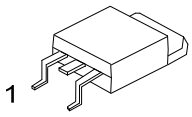
9.0A, 650V N-CHANNEL SUPER-JUNCTION MOSFET



TO-252

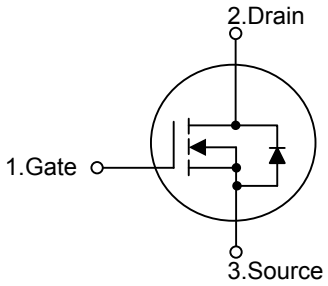
■ DESCRIPTION

The **UTC F9NM65** 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

* $R_{DS(ON)} \leq 0.58\ \Omega$ @ V_{GS}=10V, I_D=4.5A
* High switching Speed
* 100% avalanche tested
* Improved dv/dt capability

■ SYMBOL



■ ORDERING INFORMATION

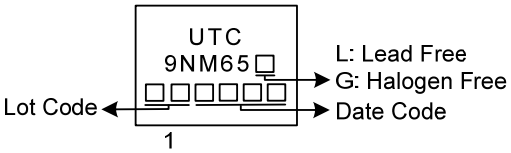
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
F9NM65L-TN3-R	F9NM65G-TN3-R	TO-252	G	D	S	Tape Reel

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

F9NM65G-TN3-R

(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) TN3: TO-252
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ 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}	±30	V
Drain Current (T_C=25°C)	Continuous	I_D	9	A
	Pulsed (Note 2)	I_{DM}	36	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	270	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.8	V/ns
Power Dissipation		P_D	62	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}=3.2A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C.
4. I_{SD} ≤ 9.0A, di/dt ≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J=25°C.

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	110	°C/W
Junction to Case	θ_{JC}	2 (Note)	°C/W

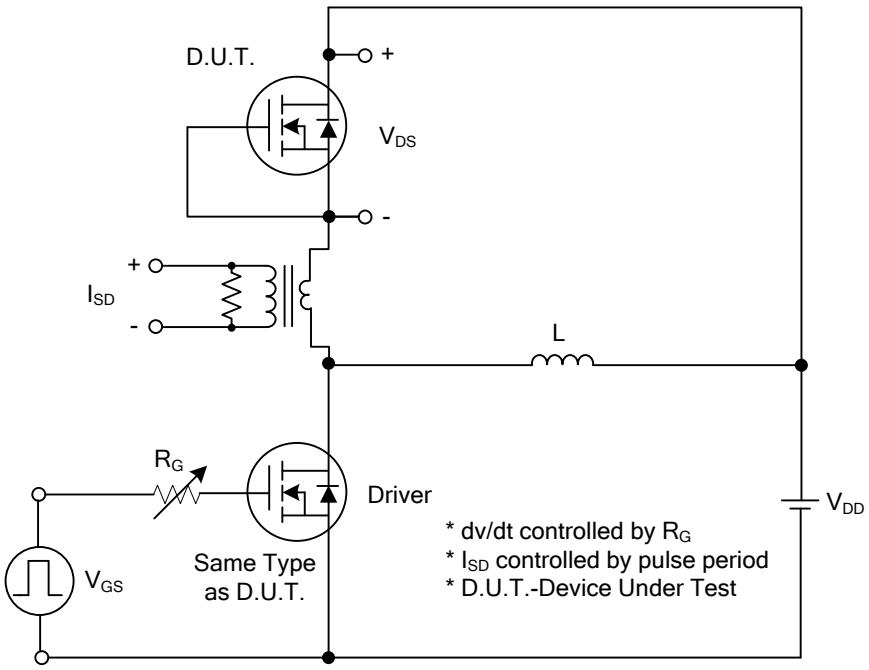
Note: The data tested by surface mounted on a 1 $inch^2$ FR-4 board with 2OZ copper.

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

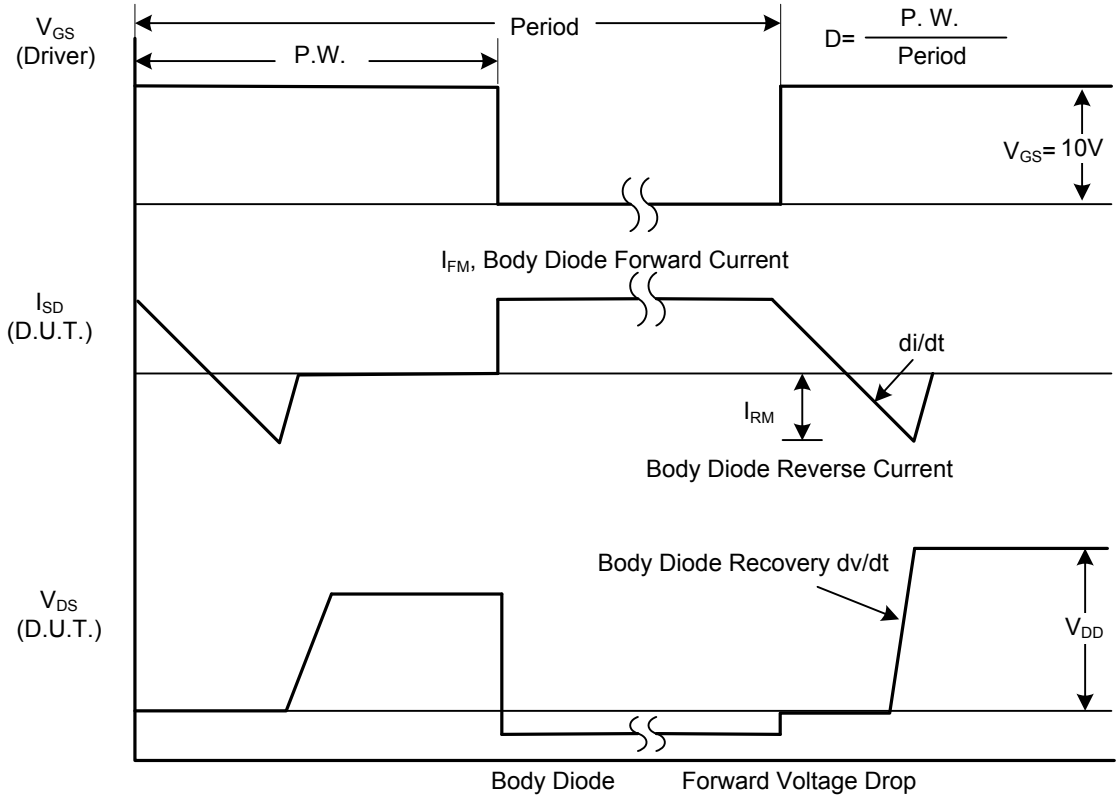
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	650			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=650V, V_{GS}=0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V			+100	nA
	Reverse		V_{GS}=-30V			-100	nA
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=4.5A			0.58	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1.0MHz		570		pF
Output Capacitance		C_{OSS}			100		pF
Reverse Transfer Capacitance		C_{RSS}			6		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 2)		Q_G	V_{DS}=520V, V_{GS}=10V, I_D=9.0A (Note 1, 2)		33		nC
Gate to Source Charge		Q_{GS}			10		nC
Gate to Drain Charge		Q_{GD}			11		nC
Turn-ON Delay Time (Note 2)		$t_{D(ON)}$	V_{DD}=100V, V_{GS}=10V, I_D=9.0A, R_G=25Ω (Note 1, 2)		8		ns
Rise Time		t_R			20		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			74		ns
Fall-Time		t_F			50		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I_S				9	A
Maximum Pulsed Drain-Source Diode Forward Current (Note 1)		I_{SM}				36	A
Drain-Source Diode Forward Voltage (Note 2)		V_{SD}	I_S=9.0A, V_{GS}=0V			1.4	V
Reverse Recovery Time		t_{rr}	I_S=9.0A, V_{GS}=0V, dI_F/dt = 100 A/μs		110		ns
Reverse Recovery Charge (Note 1)		Q_{rr}			430		nC

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

■ TEST CIRCUITS AND WAVEFORMS

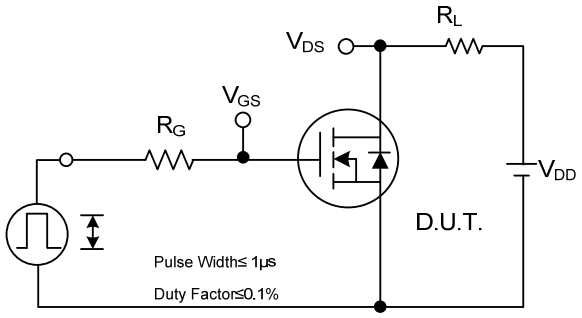


Peak Diode Recovery dv/dt Test Circuit

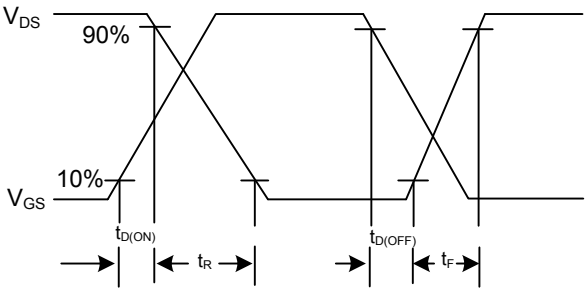


Peak Diode Recovery dv/dt Waveforms

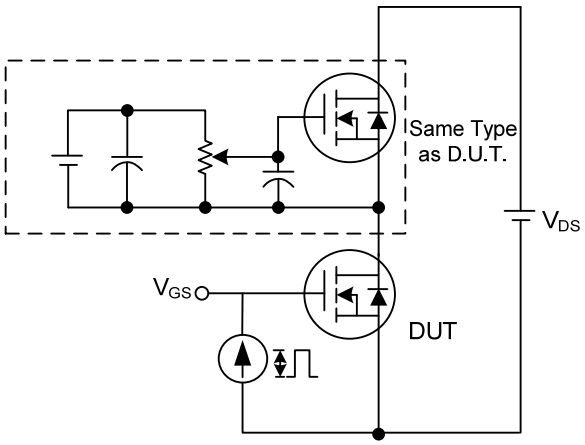
■ TEST CIRCUITS AND WAVEFORMS



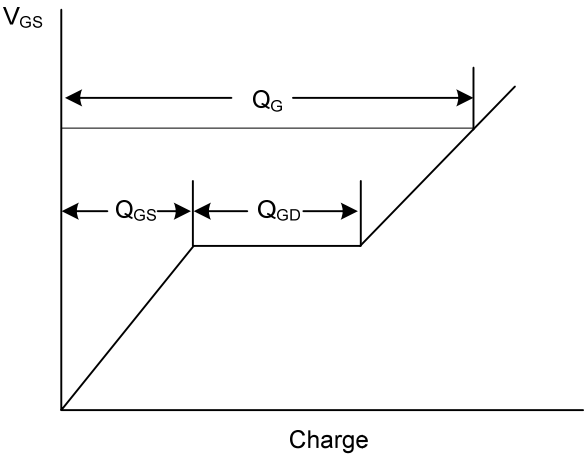
Switching Test Circuit



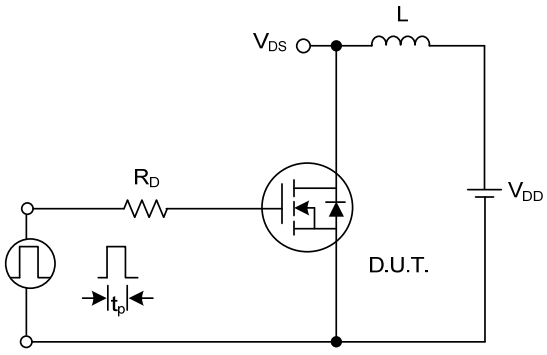
Switching Waveforms



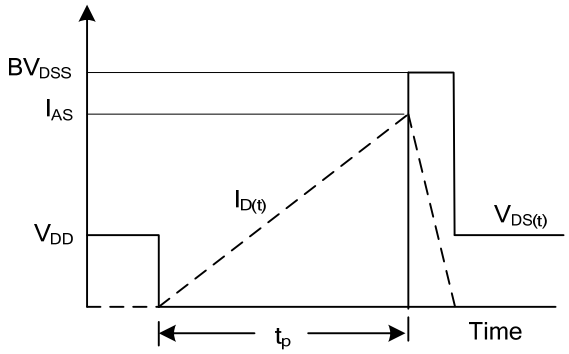
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms