



1NM65

Power MOSFET

1.0A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

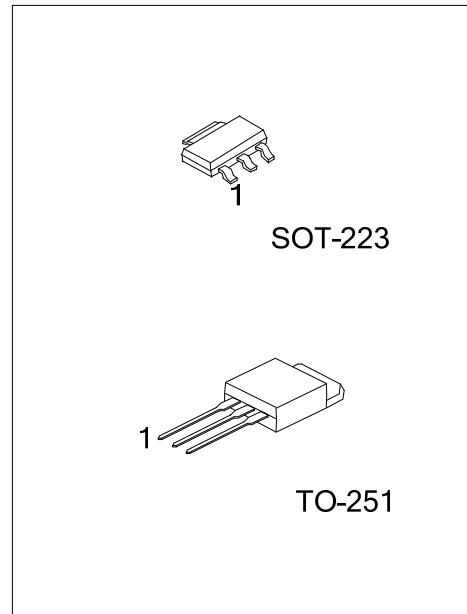
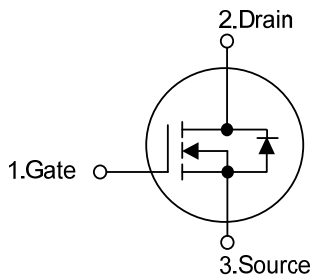
■ DESCRIPTION

The **UTC 1NM65** 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

- * $R_{DS(ON)} < 3.5\Omega @ V_{GS} = 10V, I_D = 0.5A$
- * 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	
-	1NM65G-AA3-R	SOT-223	G	D	S	Tape Reel
1NM65L-TM3-T	1NM65G-TM3-T	TO-251	G	D	S	Tube

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

<p>1NM65G-TA3-R</p> <p>└── (1)Packing Type</p> <p>└── (2)Package Type</p> <p>└── (3)Green Package</p>	<p>(1) T: Tubel, R: Tape Reel</p> <p>(2) AA3: SOT-223, TM3: TO-251</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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■ MARKING

SOT-223	TO-251

■ 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	1.0	A
	Pulsed (Note 2)	I_{DM}	4.0	A
Avalanche Current (Note 2)		I_{AR}	1.3	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	8.5	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.6	V/ns
Power Dissipation	SOT-223	P_D	10	W
	TO-251		28	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. $L=10\text{mH}$, $I_{AS}=1.3\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$.

4. $I_{SD}\leq 1.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$.

■ THERMAL CHARACTERISTICS

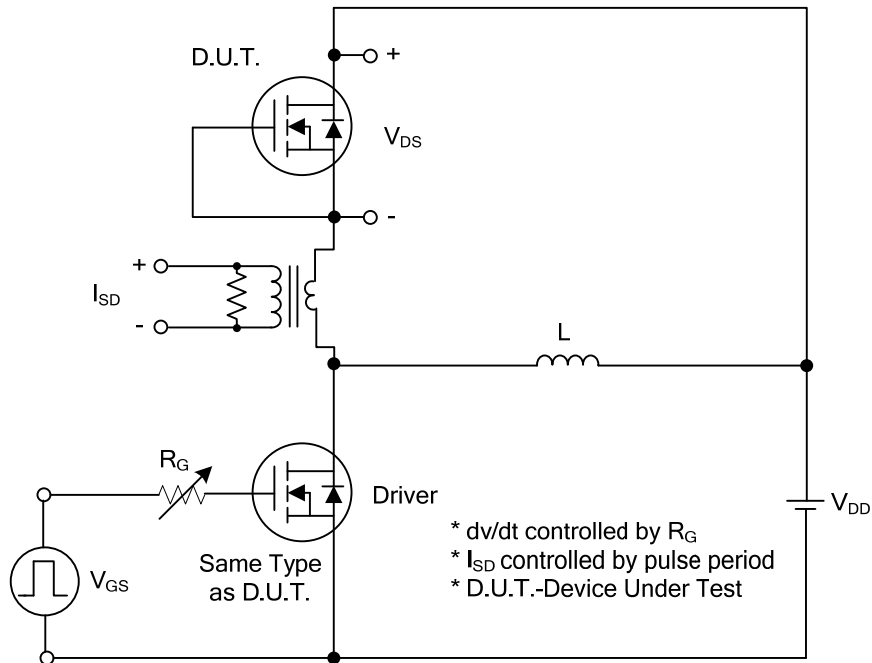
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-251		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	θ_{JC}	12.5	$^\circ\text{C}/\text{W}$
	TO-251		4.46	$^\circ\text{C}/\text{W}$

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

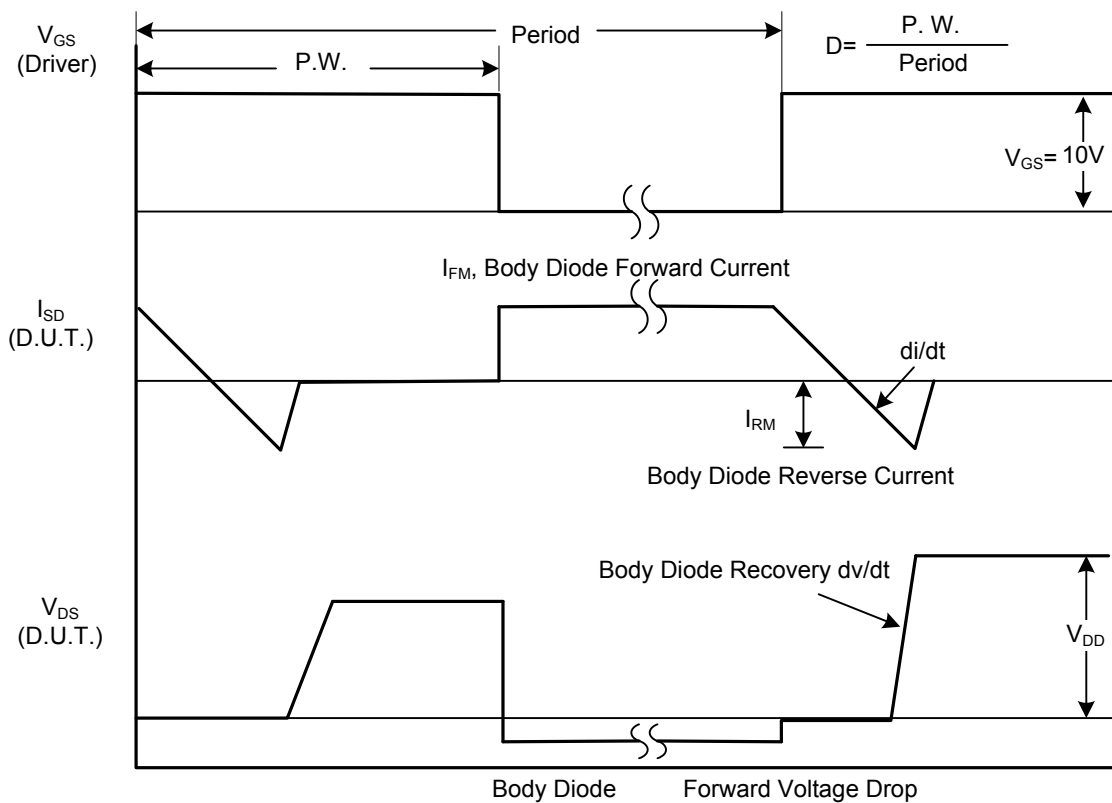
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-source Breakdown Voltage	BV _{DSS}	V _{GS} = 0V, I _D = 250μA	650			V
Drain-source Leakage Current	I _{DSS}	V _{DS} = 650V, V _{GS} = 0V			10	μA
Gate-source Leakage Current	Forward	I _{GSS}			100	nA
	Reverse					
		V _{GS} = -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 = 0.5A			3.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} = 0V, V _{DS} = 25V, f = 1MHz		117		pF
Output Capacitance	C _{OSS}			66		pF
Reverse Transfer Capacitance	C _{RSS}			7		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)		18		nC
Gate-source Charge	Q _{GS}			2		nC
Gate-drain Charge	Q _{GD}			4.5		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)		31		ns
Turn-On Rise Time	t _R			31		ns
Turn-Off Delay Time	t _{D(OFF)}			66		ns
Turn-Off Fall Time	t _F			34		ns
DRAIN-SOURCE DIODE CHARACTERISTICS						
Continuous Drain-source Current	I _S				1.0	A
Maximum Body-Diode Pulsed Current	I _{SM}				4.0	A
Drain-source Diode Forward Voltage (Note 1)	V _{SD}	I _S = 1.0A, V _{GS} = 0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S = 1.0A, V _{GS} = 0V, dI/dt = 100A/μs		160		ns
Body Diode Reverse Recovery Charge	Q _{rr}				610	

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

TEST CIRCUITS AND WAVEFORMS

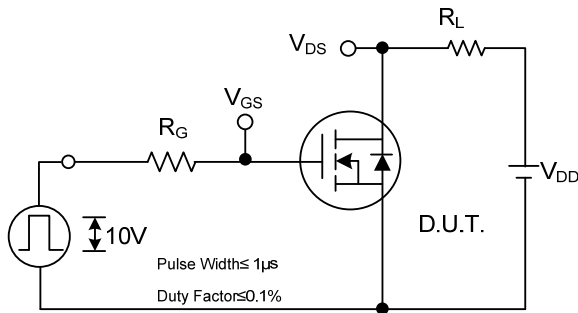


Peak Diode Recovery dv/dt Test Circuit

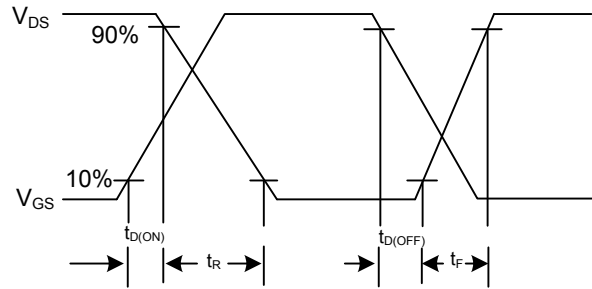


Peak Diode Recovery dv/dt Waveforms

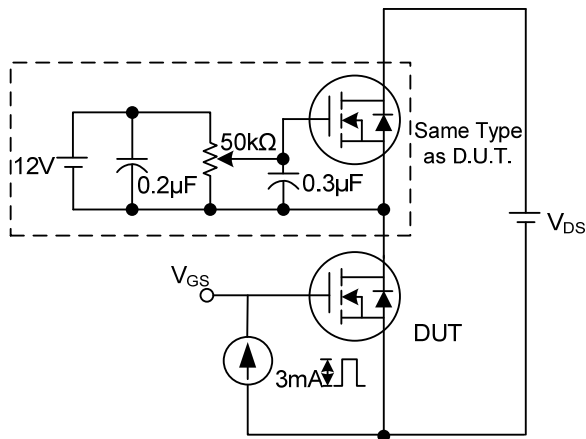
TEST CIRCUITS AND WAVEFORMS (Cont.)



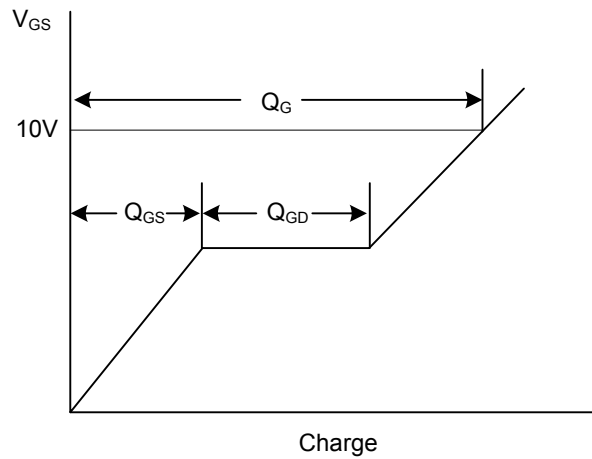
Switching Test Circuit



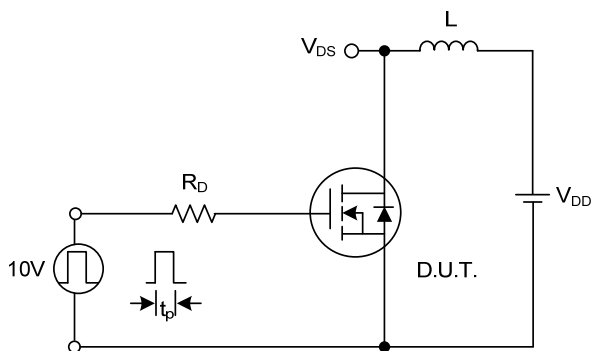
Switching Waveforms



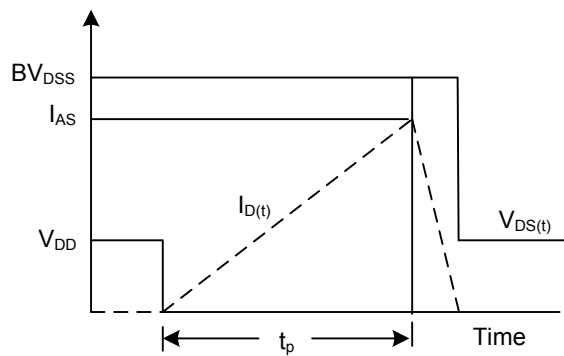
Gate Charge Test Circuit



Gate Charge Waveform

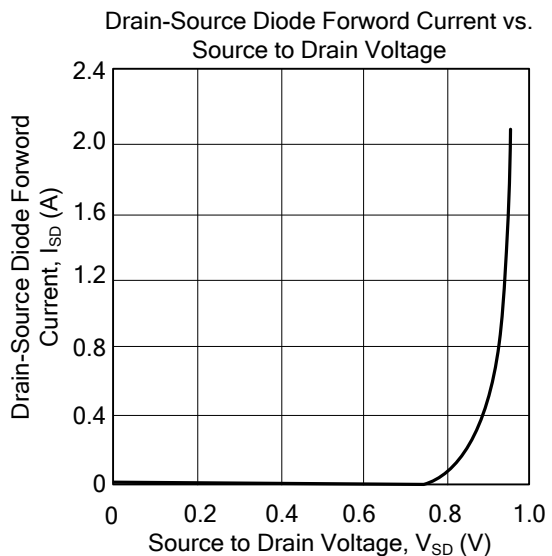
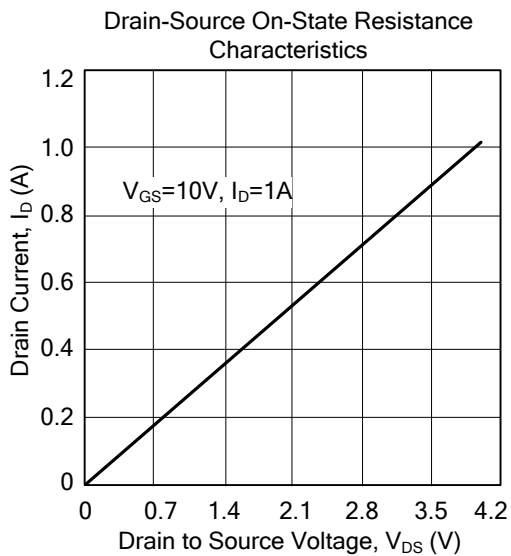
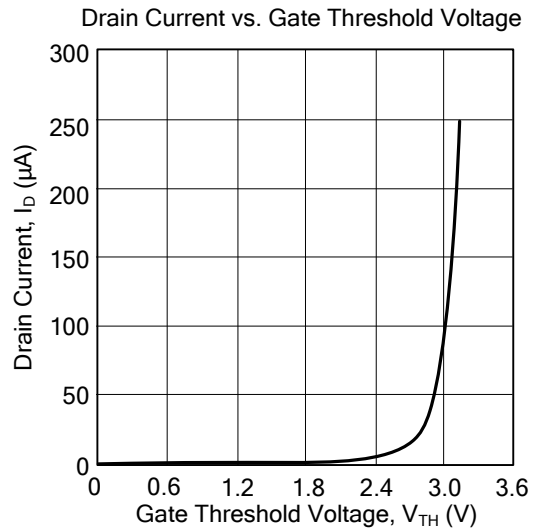
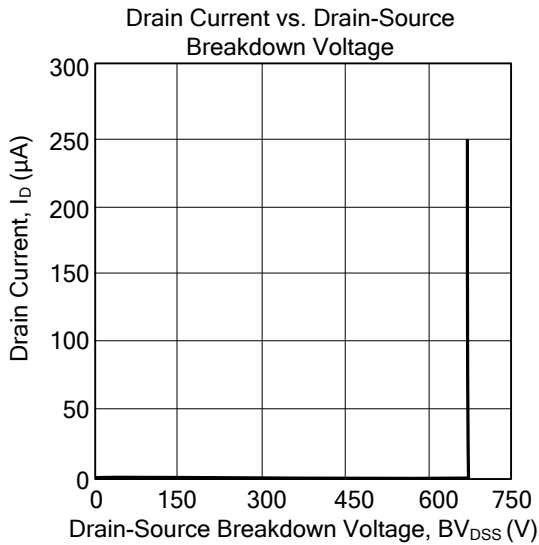


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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