



1NM65

Power MOSFET

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

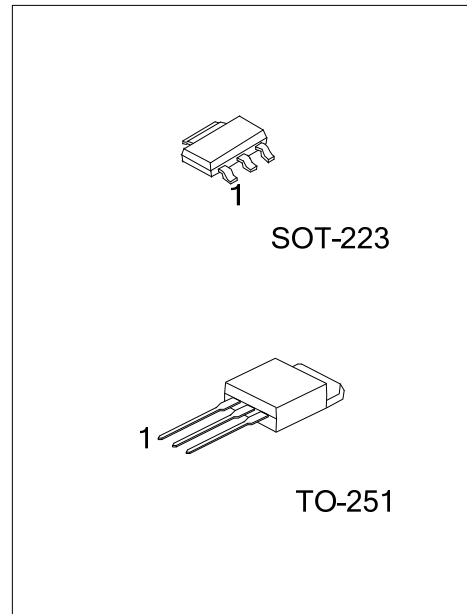
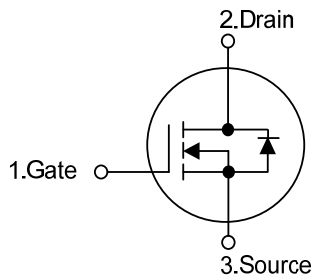
DESCRIPTION

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

1NM65G-TA3-R	(1) Packing Type	(1) T: Tubel, R: Tape Reel
	(2) Package Type	(2) AA3: SOT-223, TM3: TO-251
	(3) Green Package	(3) L: Lead Free, G: Halogen Free and Lead Free

MARKING

SOT-223	TO-251
 1	 1

■ 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		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	$^\circ\text{C}/\text{W}$

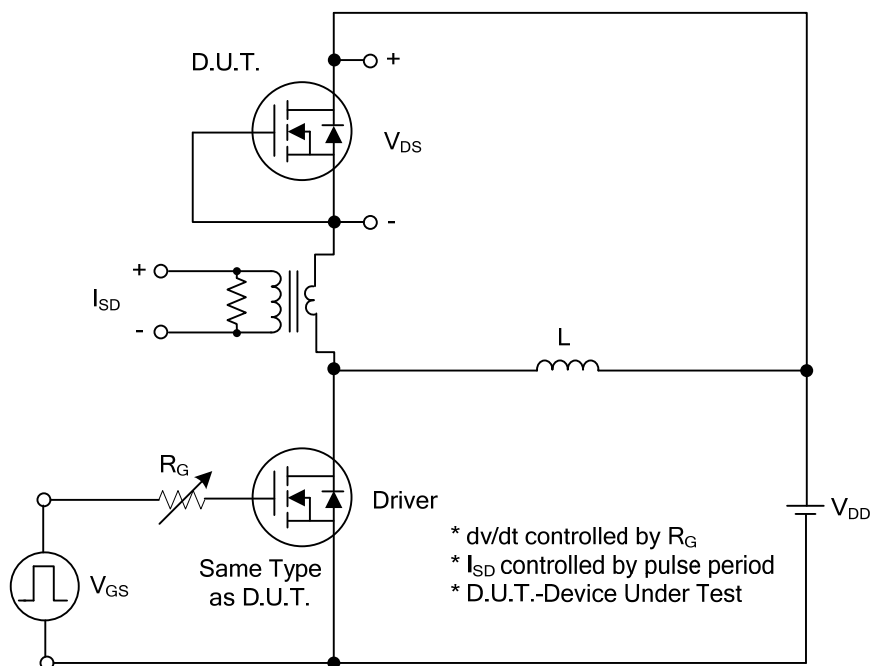
■ ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-source Breakdown Voltage		BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	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		$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	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	$V_{DS} = 50V, V_{GS} = 10V, I_D = 1.3A$ $I_G = 100\mu A$ (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)		$t_{D(ON)}$	$V_{DD} = 30V, V_{GS} = 10V, I_D = 0.5A,$ $R_G = 25\Omega$ (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}	$I_S = 1.0A, V_{GS} = 0V,$		160		ns
Body Diode Reverse Recovery Charge		Q_{rr}	$dI/dt = 100A/\mu s$		610		nC

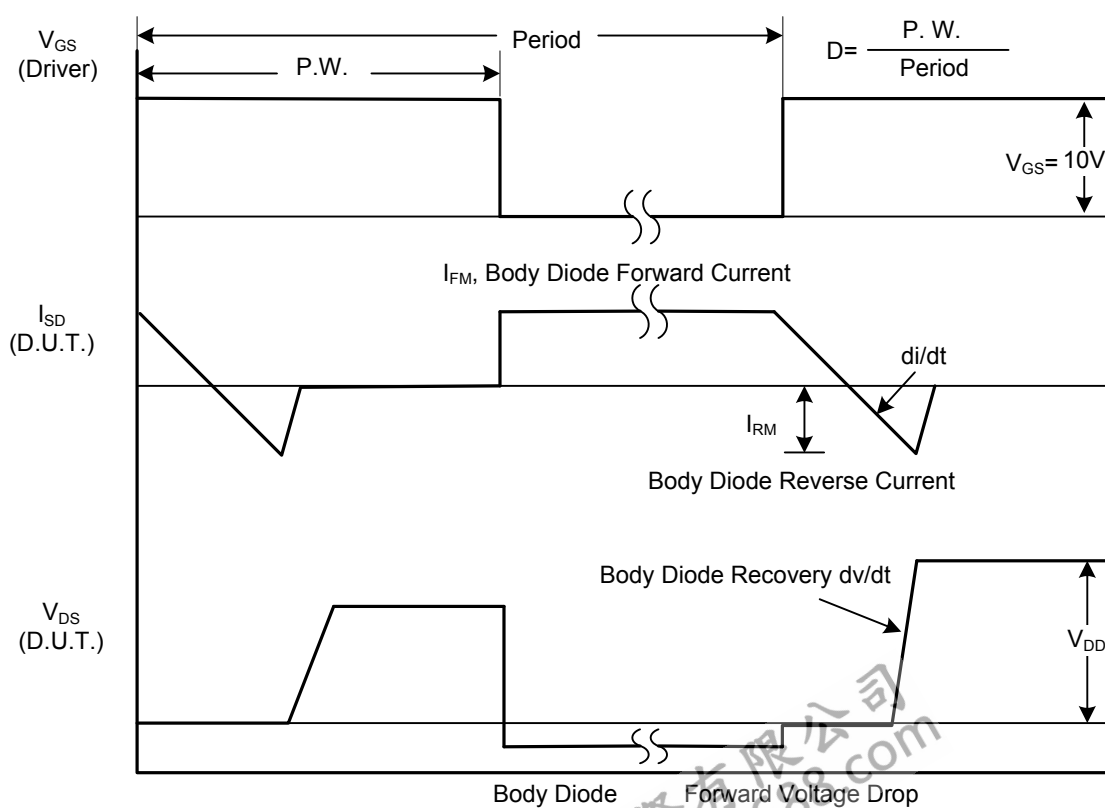
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

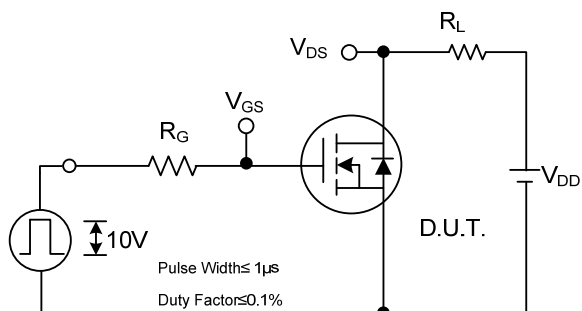


Peak Diode Recovery dv/dt Test Circuit

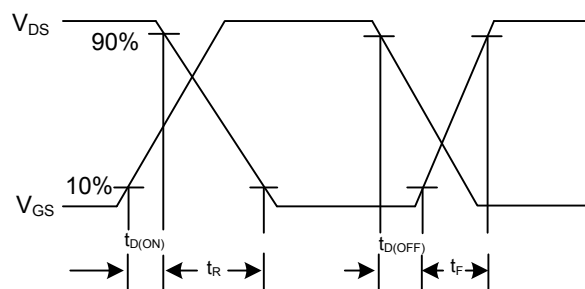


Peak Diode Recovery dv/dt Waveforms

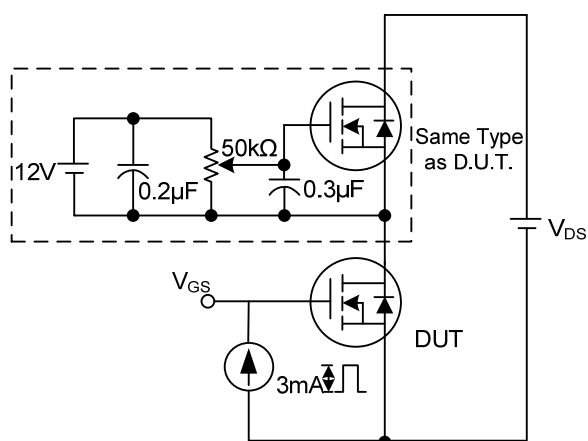
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



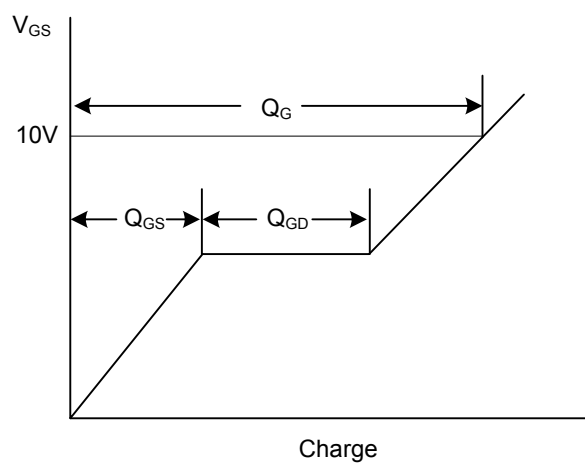
Switching Test Circuit



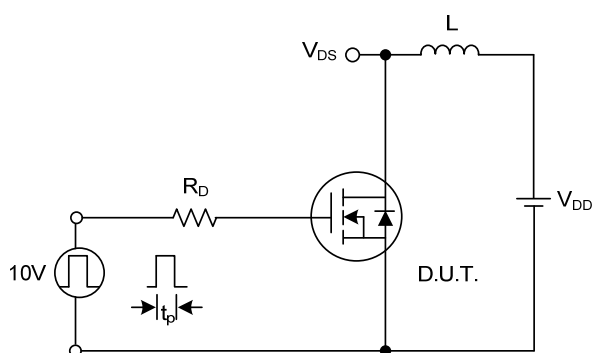
Switching Waveforms



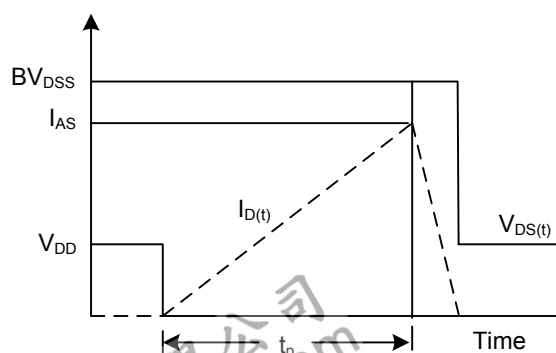
Gate Charge Test Circuit



Gate Charge Waveform

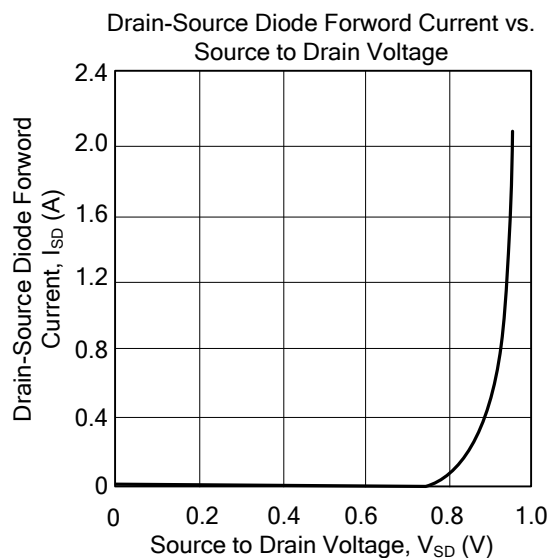
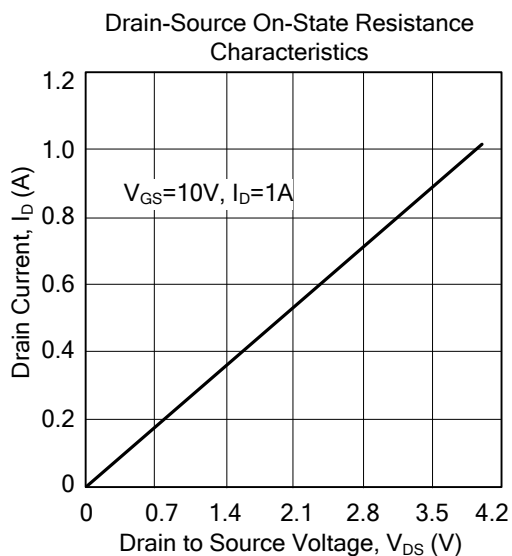
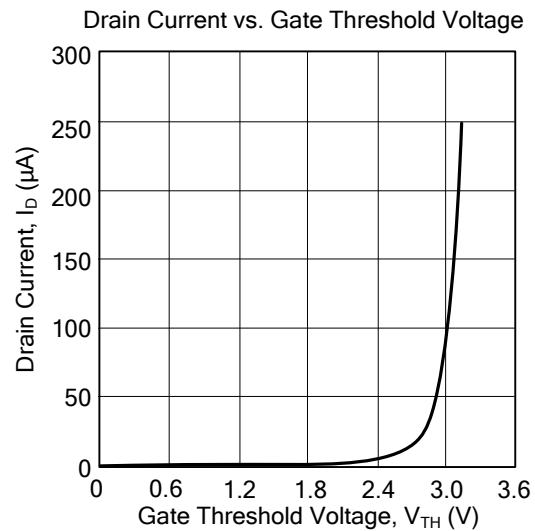
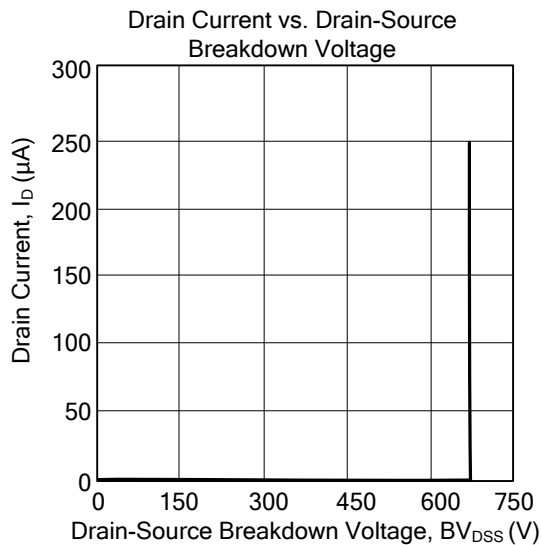


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS



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