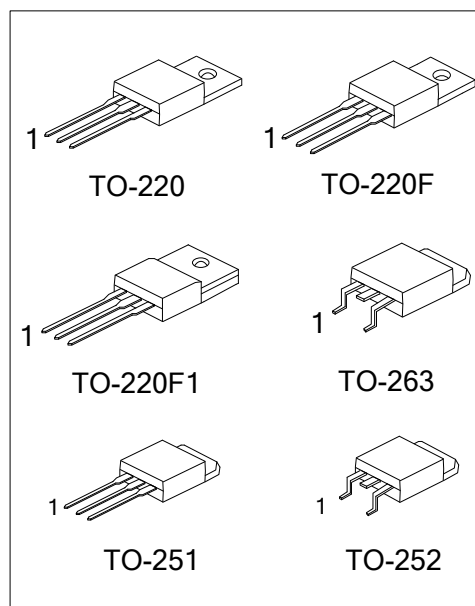
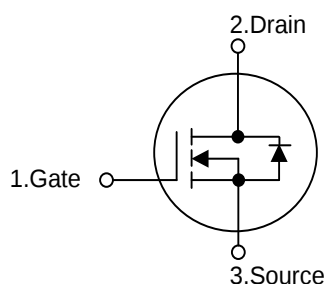


**8NM65A****Power MOSFET****8.0A, 650V N-CHANNEL
POWER MOSFET****DESCRIPTION**

The UTC **8NM65A** is a high voltage super junction MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in switching power supplies and adaptors.

FEATURES

- * $R_{DS(ON)} \leq 0.72 \Omega$ @ $V_{GS} = 10V$, $I_D = 4.0A$
- * Fast Switching Capability
- * Improved dv/dt Capability, High Ruggedness

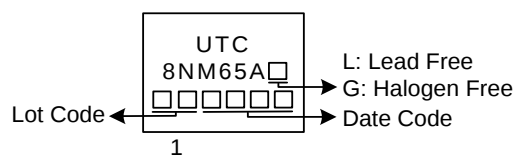
SYMBOL**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
8NM65AL-TA3-T	8NM65AG-TA3-T	TO-220	G	D	S	Tube
8NM65AL-TF1-T	8NM65AG-TF1-T	TO-220F1	G	D	S	Tube
8NM65AL-TF3-T	8NM65AG-TF3-T	TO-220F	G	D	S	Tube
8NM65AL-TM3-T	8NM65AG-TM3-T	TO-251	G	D	S	Tube
8NM65AL-TN3-R	8NM65AG-TN3-R	TO-252	G	D	S	Tape Reel
8NM65AL-TQ2-T	8NM65AG-TQ2-T	TO-263	G	D	S	Tube
8NM65AL-TQ2-R	8NM65AG-TQ2-R	TO-263	G	D	S	Tape Reel

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

	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TM3: TO-251, TN3: TO-252, 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}	± 30	V
Drain Current	Continuous	I_D	8.0	A
	Pulsed (Note 2)	I_{DM}	32	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	153.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	7.0	V/ns
Power Dissipation	TO-220/TO-263	P_D	76	W
	TO-220F/TO-220F1		28	W
	TO-251/TO-252		50	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. $L=60\text{mH}$, $I_{AS}=2.26\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 8.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/ TO-220F	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-220F1/TO-263			
	TO-251/TO-252		110	$^\circ\text{C/W}$
Junction to Case	TO-220/TO-263	θ_{JC}	1.64	$^\circ\text{C/W}$
	TO-220F/TO-220F1		4.46	$^\circ\text{C/W}$
	TO-251/TO-252		2.5	$^\circ\text{C/W}$

■ **ELECTRICAL CHARACTERISTICS** ($T_C = 25^\circ\text{C}$, 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	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 = 4.0A			0.72	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0 MHz		472		pF
Output Capacitance		C _{OSS}			279		pF
Reverse Transfer Capacitance		C _{RSS}			22		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =50V, V _{GS} =10V, I _D =1.3A, I _G =100μA (Note 1, 2)		19.8		nC
Gate to Source Charge		Q _{GS}			4.8		nC
Gate to Drain Charge		Q _{GD}			9.0		nC
Turn-on Delay Time (Note 1)		t _{D(ON)}	V _{DD} =30V, V _{GS} =10V, I _D =0.5A, R _G =25Ω (Note 1, 2)		43		ns
Rise Time		t _R			73		ns
Turn-off Delay Time		t _{D(OFF)}			166		ns
Fall-Time		t _F			63		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Pulsed Current		I _S				8	A
Drain-Source Diode Forward Voltage (Note 1)		I _{SM}				32	A
Maximum Body-Diode Continuous Current		V _{SD}	I _S =8.0A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _S =8.0A, V _{GS} =0V		312		ns
Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		3.69		μC

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

2. Essentially independent of operating temperature.

[illegible]

The diagram illustrates the timing relationships for a MOSFET switching event, showing the relationship between the gate-source voltage (V_{GS}), the drain-source current (I_{SD}), and the drain-source voltage (V_{DS}).

Top Trace: V_{GS} (Driver)

- The signal is a square wave with a pulse width (P.W.) and a period.
- The duty cycle is defined as $D = \frac{P.W.}{Period}$.
- The peak gate voltage is $V_{GS} = 10V$.

Middle Trace: I_{SD} (D.U.T.)

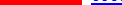
- The current is zero during the high V_{GS} period (MOSFET is in linear region).
- During the low V_{GS} period, the MOSFET is in cutoff, and the current is the body diode forward current (I_{FM}).
- When V_{GS} transitions from low to high, the current transitions from I_{FM} to zero, showing a di/dt transition.
- When V_{GS} transitions from high to low, the current transitions from zero to the body diode reverse current (I_{RM}).
- The reverse current I_{RM} is labeled as "Body Diode Reverse Current".

Bottom Trace: V_{DS} (D.U.T.)

- The voltage is zero during the high V_{GS} period.
- During the low V_{GS} period, the MOSFET is in cutoff, and the voltage is the body diode forward voltage drop.
- When V_{GS} transitions from low to high, the voltage transitions from the forward voltage drop to zero, showing a dv/dt transition.
- When V_{GS} transitions from high to low, the voltage transitions from zero to the supply voltage V_{DD} , showing a dv/dt transition.
- The transition from zero to V_{DD} is labeled as "Body Diode Recovery dv/dt ".
- The supply voltage V_{DD} is indicated on the right.

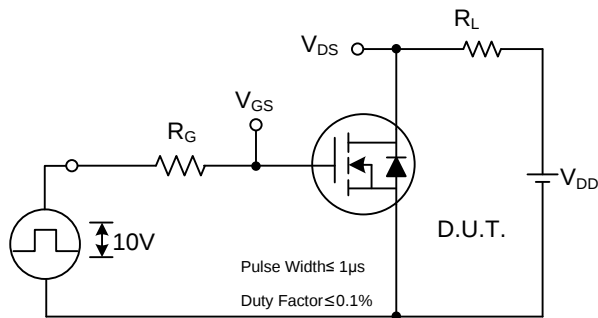
Labels and Annotations:

- Body Diode Forward Current:** I_{FM}
- Body Diode Reverse Current:** I_{RM}
- Body Diode Recovery dv/dt :** The transition from zero to V_{DD} during the low V_{GS} period.
- Body Diode Forward Voltage Drop:** The voltage drop during the low V_{GS} period.

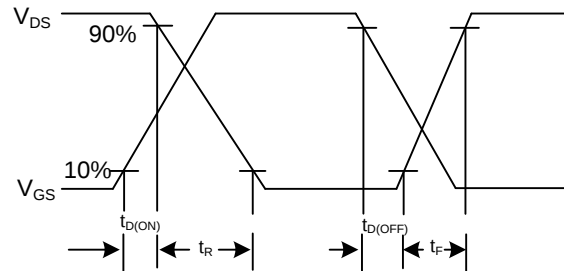


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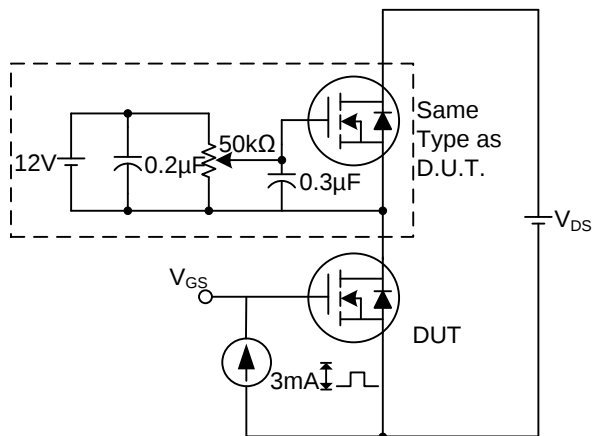
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



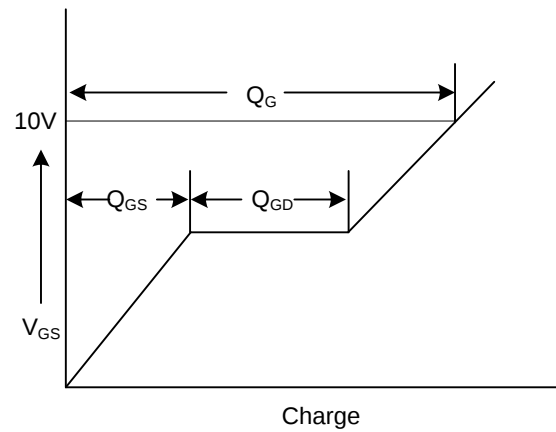
Switching Test Circuit



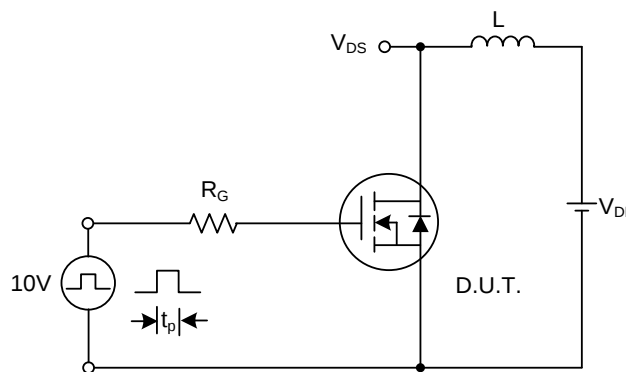
Switching Waveforms



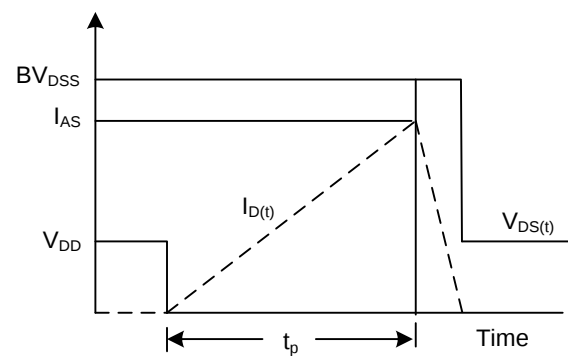
Gate Charge Test Circuit



Gate Charge Waveform

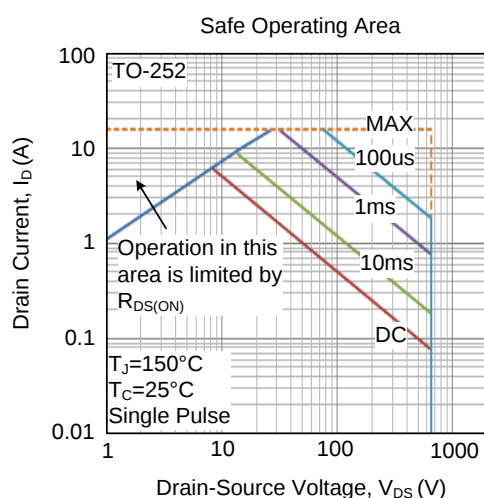


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS (Cont.)



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