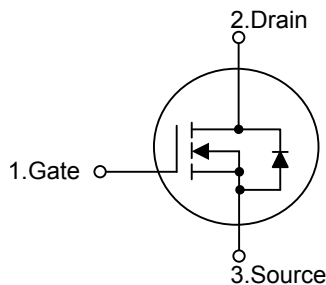


**24NM65-F****Power MOSFET****24A, 650V N-CHANNEL
SUPER-JUNCTION MOSFET****DESCRIPTION**

The UTC 24NM65-F 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 DC-DC, AC-DC converters for power applications.

FEATURES

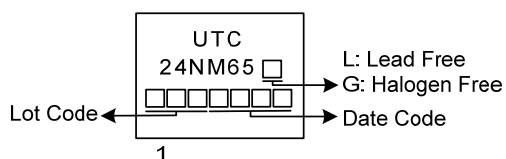
- * $R_{DS(ON)} < 0.2\Omega$ @ $V_{GS}=10V$, $I_D=10A$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
24NM65L-TF1-T	24NM65G-TF1-T	TO-220F1	G	D	S	Tube
24NM65L-T47-T	24NM65G-T47-T	TO-247	G	D	S	Tube

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

		(1) T: Tube (2) TF1: TO-220F1, T47: TO-247 (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}	± 30	V
Drain Current	Continuous	I_D	24	A
	Pulsed (Note 2)	I_{DM}	72	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	910	mJ
Peak Diode Recovery dv/dt		dv/dt	10	V/ns
Power Dissipation	TO-220F1	P_D	128	W
	TO-247		290	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. $L = 5.6 \text{ mH}$, $I_{AS} = 5.0 \text{ A}$, $V_{DD} = 100 \text{ V}$, $R_G = 25 \Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 24 \text{ A}$, $di/dt \leq 200 \text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-247		40	
Junction to Case	TO-220F1	θ_{JC}	0.98	$^{\circ}\text{C}/\text{W}$
	TO-247		0.43	

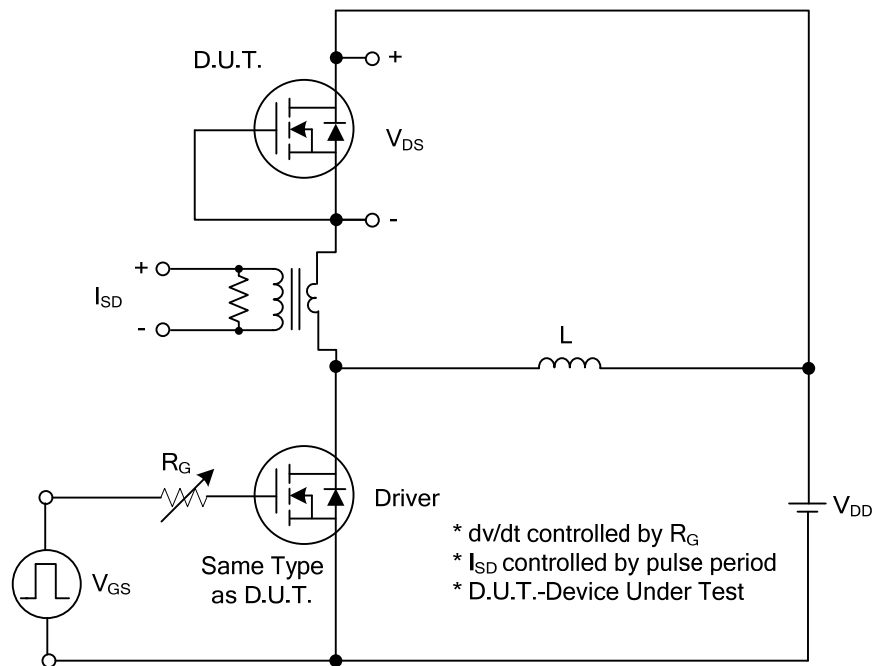
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

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			50	μA
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-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 =10A			0.2	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		2200		pF
Output Capacitance		C _{OSS}			1250		pF
Reverse Transfer Capacitance		C _{RSS}			60		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DD} =325V, V _{GS} =10V, I _D =24A I _G = 1mA (Note1, 2)		55		nC
Gate to Source Charge		Q _{GS}			12.6		nC
Gate to Drain Charge		Q _{GD}			23		nC
Turn-ON Delay Time (Note 1)		t _{D(ON)}	V _{DS} =200V, V _{GS} =10V, I _D =20A, R _G =25Ω (Note1, 2)		28		ns
Rise Time		t _R			24		ns
Turn-OFF Delay Time		t _{D(OFF)}			192		ns
Fall-Time		t _F			80		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				24	A
Maximum Body-Diode Pulsed Current		I _{SM}				72	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =24A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =24A, V _{GS} =0V,		300		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		3.4		μC

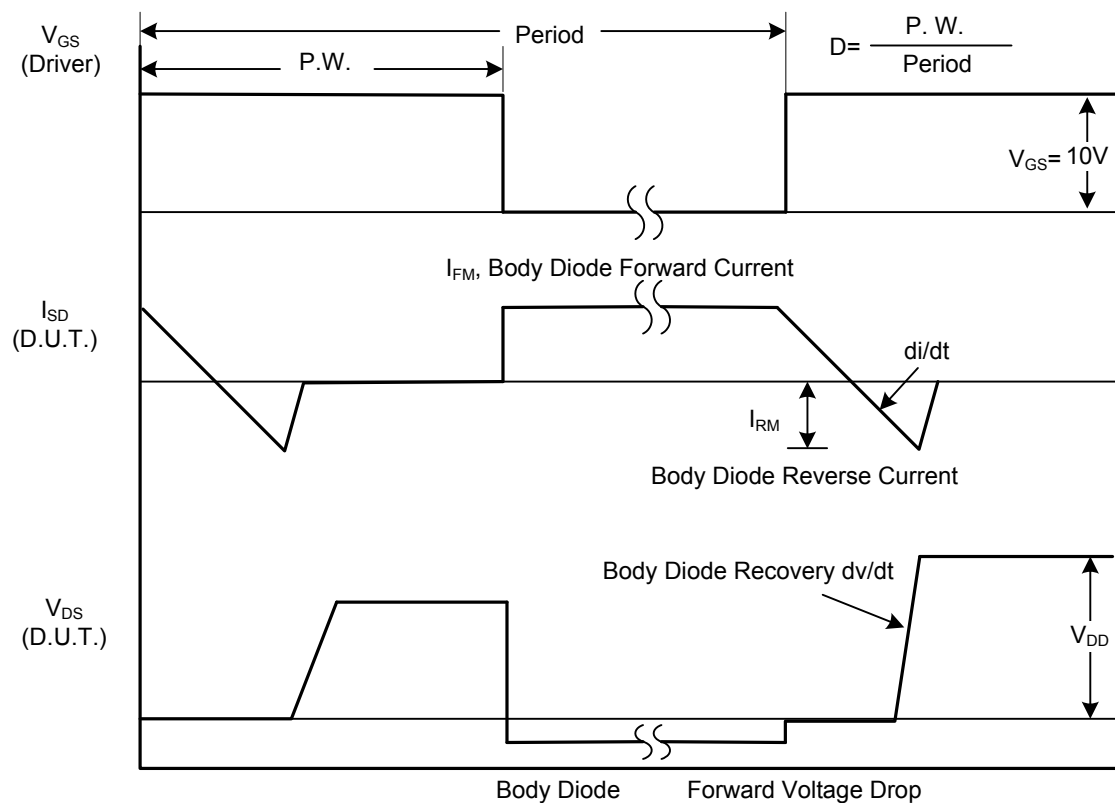
Notes: 1. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

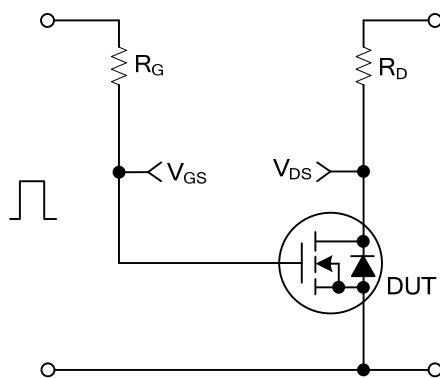


Peak Diode Recovery dv/dt Test Circuit

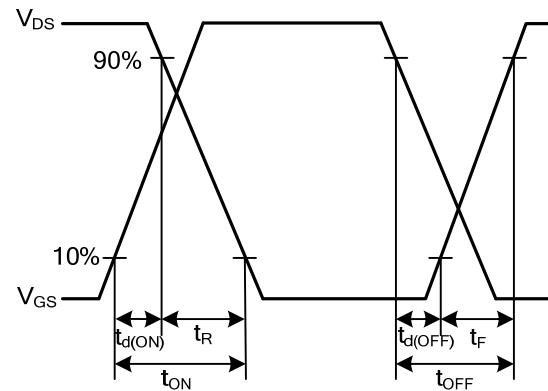


Peak Diode Recovery dv/dt Waveforms

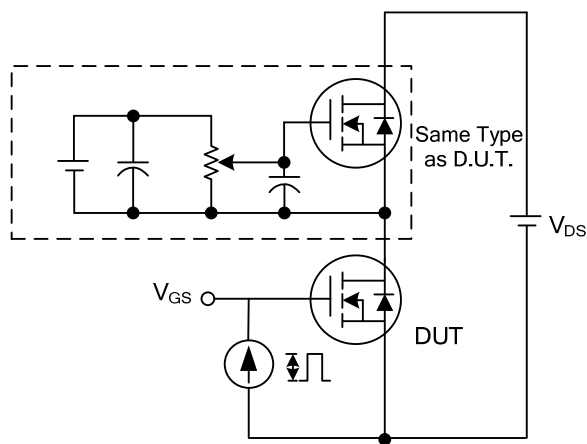
■ TEST CIRCUITS AND WAVEFORMS



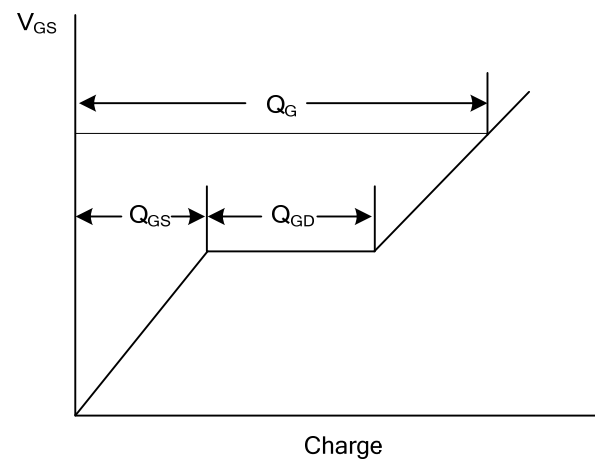
Switching Test Circuit



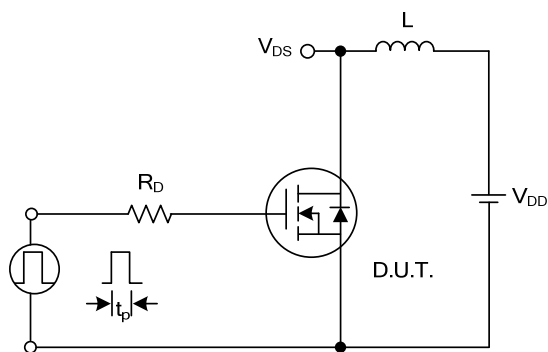
Switching Waveforms



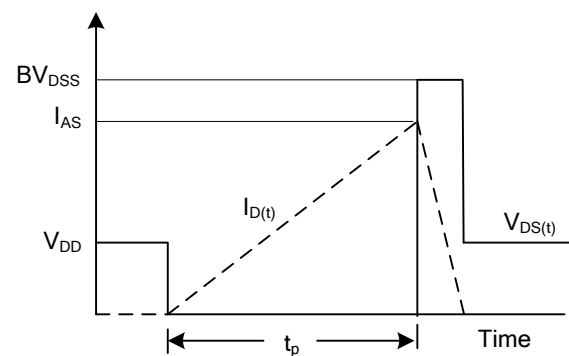
Gate Charge Test Circuit



Gate Charge Waveform

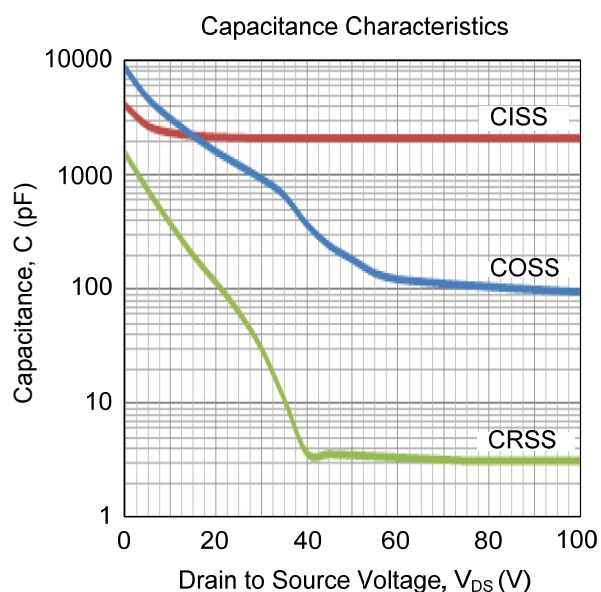


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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