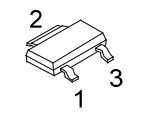
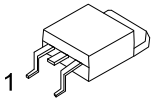
3.0A, 500V N-CHANNEL SUPER-JUNCTION MOSFET



SOT-223-2



TO-252

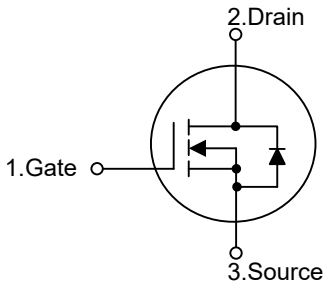
■ DESCRIPTION

The **UTC 3NM50** 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

* $R_{DS(ON)} \leq 1.5\ \Omega$ @ V_{GS}=10V, I_D=1.5A
* High Switching Speed
* 100% Avalanche Tested

■ SYMBOL



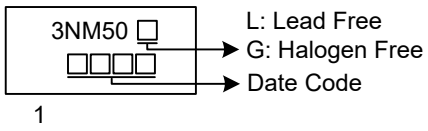
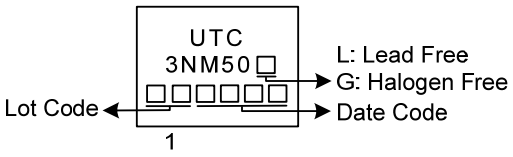
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3NM50L-AA2-R	3NM50G-AA2-R	SOT-223-2	G	D	S	Tape Reel
3NM50L-TN3-R	3NM50G-TN3-R	TO-252	G	D	S	Tape Reel

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

3NM50G-AA2-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) AA2: SOT-223-2, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

SOT-223-2	TO-252
	

■ 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	3.0	A
	Pulsed (Note 2)	I_{DM}	9	A
Avalanche Energy (Note 3)	Single Pulsed	E_{AS}	144	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3	V/ns
Power Dissipation	SOT-223-2	P_D	3.9	W
	TO-252		17	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 = 144mH, I_{AS} = 1.4A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C.
4. I_{SD} ≤ 3.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223-2	θ_{JA}	150	°C/W
	TO-252		110	°C/W
Junction to Case	SOT-223-2	θ_{JC}	32.05	°C/W
	TO-252		7.35	°C/W

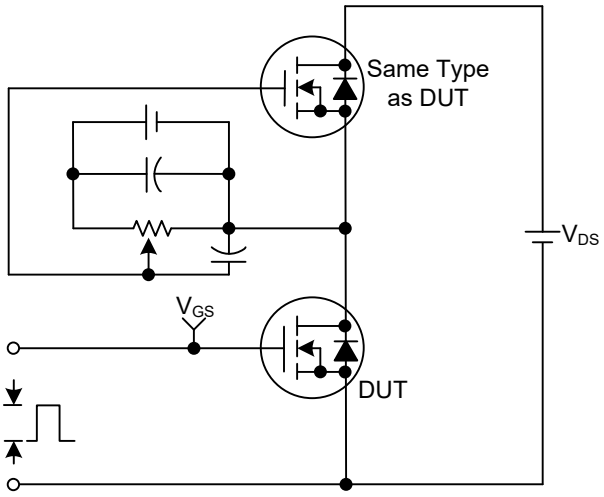
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

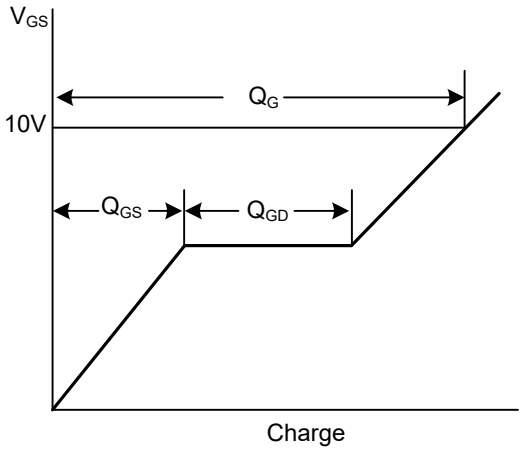
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	I_D=250μA, V_{GS}=0V	500			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=500V, V_{GS}=0V			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=+30V, V_{DS}=0V			+100	nA
	Reverse		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=1.5A			1.5	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=50V, f=1.0MHz		142		pF
Output Capacitance		C_{OSS}			70		pF
Reverse Transfer Capacitance		C_{RSS}			8		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=50V, V_{GS}=10V, I_D=1.5A, (Note 1, 2)		13		nC
Gate to Source Charge		Q_{GS}			5		nC
Gate to Drain Charge		Q_{GD}			5		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD} =100V, V_{GS}=10V, I_D =3A, R_G=25Ω (Note 1, 2)		6		ns
Rise Time		t_R			20		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			21		ns
Fall-Time		t_F			21		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				3	A
Maximum Body-Diode Pulsed Current		I_{SM}				9	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S=3.0A, V_{GS}=0V			1.4	V
Reverse Recovery Time (Note 1)		t_{rr}	I_S=3.0A, V_{GS}=0V, dI_F/dt = 100A/μs		144		ns
Reverse Recovery Charge		Q_{rr}			827		nC

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

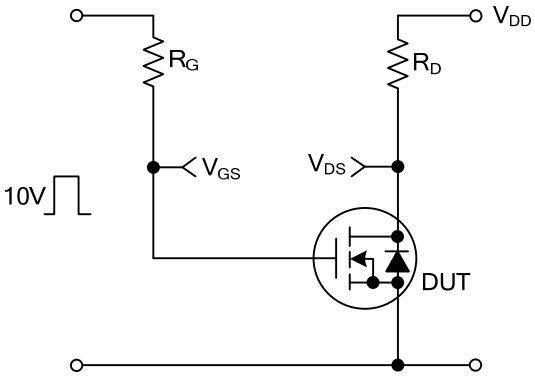
■ TEST CIRCUITS AND WAVEFORMS



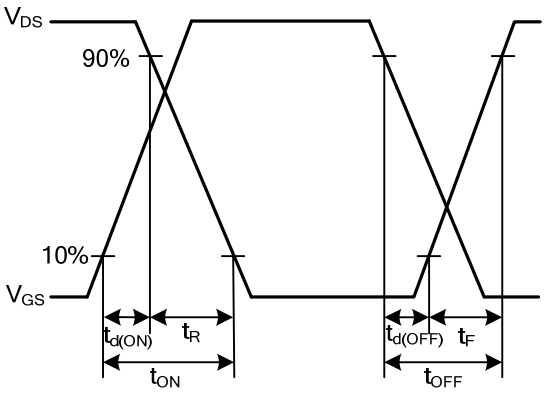
Gate Charge Test Circuit



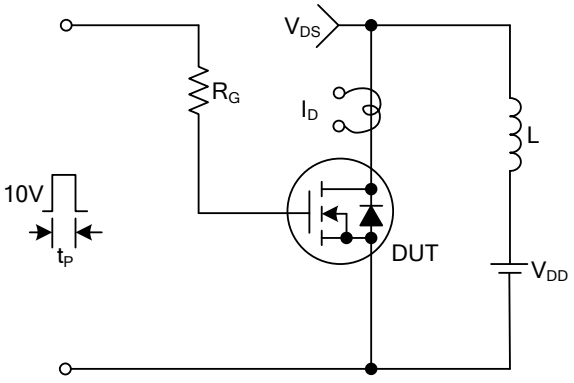
Gate Charge Waveforms



Resistive Switching Test Circuit

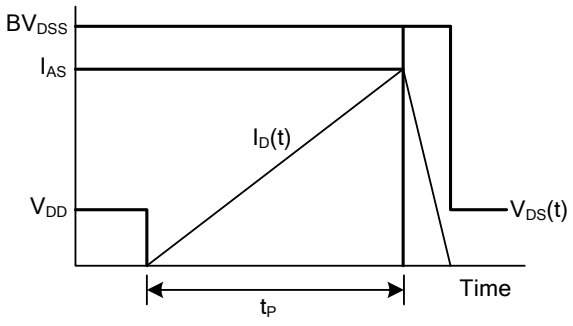


Resistive Switching Waveforms



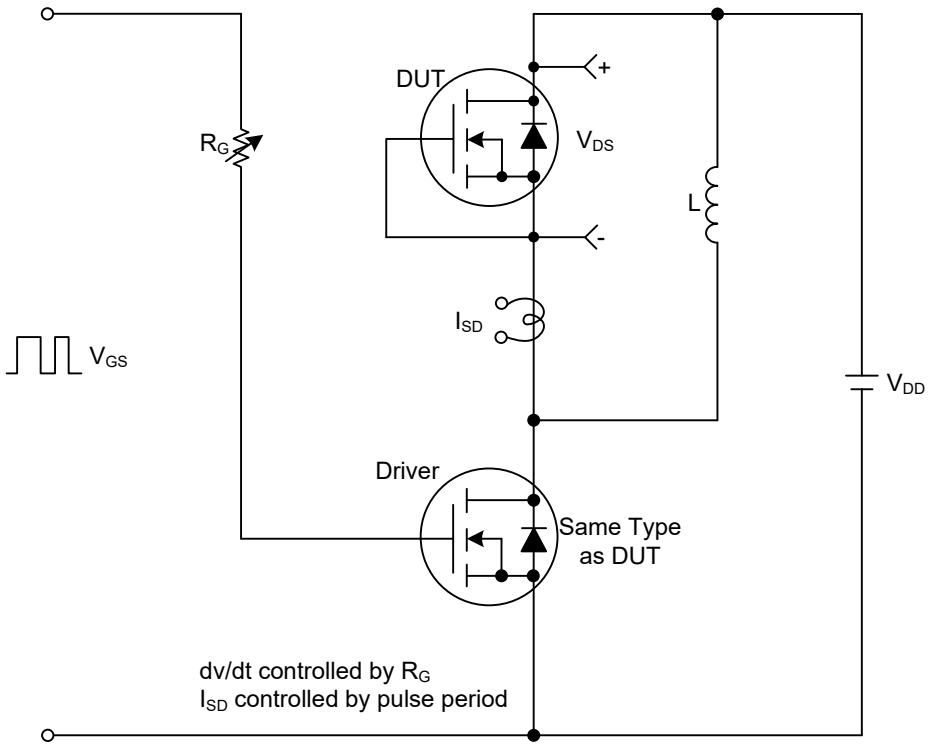
Unclamped Inductive Switching Test Circuit

$$E_{AS}=\frac{1}{2}LI_{AS}^{2}\frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$



Unclamped Inductive Switching Waveforms

■ TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit & Waveforms