



2NM65

Power MOSFET

2A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

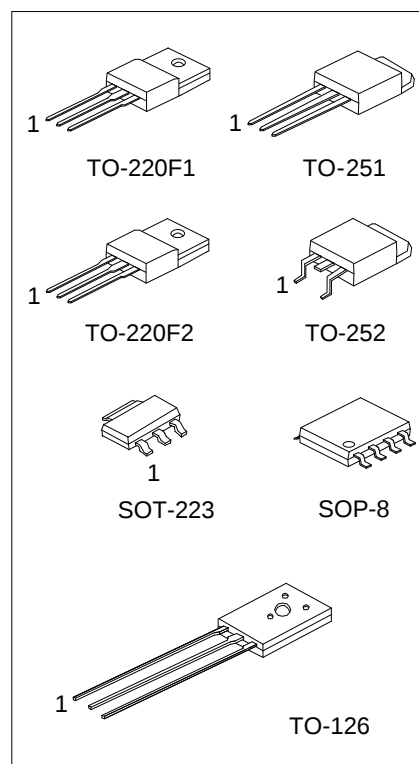
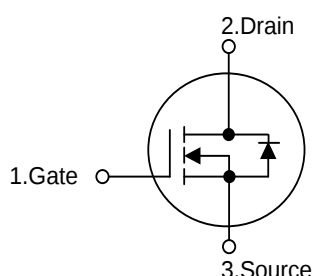
The UTC **2NM65** is a Super Junction MOSFET Structure. It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance.

The UTC **2NM65** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

FEATURES

- * $R_{DS(ON)} \leq 2.52 \Omega$ @ $V_{GS}=10V$, $I_D=1.0A$
- * 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	4	5	6	7	8	
2NM65L-AA3-R	2NM65G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
2NM65L-TF1-T	2NM65G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
2NM65L-TF2-T	2NM65G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	Tube
2NM65L-TM3-T	2NM65G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
2NM65L-TN3-R	2NM65G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
2NM65L-S08-R	2NM65G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel
2NM65L-T60-K	2NM65G-T60-K	TO-126	G	D	S	-	-	-	-	-	Bulk

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

2NM65G-AA3-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel, T: Tube, K: Bulk
	(2) AA3: SOT-223, TF1: TO-220F1, TF2: TO-220F2 TM3: TO-251, TN3: TO-252, S08: SOP-8, T60: TO-126
	(3) G: Halogen Free and Lead Free, L: Lead Free

MARKING

SOT-223	TO-220F1 / TO-220F2 / TO-251 / TO-252
2NM65 1 L: Lead Free G: Halogen Free Date Code	UTC 2NM65 1 Lot Code L: Lead Free G: Halogen Free Date Code
TO-126	SOP-8
UTC 2NM65 1 Date Code L: Lead Free G: Halogen Free	8 7 6 5 UTC 2NM65 1 2 3 4 Date Code L: Lead Free G: Halogen Free Lot 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	2.0	A
	Pulsed (Note 2)	I_{DM}	8.0	A
Avalanche Current (Note 2)		I_{AR}	1.06	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	80	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	SOT-223	P_D	10	W
	TO-220F1/TO-220F2		24	W
	TO-251/TO-252		44	W
	TO-126		12.5	W
	SOP-8		2	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. $L=144\text{mH}$, $I_{AS}=1.06\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 2.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C/W}$
	TO-220F1/TO-220F2		62.5	$^\circ\text{C/W}$
	TO-251/TO-252		100	$^\circ\text{C/W}$
	TO-126		132	$^\circ\text{C/W}$
	SOP-8		190	$^\circ\text{C/W}$
Junction to Case	SOT-223	θ_{JC}	12	$^\circ\text{C/W}$
	TO-220F1/TO-220F2		5.2	$^\circ\text{C/W}$
	TO-251/TO-252		2.8 (Note)	$^\circ\text{C/W}$
	TO-126		10.42	$^\circ\text{C/W}$
	SOP-8		62.5 (Note)	$^\circ\text{C/W}$

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

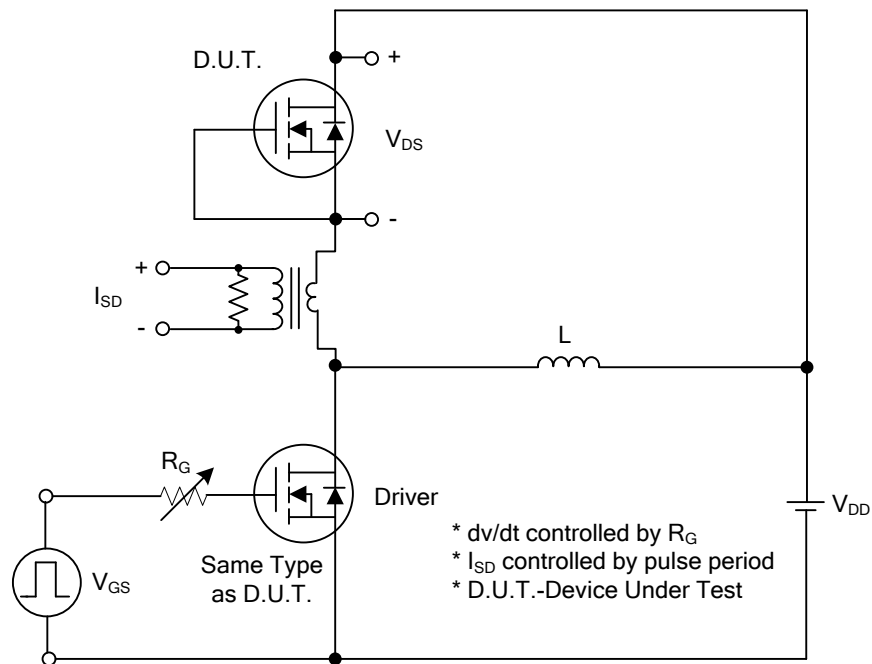
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	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 =1A			2.52	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f =1MHz		151		pF
Output Capacitance		C _{OSS}			110		pF
Reverse Transfer Capacitance		C _{RSS}			12		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =50V, V _{GS} =10V, I _D =1.3A I _G =100μA (Note 1, 2)		17.7		nC
Gate-Source Charge		Q _{GS}			2.0		nC
Gate-Drain Charge		Q _{GD}			5.6		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)		36		ns
Turn-On Rise Time		t _R			45		ns
Turn-Off Delay Time		t _{D(OFF)}			82		ns
Turn-Off Fall Time		t _F			29		ns
DRAIN-SOURCE DIODE CHARACTERISTICS							
Continuous Drain-Source Current		I _S				2.0	A
Maximum Body-Diode Pulsed Current		I _{SM}				8.0	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =2.0A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =2.0A, V _{GS} =0V		206		nS
Body Diode Reverse Recovery Charge		Q _{rr}	dI/dt=100A/μs		1.1		μC

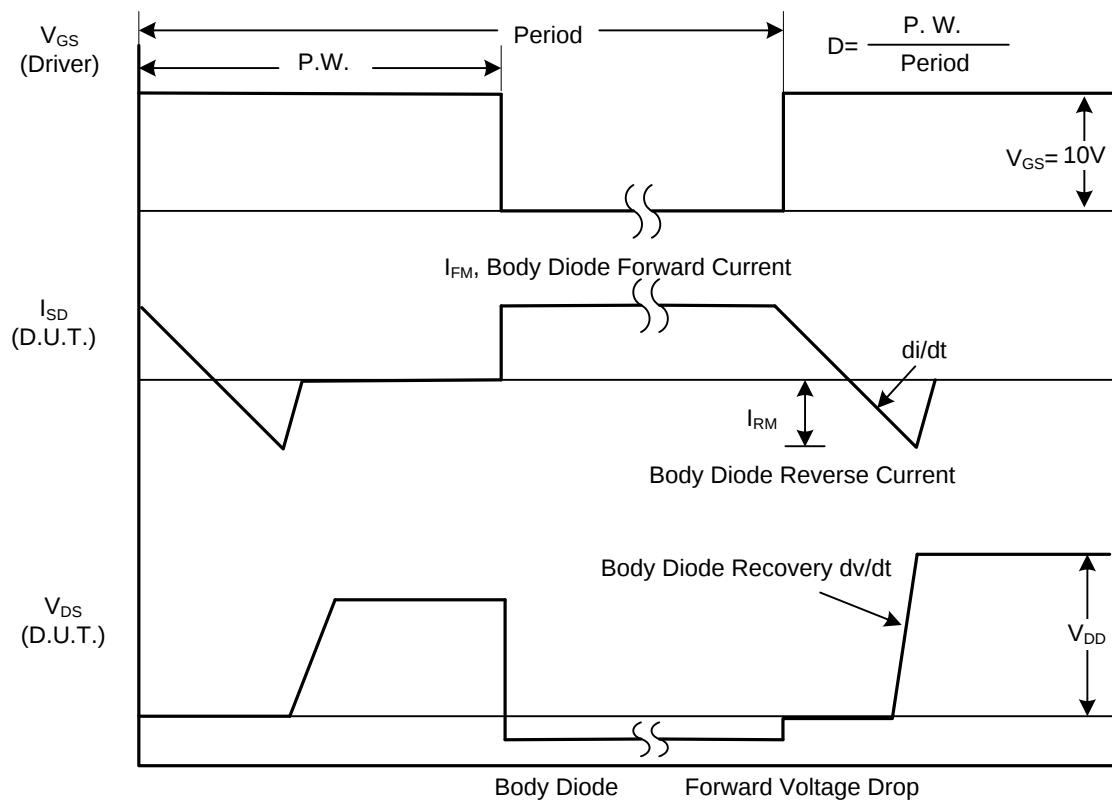
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

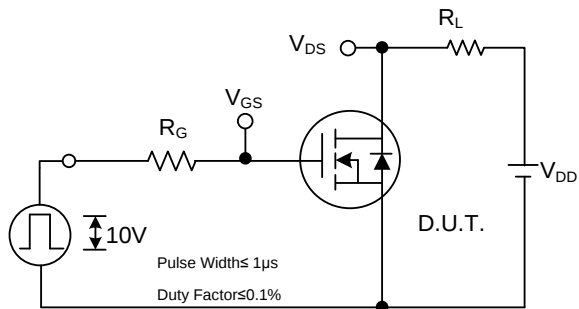


Peak Diode Recovery dv/dt Test Circuit

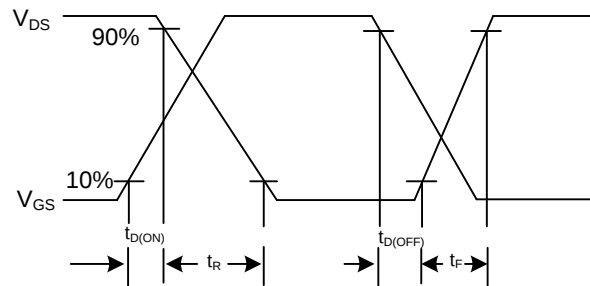


Peak Diode Recovery dv/dt Waveforms

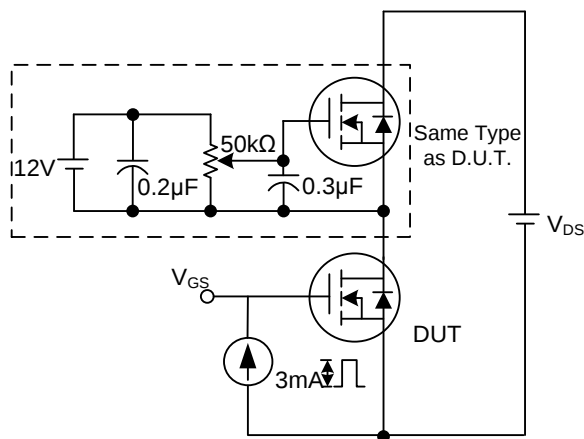
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



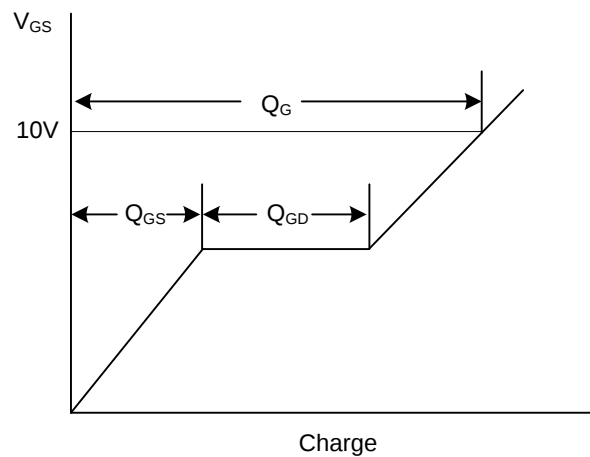
Switching Test Circuit



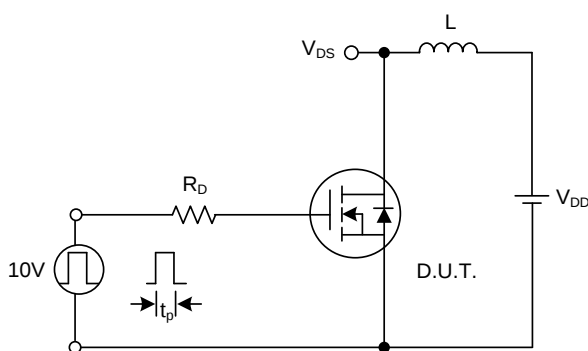
Switching Waveforms



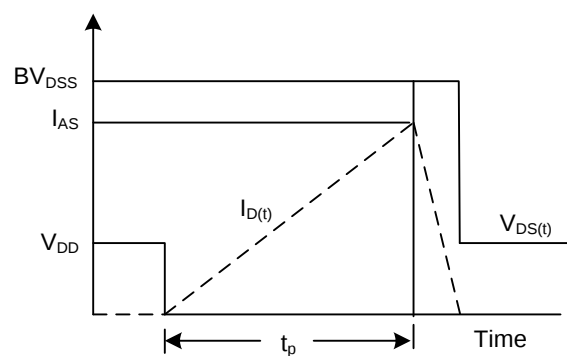
Gate Charge Test Circuit



Gate Charge Waveform

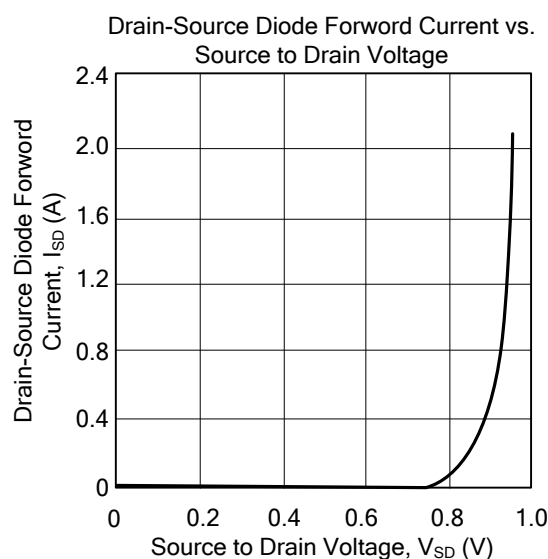
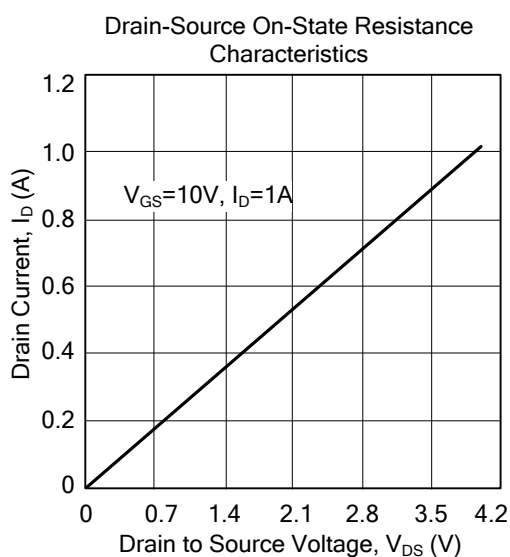
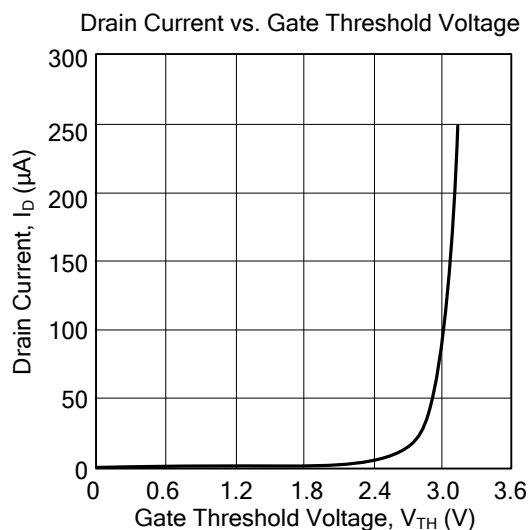
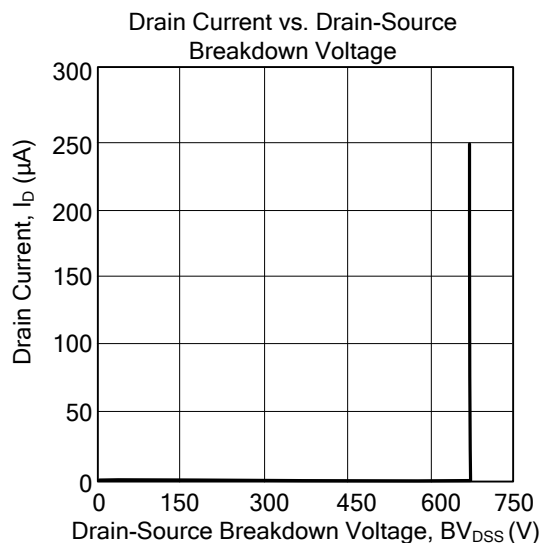


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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