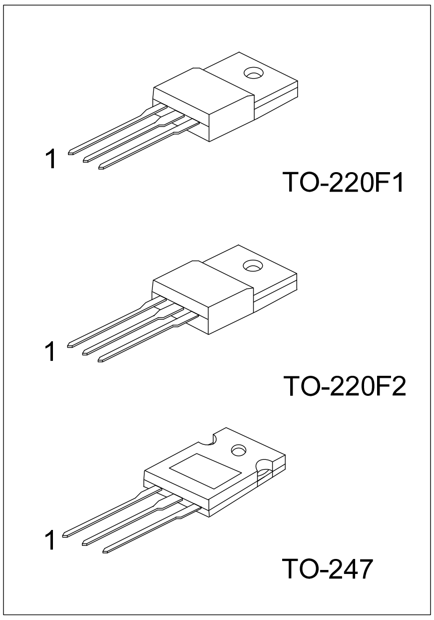
20A, 700V N-CHANNEL SUPER-JUNCTION MOSFET



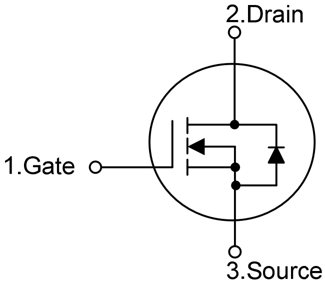
DESCRIPTION

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

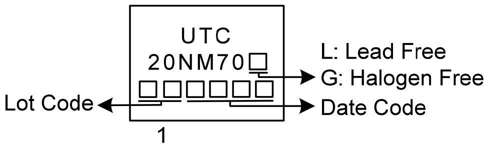
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20NM70L-TF1-T	20NM70G-TF1-T	TO-220F1	G	D	S	Tube
20NM70L-TF2-T	20NM70G-TF2-T	TO-220F2	G	D	S	Tube
20NM70L-T47-T	20NM70G-T47-T	TO-247	G	D	S	Tube

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

20NM70G-TF1-T
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube
(2) TF1: TO-220F1, TF2: TO-220F2, T47: TO-247
(3) G: Halogen Free and Lead Free, L: Lead Free

MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	700	V
Gate-Source Voltage		V_{GSS}	±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	°C
Storage Temperature Range		T_{STG}	-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=1mH, I_{AS}=6.3A, V_{DD}=50V, R_G=25Ω, Starting T_J = 25°C.
4. $I_{SD} \le 20A$, di/dt ≤ 200A/μs, $V_{DD} \le V_{(BR)DSS}$, T_J = 25°C.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1/TO-220F2	θ_{JA}	62.5	°C/W
	TO-247		40	°C/W
Junction to Case	TO-220F1/TO-220F2	θ_{JC}	3.67	°C/W
	TO-247		0.94	°C/W

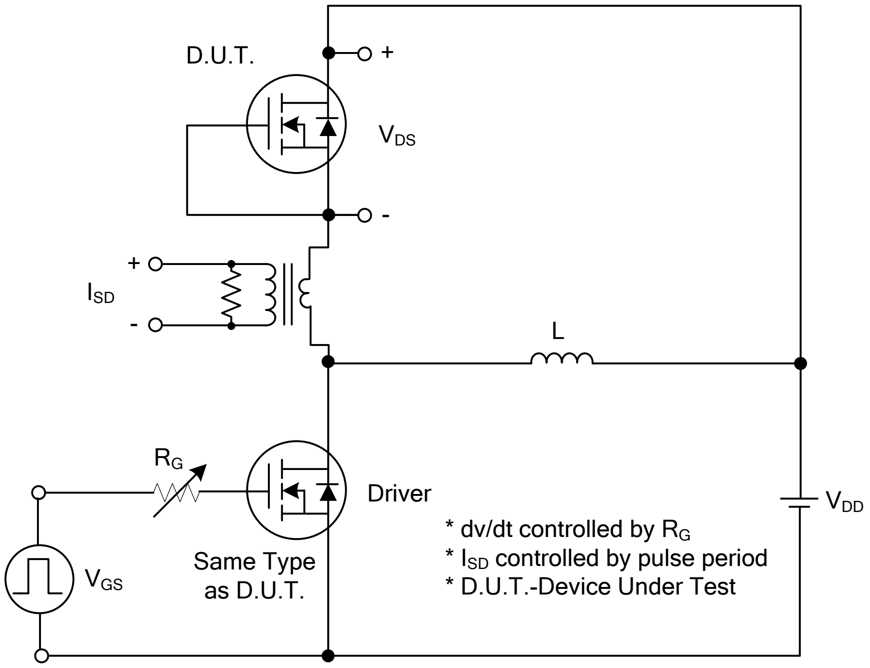
■ ELECTRICAL CHARACTERISTICS (T_J =25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	700			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=700V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{DS}=0V ,V_{GS}=+30V			+100	nA
	Reverse		V_{DS}=0V ,V_{GS}=-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}= V_{GS}, I_D=250μA	2.5		4.5	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=10A			0.26	Ω
DYNAMIC PARAMETERS							
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
SWITCHING PARAMETERS							
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=25Ω (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
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
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/μs		500		ns
Reverse Recovery Charge		Q_{rr}			18.2		μC

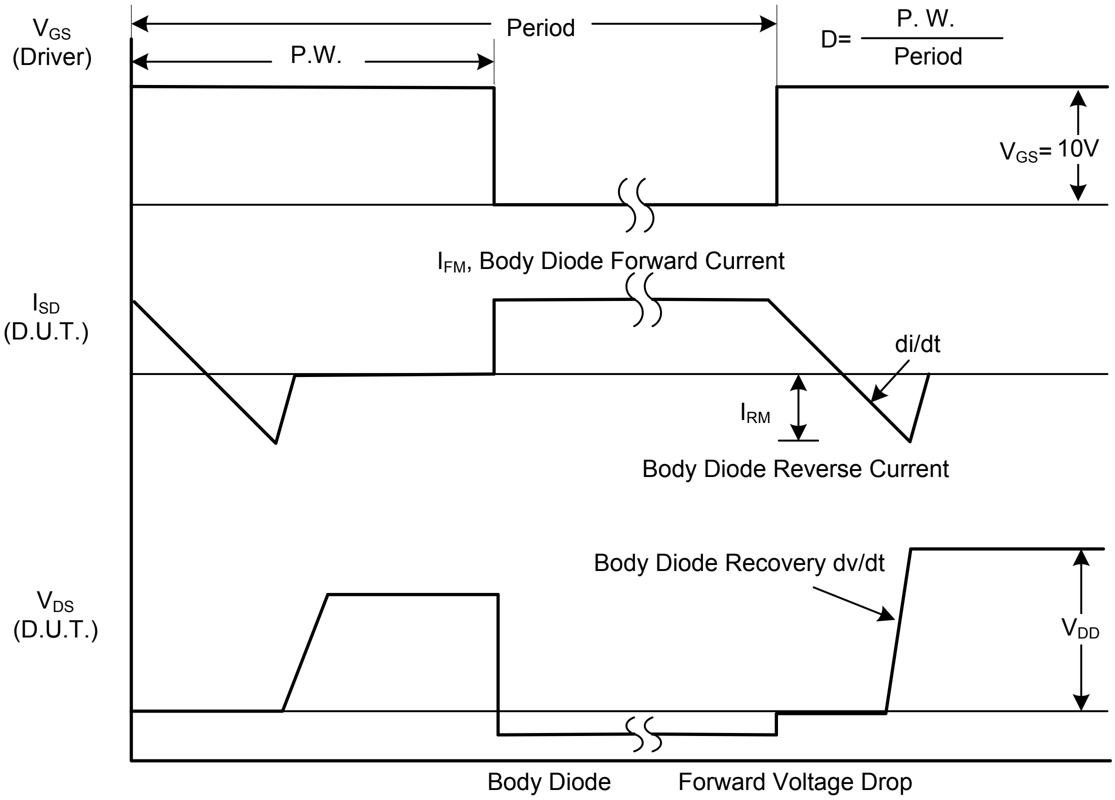
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

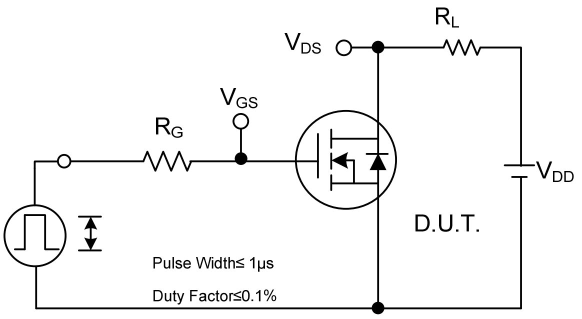


Peak Diode Recovery dv/dt Test Circuit

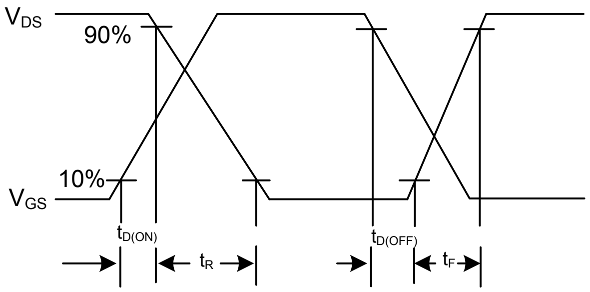


Peak Diode Recovery dv/dt Waveforms

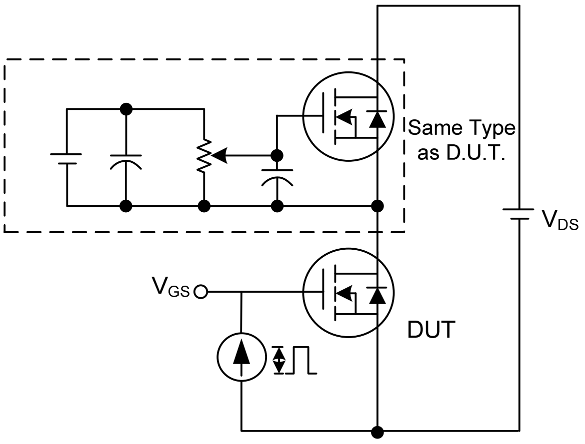
■ TEST CIRCUITS AND WAVEFORMS



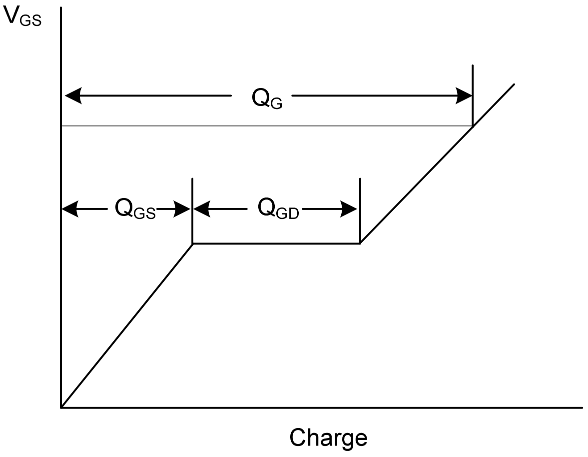
Switching Test Circuit



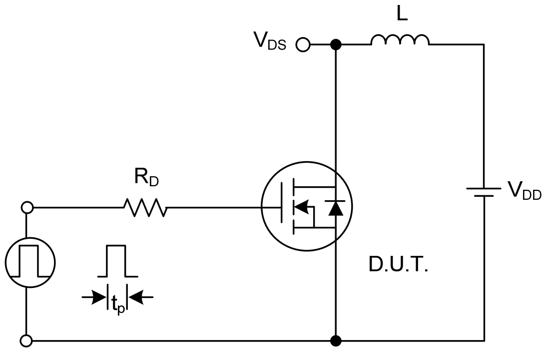
Switching Waveforms



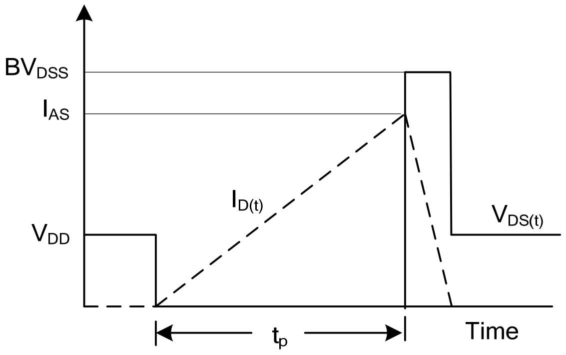
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms