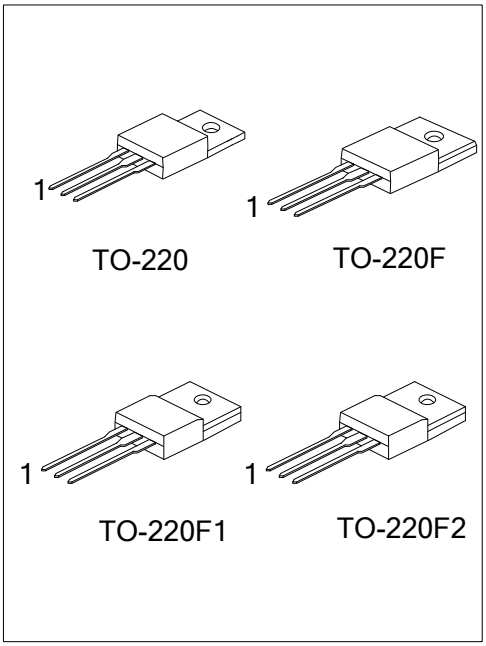
22A, 500V N-CHANNEL SUPER-JUNCTION MOSFET



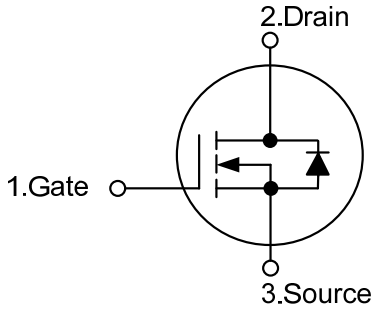
■ DESCRIPTION

The **UTC 22NM50** 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

* $R_{DS(ON)} \leq 0.15\ \Omega$ @ V_{GS}=10V, I_D=11A
* Fast Switching Capability
* Avalanche Energy Specified
* Improved dv/dt Capability, High Ruggedness

■ SYMBOL



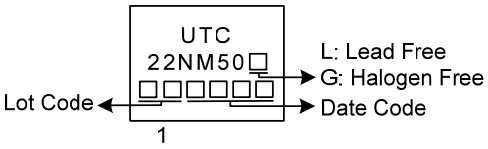
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
22NM50L-TA3-T	22NM50G-TA3-T	TO-220	G	D	S	Tube
22NM50L-TF3-T	22NM50G-TF3-T	TO-220F	G	D	S	Tube
22NM50L-TF1-T	22NM50G-TF1-T	TO-220F1	G	D	S	Tube
22NM50L-TF2-T	22NM50G-TF2-T	TO-220F2	G	D	S	Tube

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

22NM50G-TA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2 (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}	500	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	22	A
	Pulsed (Note 2)	I_{DM}	44	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	968	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6.9	V/ns
Power Dissipation	TO-220	P_D	118	W
	TO-220F/TO-220F1 TO-220F2		34	W
Junction Temperature		T_J	+150	°C
Storage Temperature		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 = 100mH, I_{AS} = 4.4A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. I_{SD} ≤ 22A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

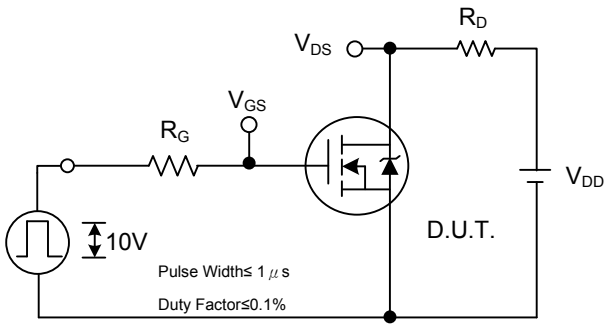
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220	θ_{JC}	1.06	°C/W
	TO-220F/TO-220F1 TO-220F2		3.68	°C/W

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

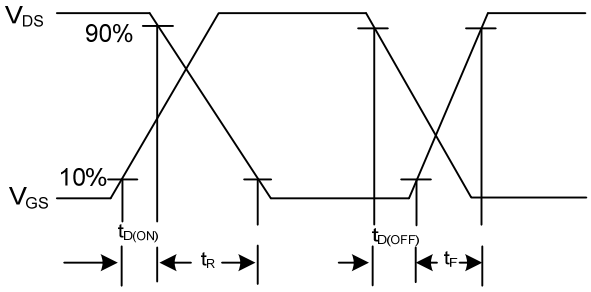
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	500			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=500V, V_{GS}=0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{DS}=0V, V_{GS}=+30V			+100	nA
	Reverse		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
Static Drain-Source On-Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=11A			0.15	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1.0MHz		1440		pF
Output Capacitance		C_{OSS}			1385		pF
Reverse Transfer Capacitance		C_{RSS}			119		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=400V, V_{GS}=10V, I_D=22A I_G= 1mA (Note1, 2)		68		nC
Gate to Source Charge		Q_{GS}			18		nC
Gate to Drain Charge		Q_{GD}			28		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DS}=100V, V_{GS}=10V, I_D=22A, R_G=25Ω (Note1, 2)		18		ns
Rise Time		t_R			40		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			200		ns
Fall-Time		t_F			42		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				22	A
Maximum Body-Diode Pulsed Current		I_{SM}				44	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=22A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S=22A, V_{GS}=0V, dI_F/dt=100A/μs		440		ns
Body Diode Reverse Recovery Charge		Q_{rr}			8		μC

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

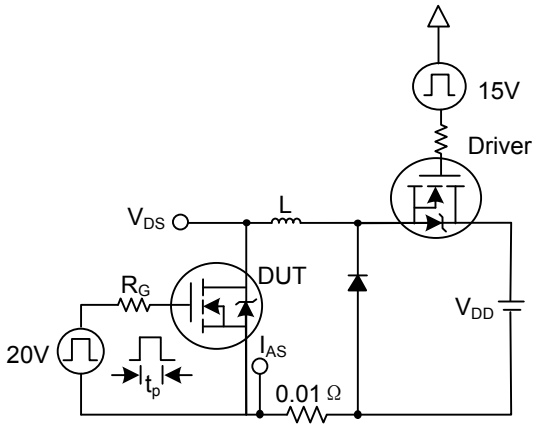
■ TEST CIRCUITS AND WAVEFORMS



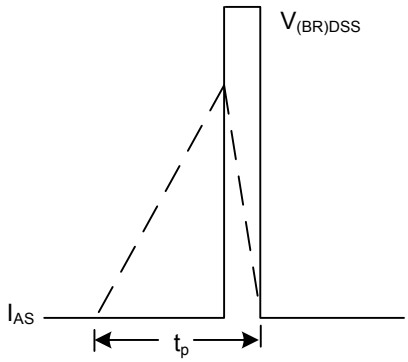
Switching Test Circuit



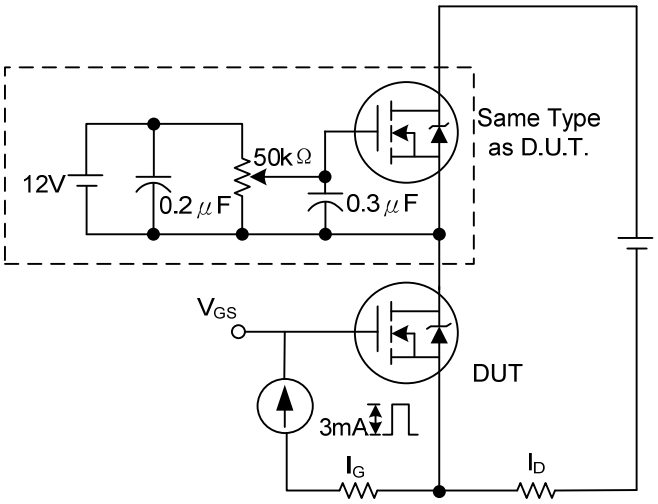
Switching Waveforms



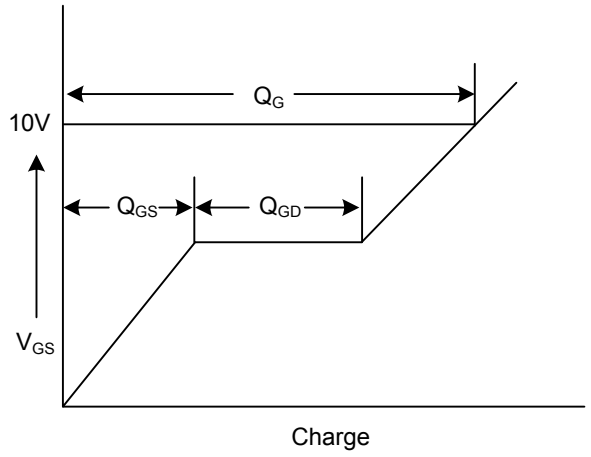
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms



Gate Charge Test Circuit



Gate Charge Waveform

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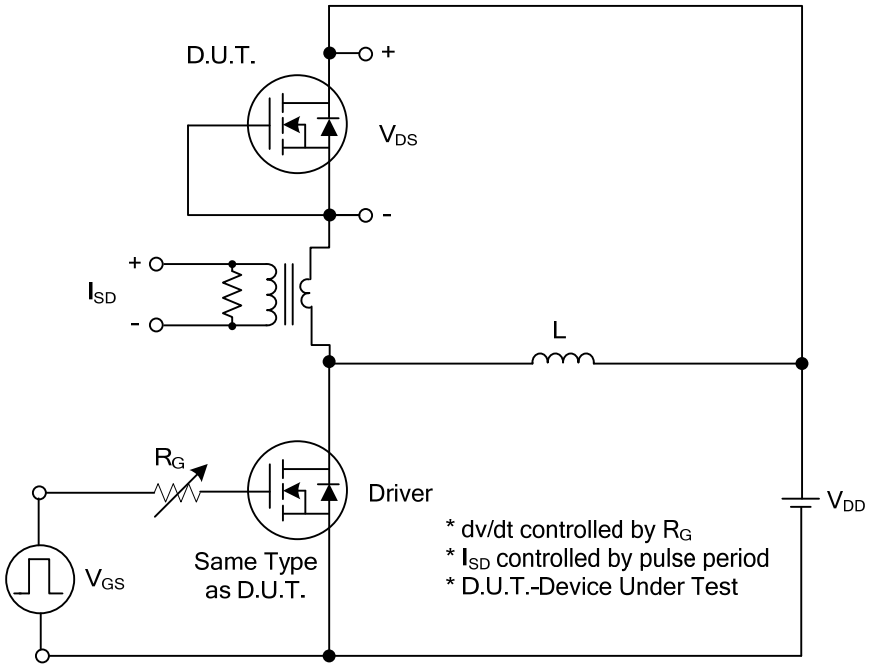

Peak Diode Recovery dv/dt Test Circuit