



3NM65

Power MOSFET

3A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

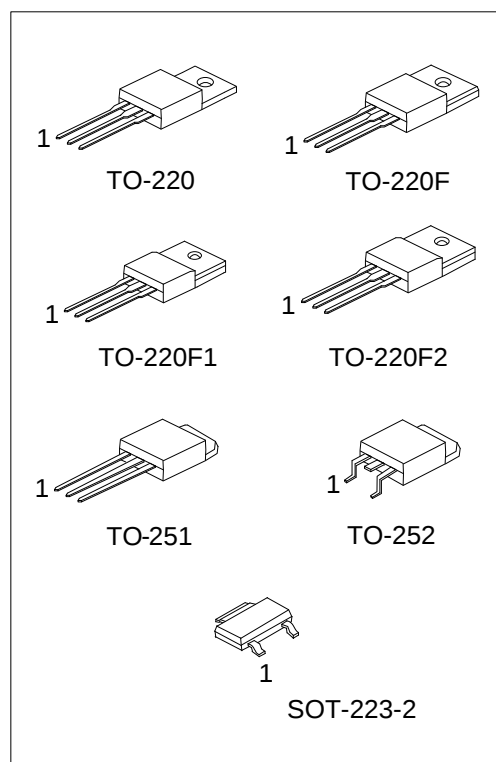
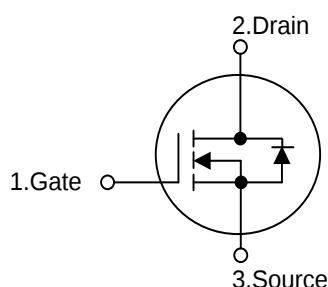
The UTC **3NM65** is a Super Junction MOSFET Structure. It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance.

The UTC **3NM65** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

FEATURES

- * $R_{DS(ON)} \leq 2.15 \Omega$ @ $V_{GS}=10V$, $I_D=1.5A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3NM65L-AA2-R	3NM65G-AA2-R	SOT-223-2	G	D	S	Tape Reel
3NM65L-TA3-T	3NM65G-TA3-T	TO-220	G	D	S	Tube
3NM65L-TF1-T	3NM65G-TF1-T	TO-220F1	G	D	S	Tube
3NM65L-TF2-T	3NM65G-TF2-T	TO-220F2	G	D	S	Tube
3NM65L-TF3-T	3NM65G-TF3-T	TO-220F	G	D	S	Tube
3NM65L-TM3-T	3NM65G-TM3-T	TO-251	G	D	S	Tube
3NM65L-TN3-R	3NM65G-TN3-R	TO-252	G	D	S	Tape Reel

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

3NM65G-AA2-R (1) Packing Type (2) Package Type (3) Green Package	(1) R: Tape Reel, T: Tube (2) AA2: SOT-223-2, TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

SOT-223-2	TO-220 / TO-220F / TO-220F1 TO-220F2 /TO-251 / TO-252
3NM65 1 L: Lead Free G: Halogen Free Date Code	UTC 3NM65 1 Lot Code L: Lead Free G: Halogen Free Date Code

■ **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	3	A
	Pulsed (Note 2)	I_{DM}	9	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	104	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	SOT-223-2	P_D	3	W
	TO-220		60	W
	TO-220F/TO-220F1		24	W
	TO-220F2		25	W
	TO-251/TO-252		44	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. $L=144\text{mH}$, $I_{AS}=1.2\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 3.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	SOT-223-2	θ_{JA}	250	$^{\circ}\text{C/W}$
	TO-220/TO-220F		62.5	
	TO-220F1/TO-220F2			
	TO-251/TO-252		110	
Junction to Case	SOT-223-2	θ_{JC}	41.6	$^{\circ}\text{C/W}$
	TO-220		2.08	
	TO-220F/TO-220F1		5.2	
	TO-220F2		5.1	
	TO-251/TO-252		2.84	

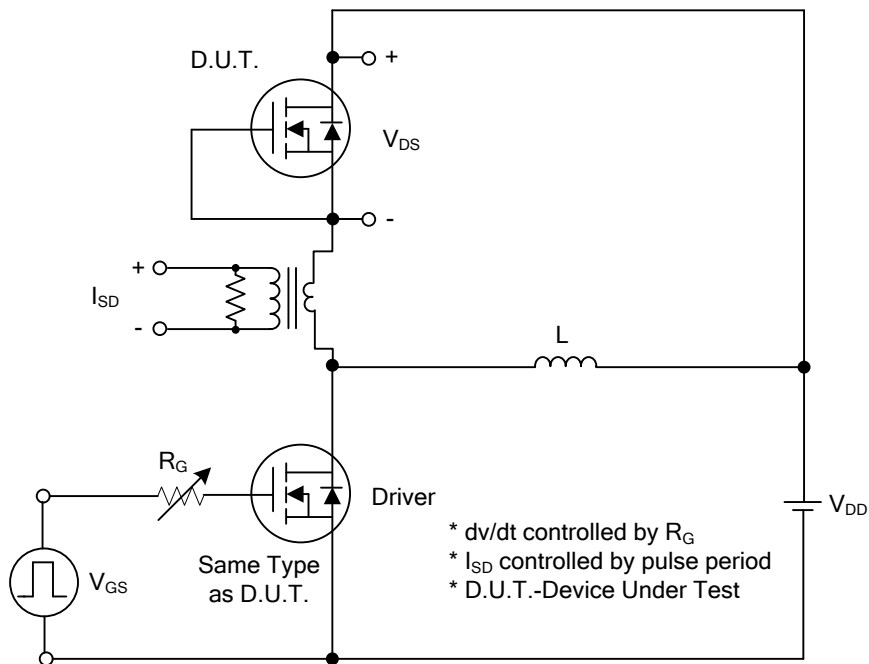
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

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	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 = 1.5A			2.15	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1MHz		210		pF
Output Capacitance		C _{OSS}			160		pF
Reverse Transfer Capacitance		C _{RSS}			16		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =300V, V _{GS} =10V, I _D =3.0A, I _G =5mA (Note 1, 2)		15.5		nC
Gate-Source Charge		Q _{GS}			5.4		nC
Gate-Drain Charge		Q _{DD}			6.0		nC
Turn-On Delay Time (Note 1)		t _{D(ON)}	V _{DD} =200V, V _{GS} =10V, I _D =3.0A, R _G =25Ω (Note 1, 2)		7.2		ns
Turn-On Rise Time		t _R			16.5		ns
Turn-Off Delay Time		t _{D(OFF)}			30		ns
Turn-Off Fall Time		t _F			24		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				3	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				9	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	V _{GS} = 0 V, I _S = 3.0 A			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	V _{GS} =0V, I _S =3.0A		236		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		1.5		nC

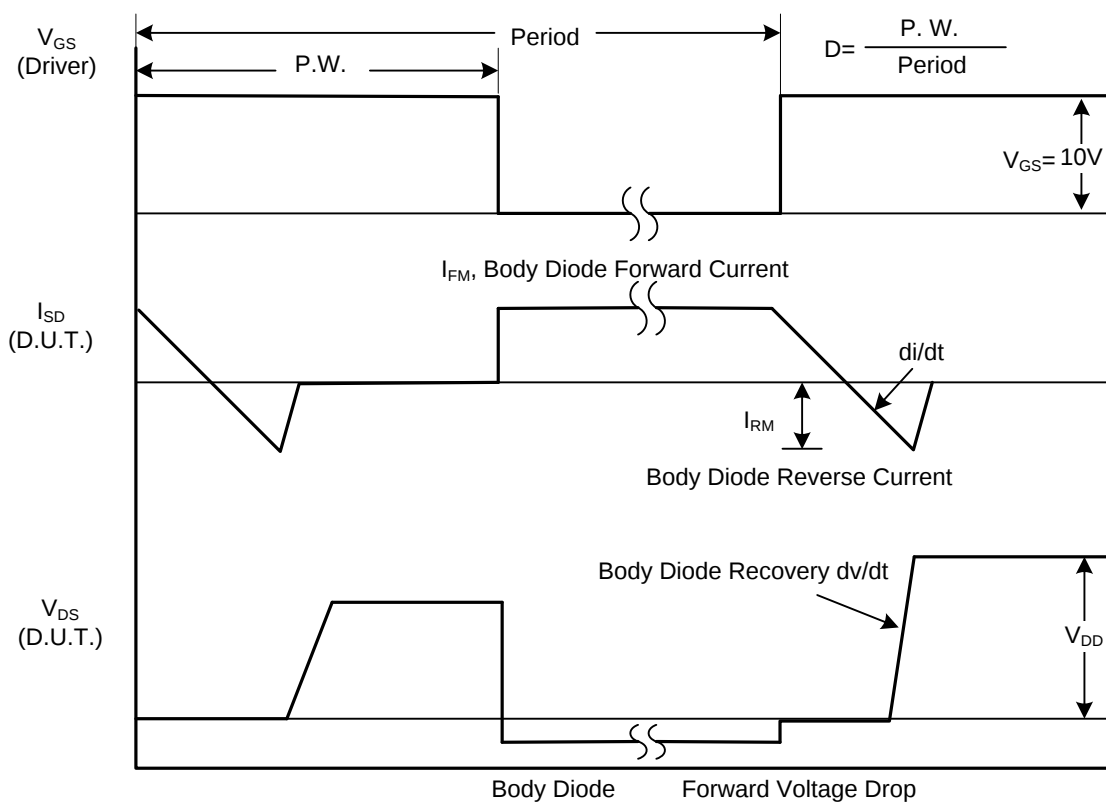
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

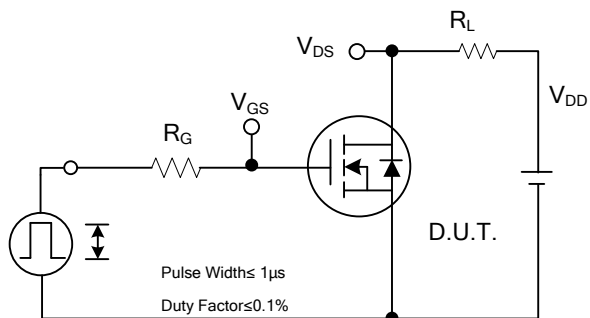


Peak Diode Recovery dv/dt Test Circuit

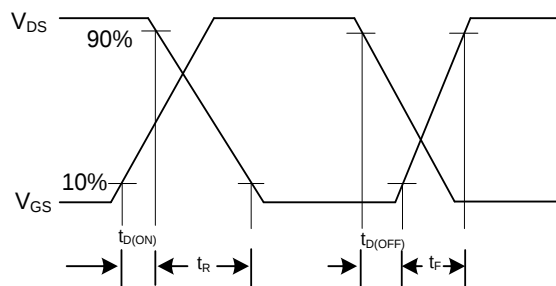


Peak Diode Recovery dv/dt Waveforms

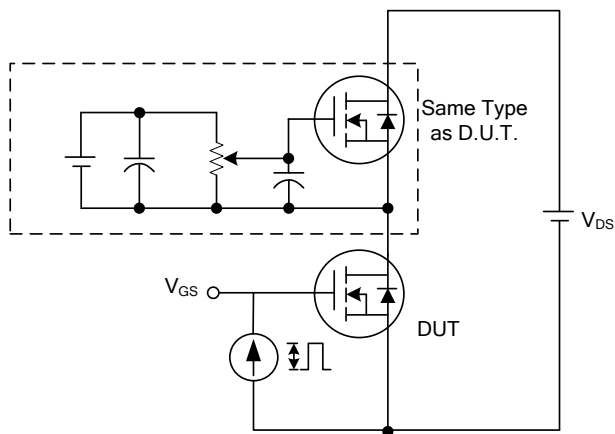
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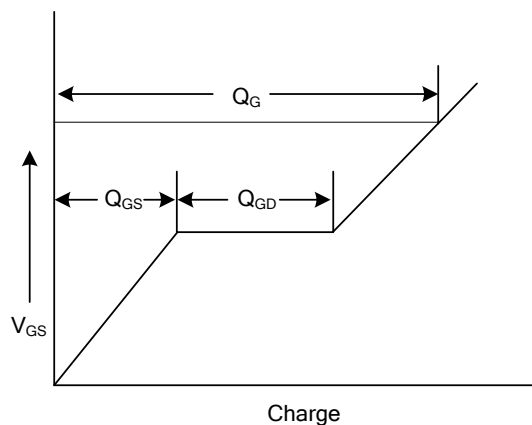
Switching Test Circuit



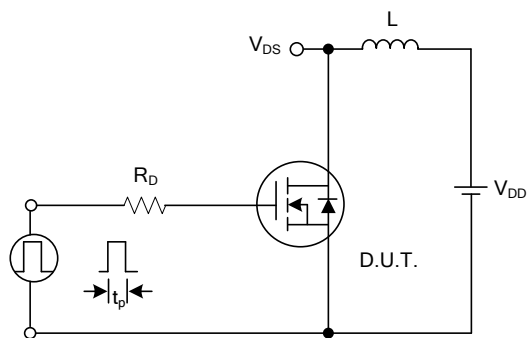
Switching Waveforms



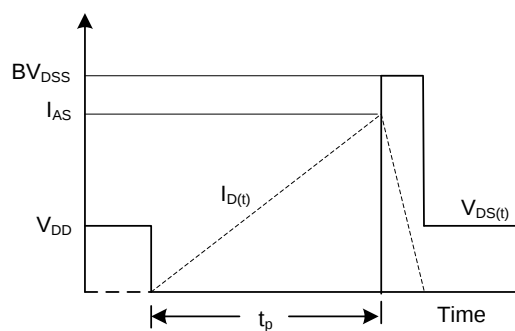
Gate Charge Test Circuit



Gate Charge Waveform

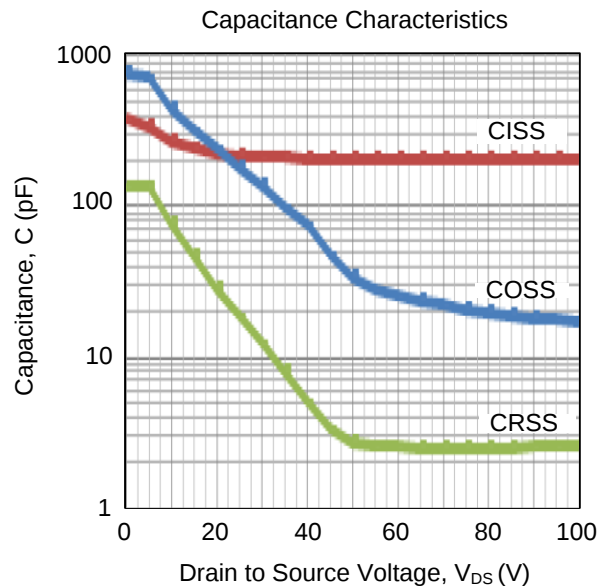
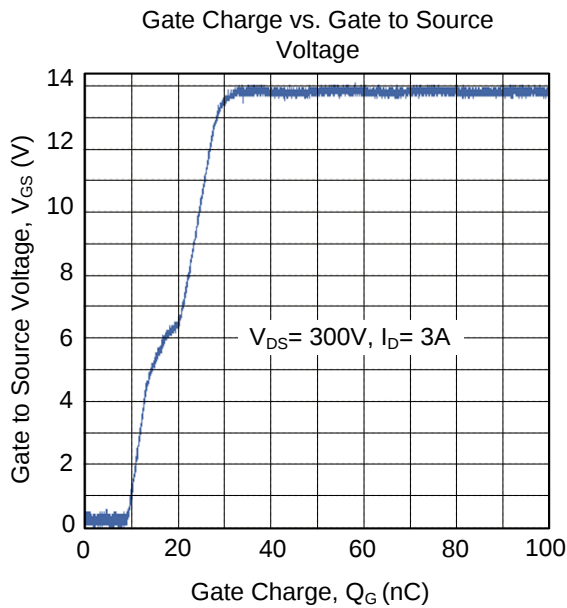


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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