



**20NM70**

Preliminary

**Power MOSFET**

**20A, 700V N-CHANNEL  
SUPER-JUNCTION MOSFET**

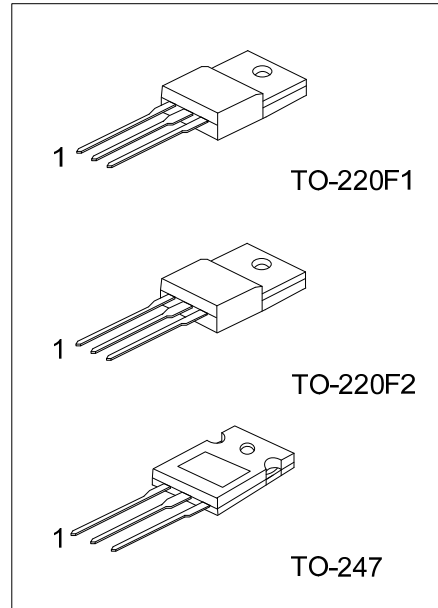
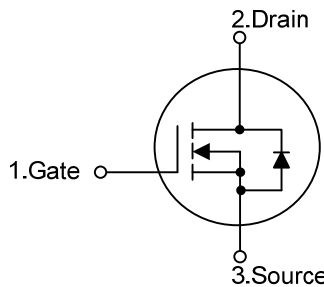
■ DESCRIPTION

The **UTC 20NM70** 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 AC-DC converters for power applications.

■ FEATURES

- \*  $R_{DS(ON)} \leq 0.26 \Omega @ V_{GS}=10V, I_D=10A$
- \* By using Super Junction Structure
- \* Fast Switching
- \* With 100% Avalanche Tested

■ SYMBOL



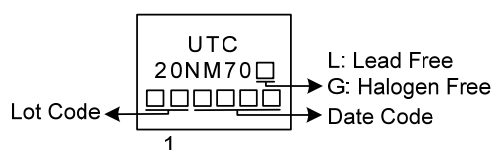
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20NM70L-TF1-T	20NM70G-TF1-T	TO-220F1	G	D	S	Tube
20NM70L-TF2-T	20NM70G-TF2-T	TO-220F2	G	D	S	Tube
20NM70L-T47-T	20NM70G-T47-T	TO-247	G	D	S	Tube

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

<p>20NM70G-TF1-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) TF1: TO-220F1, TF2: TO-220F2, T47: TO-247</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS ( $T_c=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	700	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	Continuous	$I_D$	20	A
Pulsed Drain Current	Pulsed (Note 2)	$I_{DM}$	40	A
Avalanche energy	Single Pulsed (Note 3)	$E_{AS}$	20.2	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6.7	V/nS
Power Dissipation	TO-220F1/TO-220F2	$P_D$	34	W
	TO-247		132	W
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature Range		$T_{STG}$	-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.  $L=1\text{mH}$ ,  $I_{AS}=6.3\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .

4.  $I_{SD} \leq 20\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J = 25^\circ\text{C}$ .

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1/TO-220F2	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-247		40	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220F1/TO-220F2	$\theta_{JC}$	3.67	$^\circ\text{C}/\text{W}$
	TO-247		0.94	$^\circ\text{C}/\text{W}$

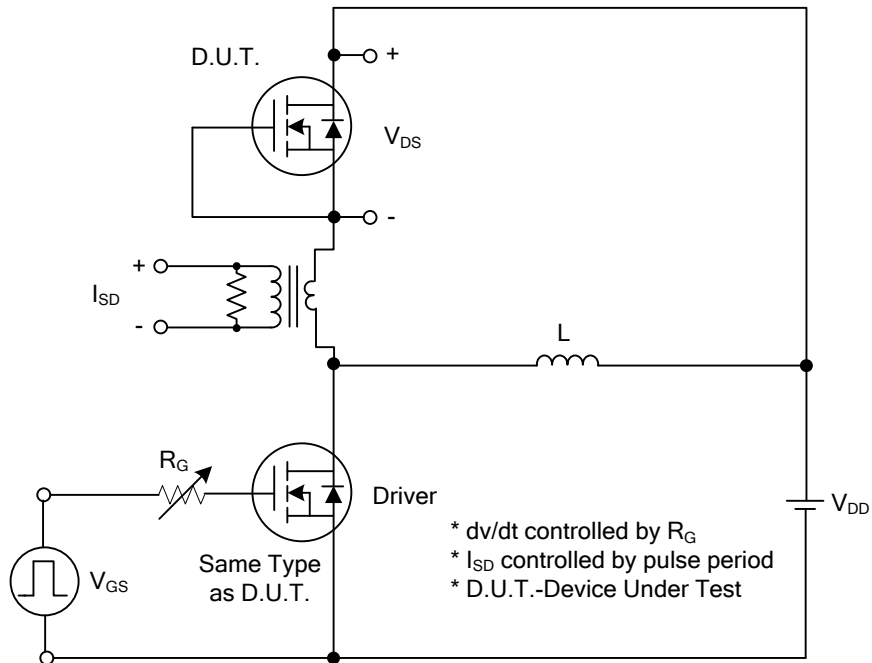
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>								
Drain-Source Breakdown Voltage		$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	700			V	
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=700V, V_{GS}=0V$			10	$\mu A$	
Gate-Source Leakage Current	Forward	$I_{GSS}$	$V_{DS}=0V, V_{GS}=+30V$			+100	nA	
	Reverse		$V_{DS}=0V, V_{GS}=-30V$			-100	nA	
<b>ON CHARACTERISTICS</b>								
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5		4.5	V	
Drain-Source On-State Resistance		$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$			0.26	$\Omega$	
<b>DYNAMIC PARAMETERS</b>								
Input Capacitance		$C_{ISS}$	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$		1350		pF	
Output Capacitance		$C_{OSS}$				102.2		pF
Reverse Transfer Capacitance		$C_{RSS}$				87.2		pF
<b>SWITCHING PARAMETERS</b>								
Total Gate Charge (Note 1)		$Q_G$	$V_{DS}=560V, V_{GS}=10V, I_D=20A$ $I_G=1mA$ (Note 1, 2)		51		nC	
Gate to Source Charge		$Q_{GS}$				13.8		nC
Gate to Drain Charge		$Q_{GD}$				21.4		nC
Turn-on Delay Time (Note 1)		$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V, I_D=20A,$ $R_G=25\Omega$ (Note 1, 2)		19.2		ns	
Rise Time		$t_R$				32.3		ns
Turn-off Delay Time		$t_{D(OFF)}$				153		ns
Fall-Time		$t_F$				70.8		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>								
Maximum Body-Diode Pulsed Current		$I_S$				20	A	
Drain-Source Diode Forward Voltage (Note 1)		$I_{SM}$				40	A	
Maximum Body-Diode Continuous Current		$V_{SD}$	$I_S=20A, V_{GS}=0V$			1.4	V	
Reverse Recovery Time (Note 1)		$t_{rr}$	$I_S=20A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$		500		ns	
Reverse Recovery Charge		$Q_{rr}$				18.2		$\mu C$

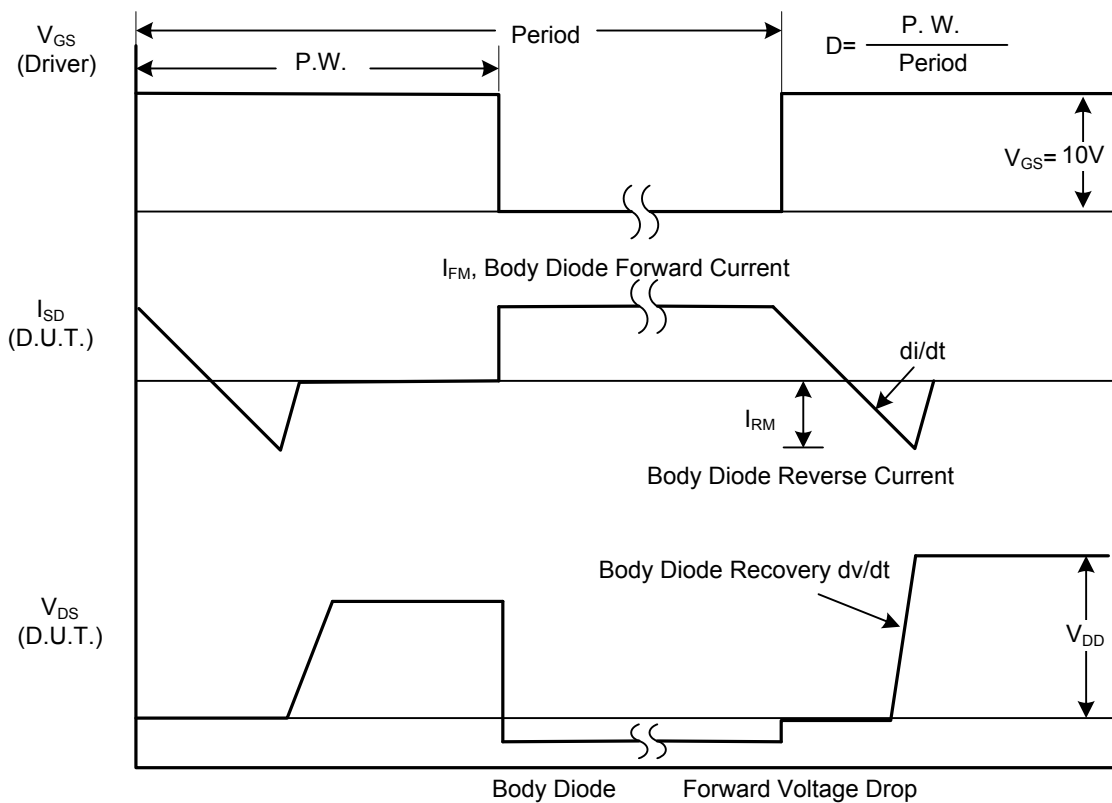
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

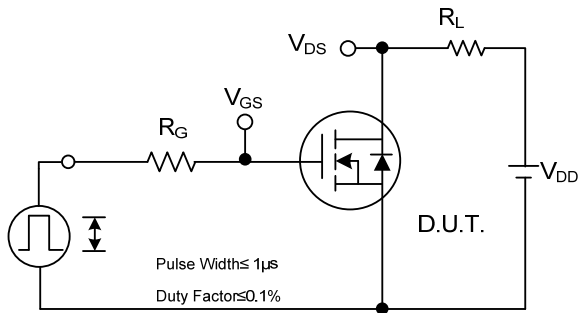


Peak Diode Recovery dv/dt Test Circuit

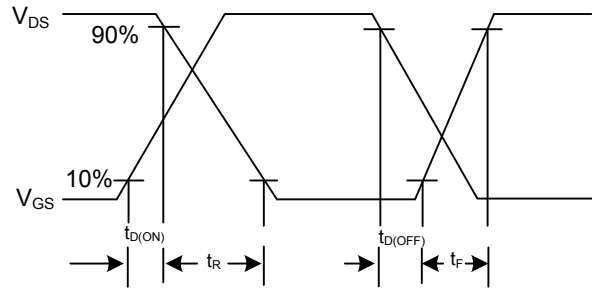


Peak Diode Recovery dv/dt Waveforms

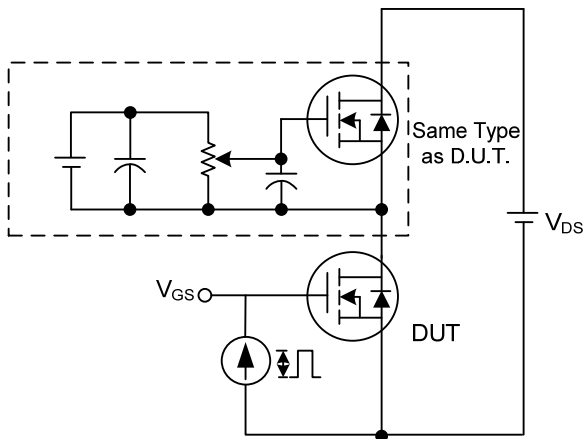
■ TEST CIRCUITS AND WAVEFORMS



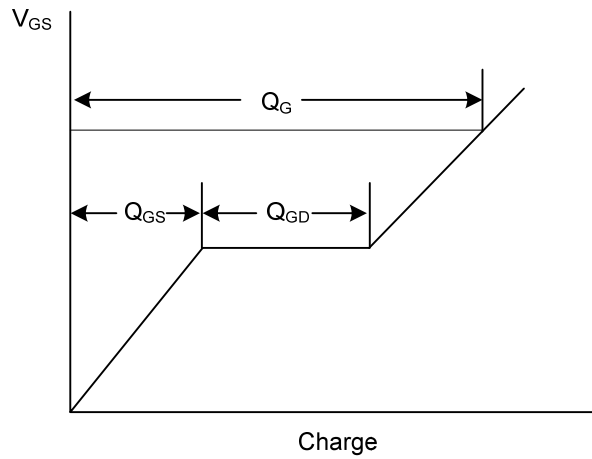
Switching Test Circuit



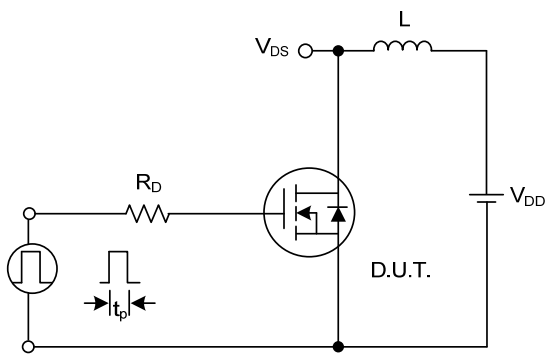
Switching Waveforms



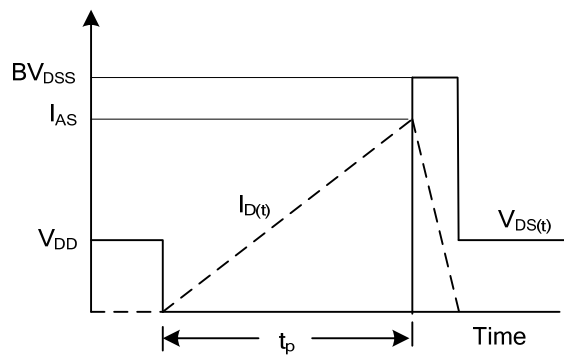
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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