



## 9NM70-FDS

Power MOSFET

### 9A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

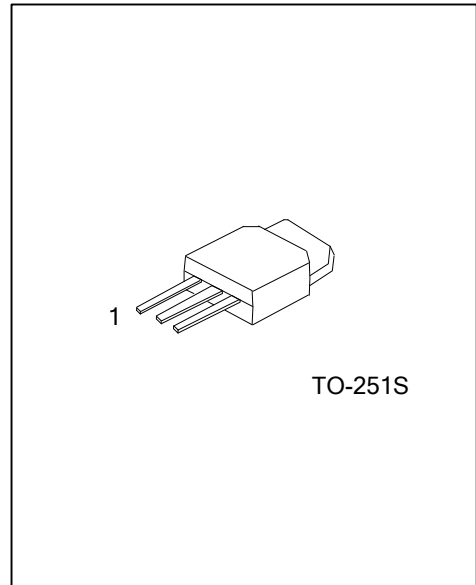
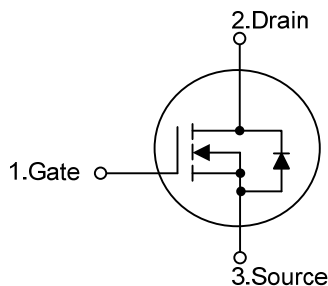
#### DESCRIPTION

The **UTC 9NM70-FDS** 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

- \*  $R_{DS(ON)} < 0.8\Omega$  @  $V_{GS}=10V, I_D=4.5A$
- \* By using Super Junction Structure
- \* Fast Switching
- \* With 100% Avalanche Tested

#### SYMBOL



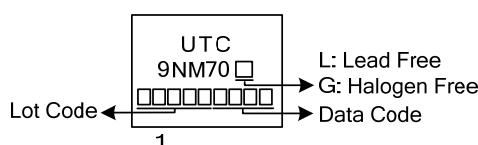
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9NM70L-TMS-T	9NM70G-TMS-T	TO-251S	G	D	S	Tube

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

<p>9NM70G-TMS-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) TMS: TO-251S</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		V <sub>DSS</sub>	700	V
Gate to Source Voltage		V <sub>GSS</sub>	±30	V
Continuous Drain Current	Continuous	I <sub>D</sub>	9	A
Pulsed Drain Current	Pulsed (Note 2)	I <sub>DM</sub>	36	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	160	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	8.5	V/ns
Power Dissipation		P <sub>D</sub>	100	W
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-55 ~ +150	°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=60mH, I<sub>AS</sub>=2.3A, V<sub>DD</sub>= 50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.

4. I<sub>SD</sub> ≤ 9A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub>=25°C.

### ■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ <sub>JA</sub>	110	°C/W
Junction to Case	θ <sub>JC</sub>	1.25	°C/W

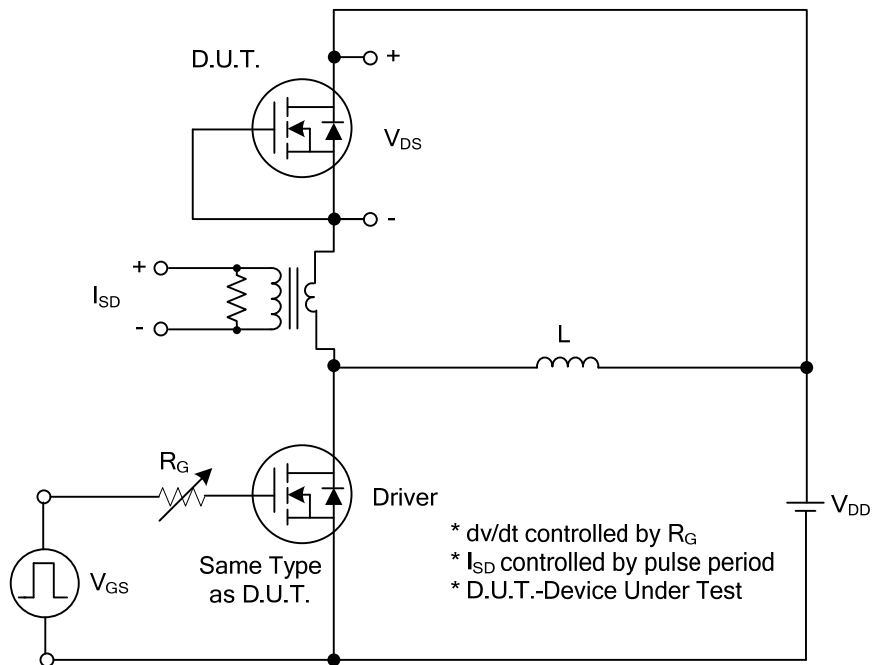
### ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	700			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =700V, V <sub>GS</sub> =0V			10	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V			±100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5		4.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A			0.8	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz		557		pF
Output Capacitance	C <sub>OSS</sub>			508		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			52		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =200V, V <sub>GS</sub> =10V, I <sub>D</sub> =9.0A, I <sub>G</sub> =1mA (Note 1, 2)		28		nC
Gate to Source Charge	Q <sub>GS</sub>			10		nC
Gate to Drain Charge	Q <sub>GD</sub>			9.6		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =350V, V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A, R <sub>G</sub> =25Ω (Note 1, 2)		9.4		ns
Rise Time	t <sub>R</sub>			16.4		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			68		ns
Fall-Time	t <sub>F</sub>			27.2		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				9	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				36	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =9.0A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =9.0A, V <sub>GS</sub> =0V		153.2		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	di <sub>F</sub> /dt=100A/μs		0.94		μC

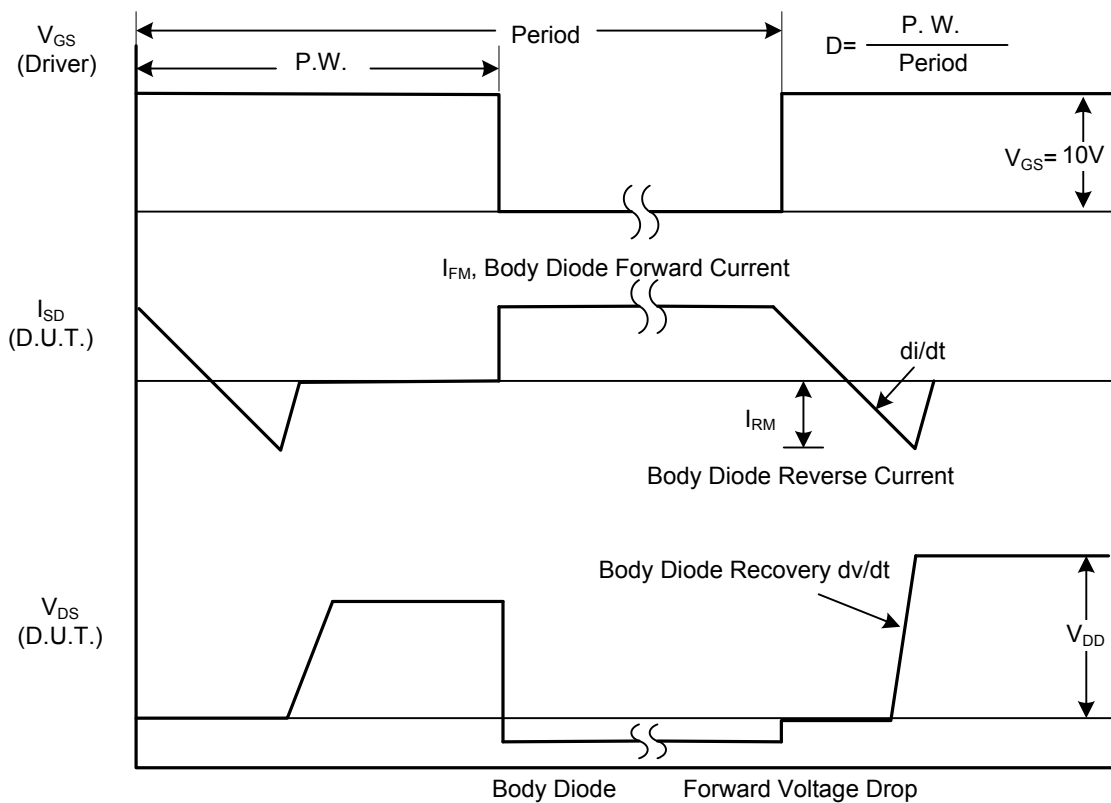
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature

## TEST CIRCUITS AND WAVEFORMS

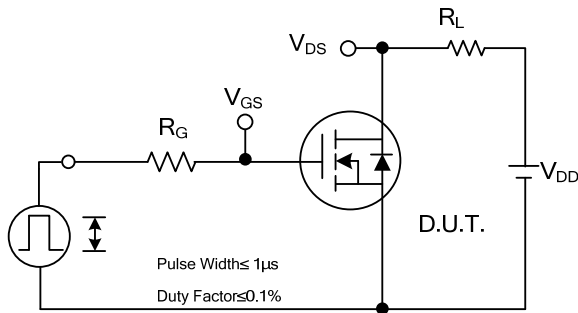


**Peak Diode Recovery dv/dt Test Circuit**

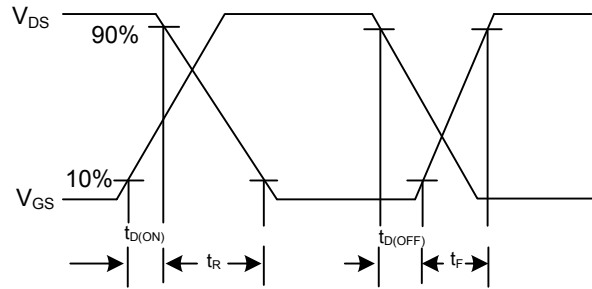


**Peak Diode Recovery dv/dt Waveforms**

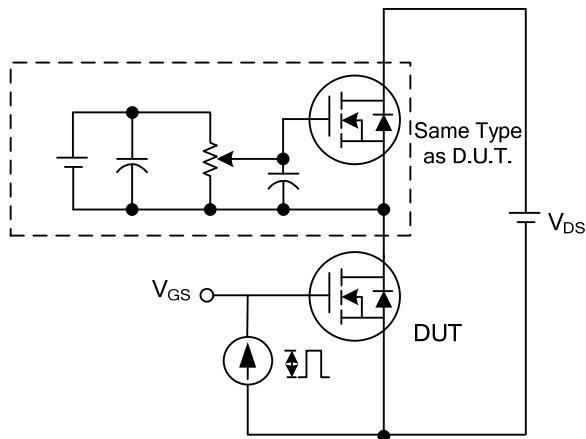
## TEST CIRCUITS AND WAVEFORMS (Cont.)



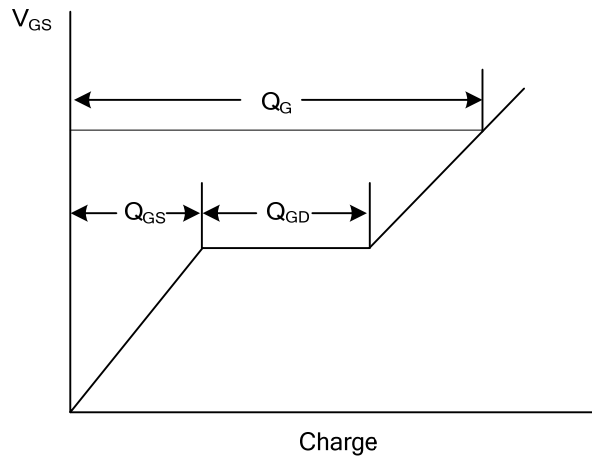
**Switching Test Circuit**



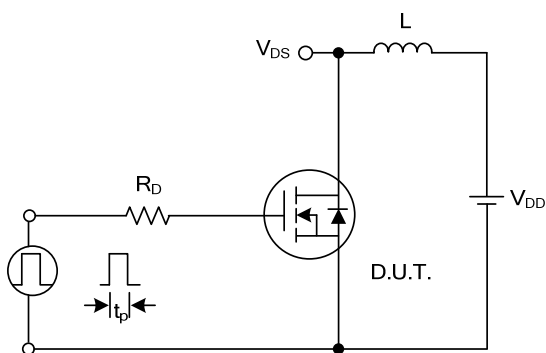
**Switching Waveforms**



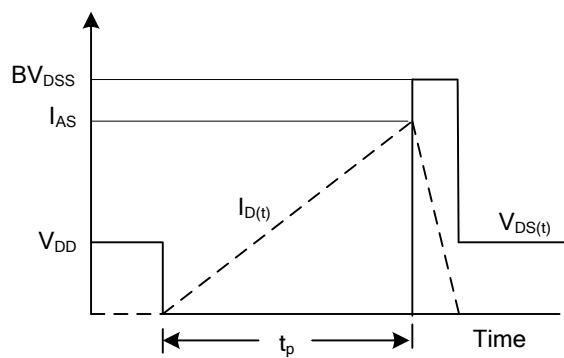
**Gate Charge Test Circuit**



**Gate Charge Waveform**

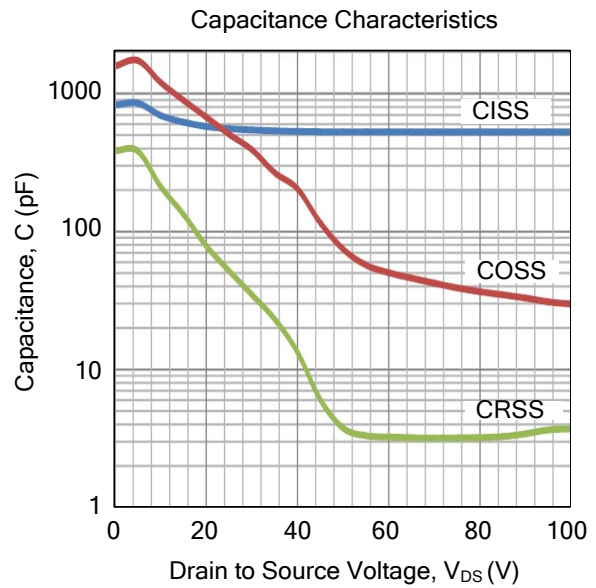
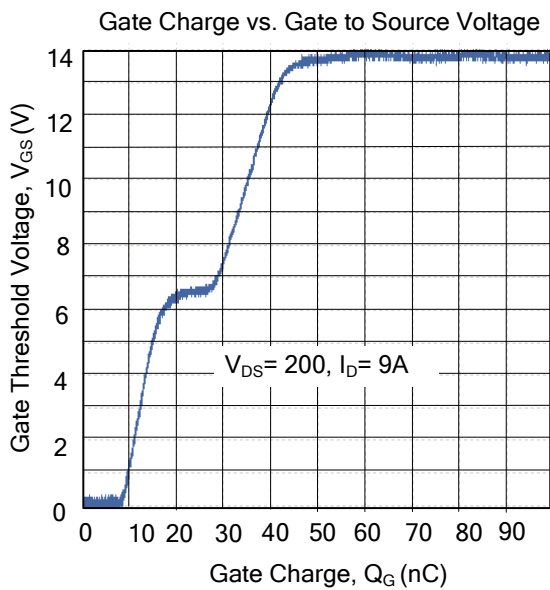


**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

### TYPICAL CHARACTERISTICS



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