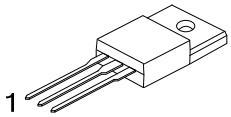
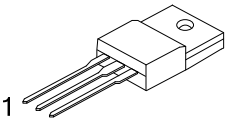
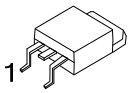
6.0A, 500V N-CHANNEL SUPER-JUNCTION MOSFET



TO-220F



TO-220F1



TO - 252

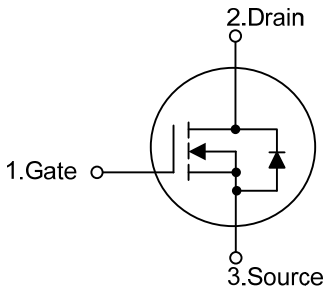
■ DESCRIPTION

The **UTC 6NM50** 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

* $R_{DS(on)}$ < 0.9Ω @ V_{GS}=10V, I_D=3.0A
* Improved dv/dt capability
* Fast switching
* 100% avalanche tested

■ SYMBOL



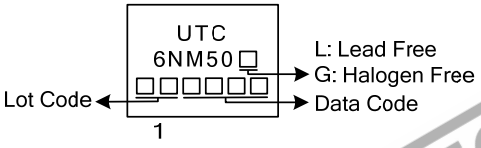
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
6NM50L-TF1-T	6NM50G-TF1-T	TO-220F	G	D	S	Tube
6NM50L-TF3-T	6NM50G-TF3-T	TO-220F1	G	D	S	Tube
6NM50L-TN3-R	6NM50G-TN3-R	TO-252	G	D	S	Tape Reel

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

6NM50L-TF1-T (1)Packing Type (2)Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF3: TO-220F, TN3: TO-252 (3) L: Lead Free, G: Halogen Free and 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 (T_C=25°C)	Continuous	I_D	6.0	A
	Pulsed (Note 2)	I_{DM}	24	A
Avalanche Current (Note 2)		I_{AR}	2.6	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	155	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.4	V/ns
Power Dissipation	TO-220F/TO-220F1	P_D	31	W
	TO-252		50	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=46mH, I_{AS}=2.6A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C
4. I_{SD}≤6.0A, di/dt≤200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL RESISTANCES CHARACTERISTICS

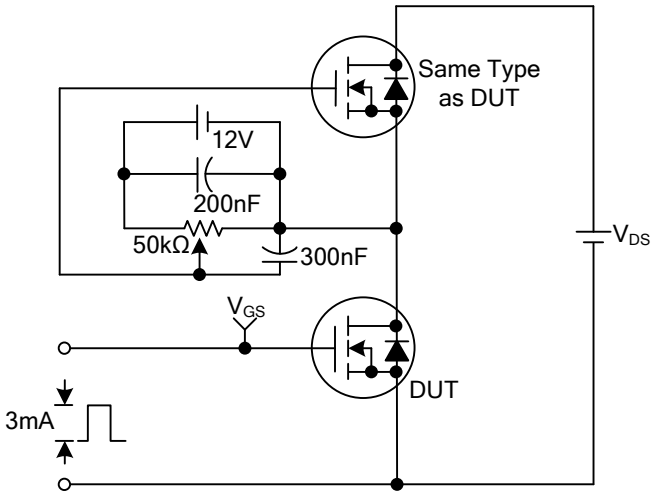
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220F/TO-220F1	$θ_{JA}$	62.5	°C/W
	TO-252		110	°C/W
Junction to Case	TO-220F/TO-220F1	$θ_{JC}$	4.0	°C/W
	TO-252		2.5	°C/W

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

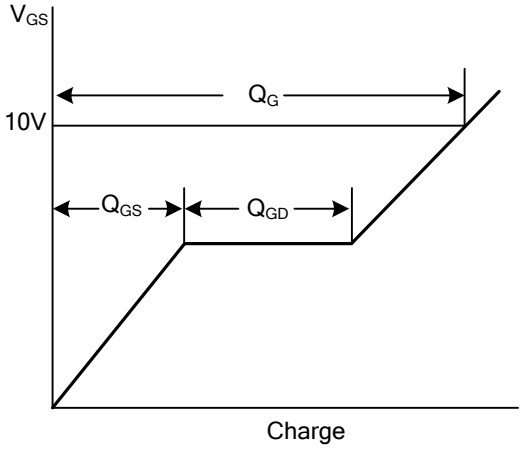
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0V, I_D = 250μA	500			V
Drain-Source Leakage Current		I_{DSS}	V_{DS} = 500V, V_{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30V, V_{DS} = 0V			100	nA
	Reverse		V_{GS} = -30V, V_{DS} = 0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5		4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10V, I_D = 3.0A			0.9	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS}=25V, V_{GS}=0V, f=1.0MHz		295		pF
Output Capacitance		C_{OSS}			200		pF
Reverse Transfer Capacitance		C_{RSS}			40		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=50V, V_{GS}=10V, I_D=1.3A , I_G=100μA (Note 1, 2)		37		nC
Gate to Source Charge		Q_{GS}			3		nC
Gate to Drain Charge		Q_{GD}			10		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=30V, V_{GS}=10V, I_D=0.5A, R_G=25Ω (Note 1, 2)		35		nS
Rise Time		t_R			68		nS
Turn-OFF Delay Time		$t_{D(OFF)}$			130		nS
Fall-Time		t_F			70		nS
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				6	A
Maximum Body-Diode Pulsed Current		I_{SM}				24	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	V_{GS} = 0V, I_S = 6.0A			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	V_{GS} = 0V, I_S = 6.0A, dI_F / dt =100A/μs (Note 1)		285		nS
Body Diode Reverse Recovery Charge		Q_{rr}			2.3		μC

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

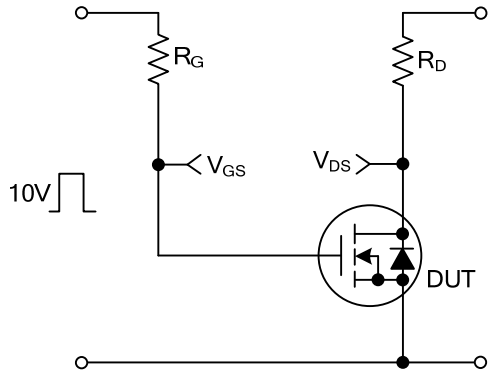
■ TEST CIRCUITS AND WAVEFORMS



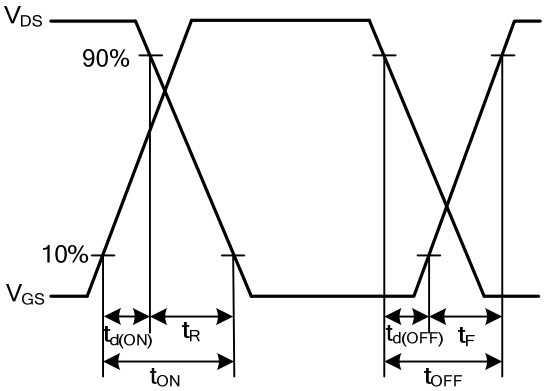
Gate Charge Test Circuit



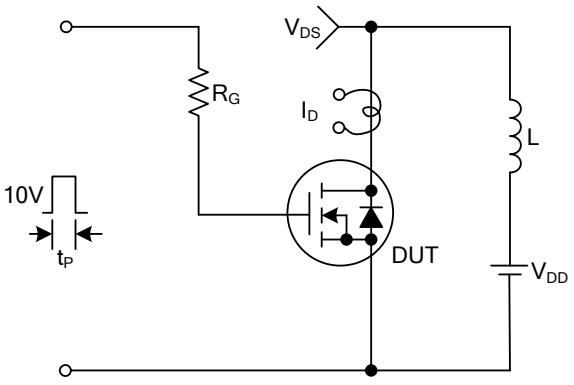
Gate Charge Waveforms



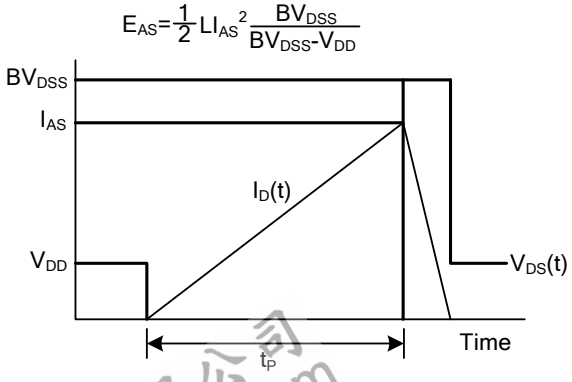
Resistive Switching Test Circuit



Resistive Switching Waveforms

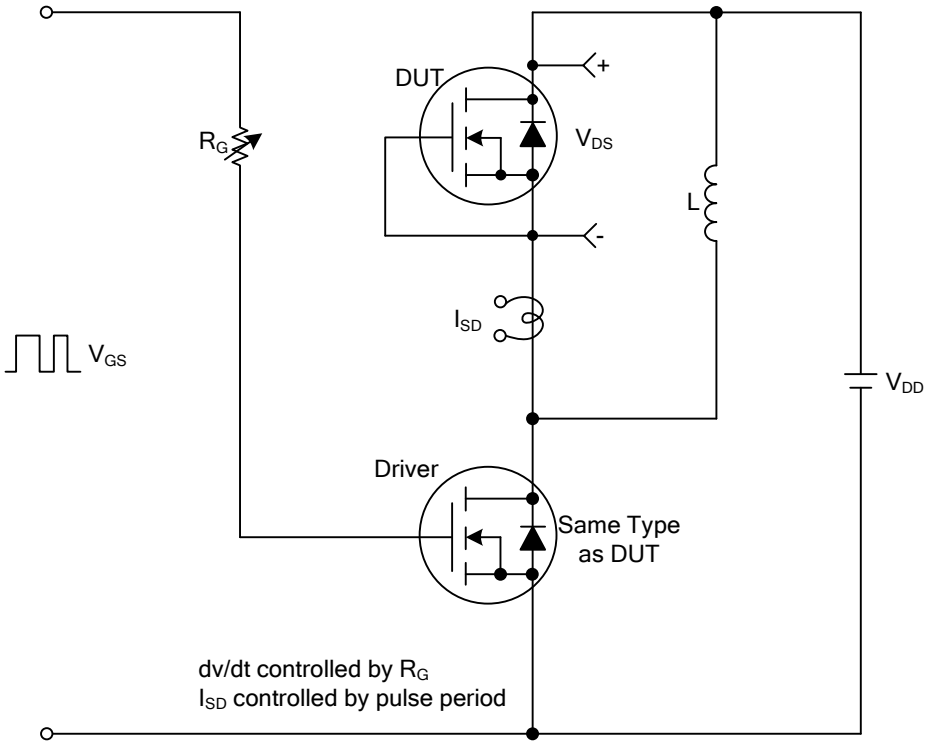


Unclamped Inductive Switching Test Circuit

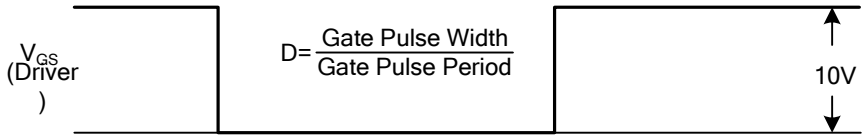


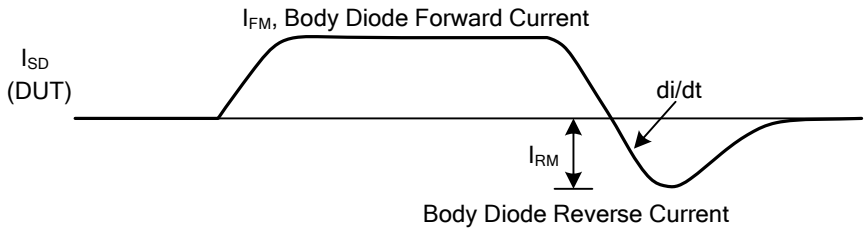
Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS(Cont.)



Peak Diode Recovery dv/dt Test Circuit & Waveforms





Body Diode Reverse Current