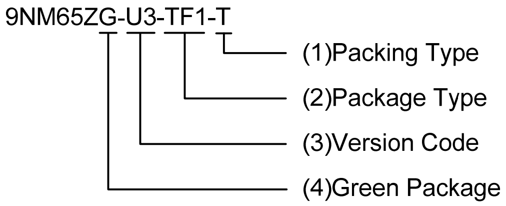
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9NM65ZL-U3-TF1-T	9NM65ZG-U3-TF1-T	TO-220F1	G	D	S	Tube
9NM65ZL-U3-TW1-T	9NM65ZG-U3-TW1-T	TO-220WF	G	D	S	Tube
9NM65ZL-U3-TN3-R	9NM65ZG-U3-TN3-R	TO-252	G	D	S	Tape Reel

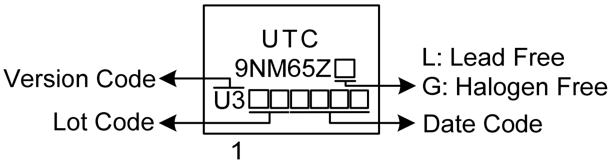
Note: Pin Assignment: G: Gate D: Drain S: Source



(1) T: Tube, R: Tape Reel
(2) TF1: TO-220F1, TW1: TO-220WF, TN3: TO-252
(3) Version U3
(4) G: Halogen Free and Lead Free, L: Lead Free

■ QW-R205-A50.a

MARKING


UTC
9NM65Z□
U3□□□□□□
Version Code
Lot Code
L: Lead Free
G: Halogen Free
Date Code
1

■ 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
Drain Current	Continuous	I_D	9	A
	Pulsed (Note 2)	I_{DM}	27	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	110	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.3	V/ns
Power Dissipation	TO-220F1/TO-220WF	P_D	28	W
	TO-252		54	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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 = 100mH, I_{AS} = 1.5A, V_{DD} =50V, R_G = 25Ω Starting T_J = 25°C

4. $I_{SD} \leq 9.0A$, di/dt ≤ 200A/μs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1/TO-220WF	θ_{JA}	62.5	°C/W
	TO-252		110	°C/W
Junction to Case	TO-220F1/TO-220WF	θ_{JC}	4.46	°C/W
	TO-252		2.31 (Note)	°C/W

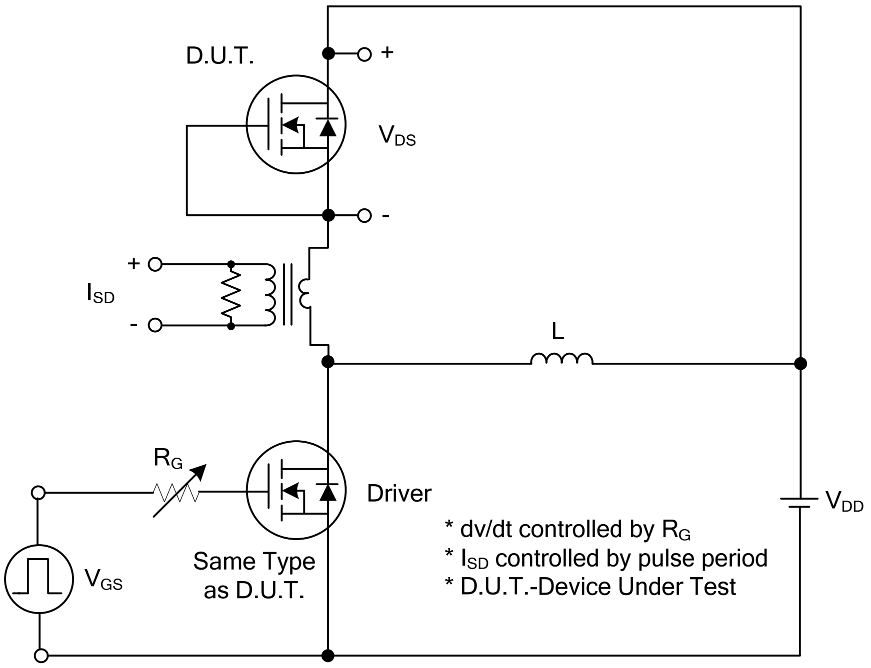
Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

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

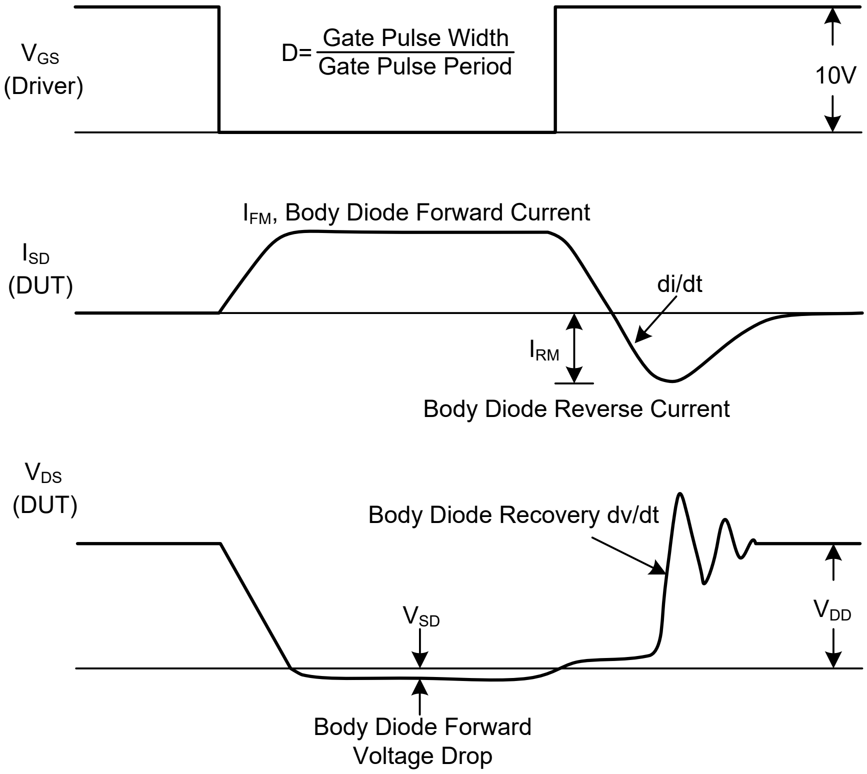
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	650			V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS}=0V			±10	μA
ON CHARACTERISTICS						
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=2.5A			0.7	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1MHz		522		pF
Output Capacitance	C_{OSS}			85		pF
Reverse Transfer Capacitance	C_{RSS}			4		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	V_{DS}=520V, V_{GS}=10V, I_D=1.0A (Note 1, 2)		22		nC
Gate-Source Charge	Q_{GS}			5.8		nC
Gate-Drain Charge	Q_{DD}			5.3		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V I_D =3.25A,R_G =25Ω (Note 1, 2)		7		ns
Turn-On Rise Time	t_R			20		ns
Turn-Off Delay Time	$t_{D(OFF)}$			50		ns
Turn-Off Fall Time	t_F			32		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				9	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	I_S=9.0A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	I_S=9.0A, V_{GS}=0V, dI_F/dt=100A/μs		220		nS
Body Diode Reverse Recovery Charge	Q_{rr}			1779		nC

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

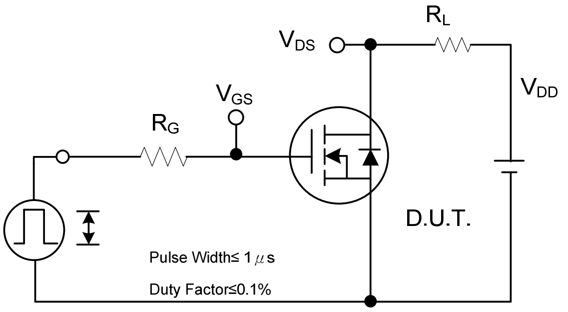


Peak Diode Recovery dv/dt Test Circuit

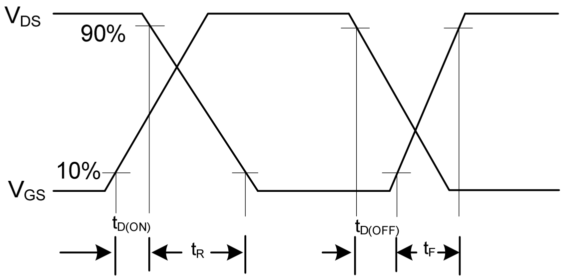


Peak Diode Recovery dv/dt Waveforms

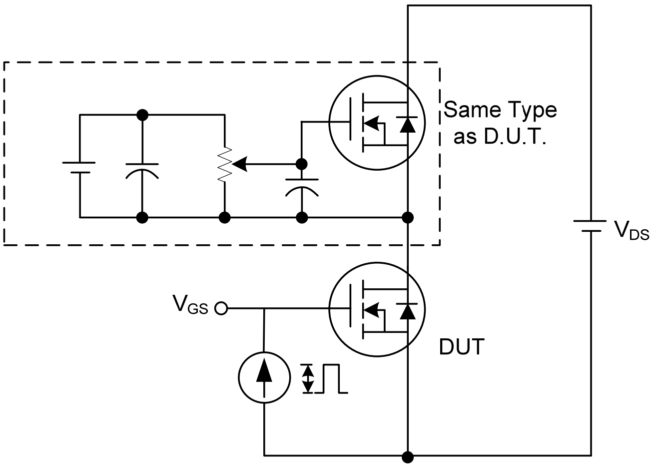
■ TEST CIRCUITS AND WAVEFORMS



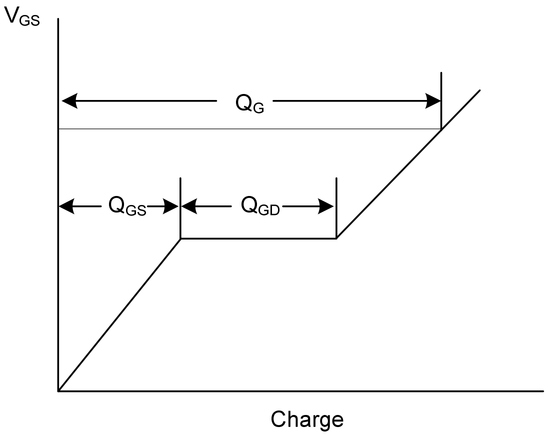
Switching Test Circuit



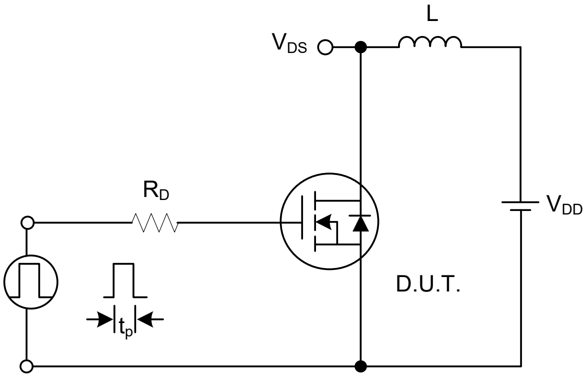
Switching Waveforms



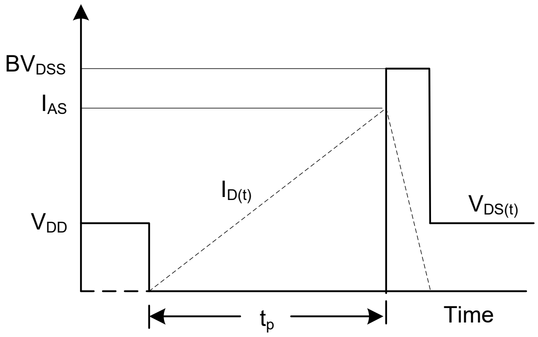
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms