



# 15NM50-U2

**Power MOSFET**

## 15A, 500V N-CHANNEL SUPER-JUNCTION MOSFET

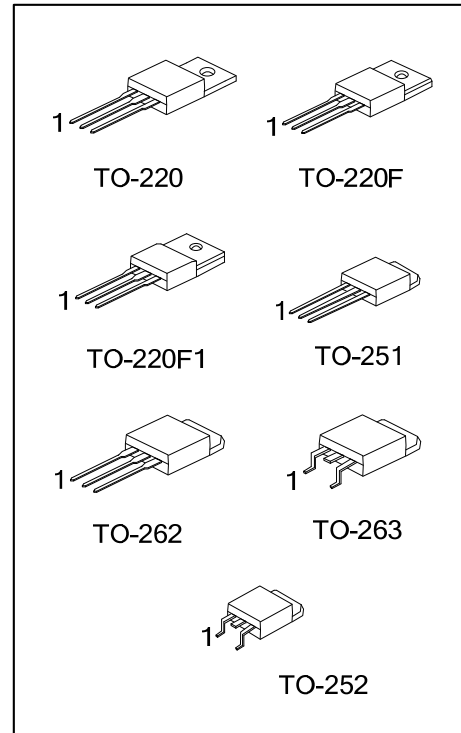
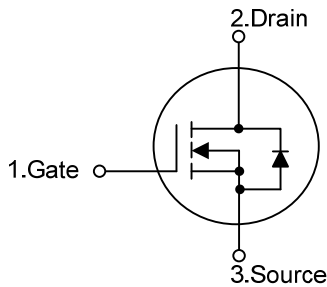
■ DESCRIPTION

The **UTC 15NM50-U2** 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

- \*  $R_{DS(ON)} \leq 0.35\Omega @ V_{GS}=10V, I_D=7.5A$
- \* By using Super Junction Structure
- \* Fast Switching
- \* With 100% Avalanche Tested

■ SYMBOL



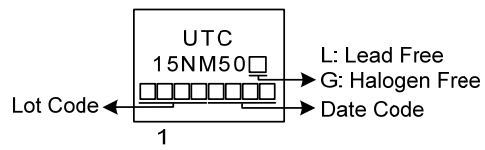
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
15NM50L-TA3-T	15NM50G-TA3-T	TO-220	G	D	S	Tube
15NM50L-TF1-T	15NM50G-TF1-T	TO-220F1	G	D	S	Tube
15NM50L-TF3-T	15NM50G-TF3-T	TO-220F	G	D	S	Tube
15NM50L-TM3-T	15NM50G-TM3-T	TO-251	G	D	S	Tube
15NM50L-TN3-R	15NM50G-TN3-R	TO-252	G	D	S	Tape Reel
15NM50L-T2Q-T	15NM50G-T2Q-T	TO-262	G	D	S	Tube
15NM50L-TQ2-T	15NM50G-TQ2-T	TO-263	G	D	S	Tube
15NM50L-TQ2-R	15NM50G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>15NM50G-TA3-T</p> <ul style="list-style-type: none"> <li>(1)Packing Type</li> <li>(2)Package Type</li> <li>(3)Green Package</li> </ul>	<p>(1) T: Tube, R: Tape Reel                  (2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TM3: TO-251, TN3: TO-252, T2Q: TO-262, TQ2: TO-263                  (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		$V_{DSS}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	15	A
	Pulsed (Note 2)	$I_{DM}$	60	A
Avalanche Current (Note 2)		$I_{AR}$	6.4	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	450	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.2	V/ns
Power Dissipation	TO-220F/TO-220F1	$P_D$	41	W
	TO-251/TO-252		75	W
	TO-220/TO-262/TO-263		90	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.  $L=22\text{mH}$ ,  $I_{AS}=6.4\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .

4.  $I_{SD} \leq 13\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J = 25^\circ\text{C}$ .

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-262/ TO-263	$\theta_{JA}$	62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1		3	$^\circ\text{C}/\text{W}$
Junction to Case	TO-251/TO-252	$\theta_{JC}$	1.6	$^\circ\text{C}/\text{W}$
	TO-220/TO-262/TO-263		1.38	$^\circ\text{C}/\text{W}$

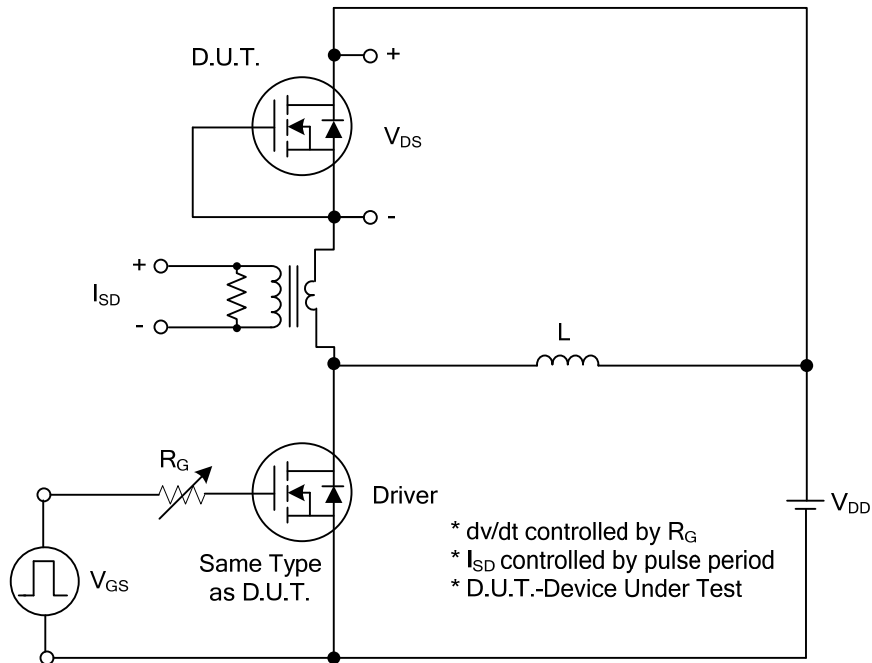
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	500			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =500V, V <sub>GS</sub> =0V			10	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V			±100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA	2.5		4.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =7.5A			0.35	Ω
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		755		pF
Output Capacitance	C <sub>OSS</sub>			270		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			106		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =1.3A , I <sub>G</sub> =100μA (Note 1, 2)		75		nC
Gate to Source Charge	Q <sub>GS</sub>			5.5		nC
Gate to Drain Charge	Q <sub>GD</sub>			23.5		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =200V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A, R <sub>G</sub> =25Ω (Note 1, 2)		7		ns
Rise Time	t <sub>R</sub>			23		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			80		ns
Fall-Time	t <sub>F</sub>			30		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				15	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				60	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =15A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs		330		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>				4.4	

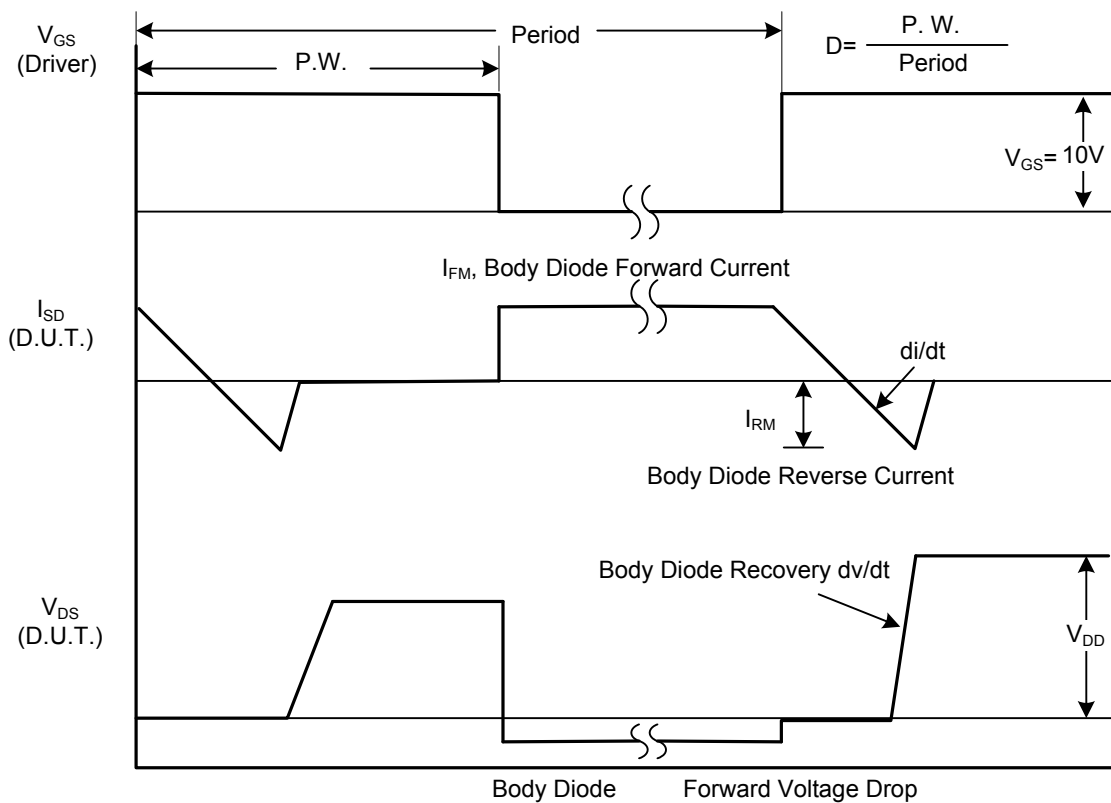
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS

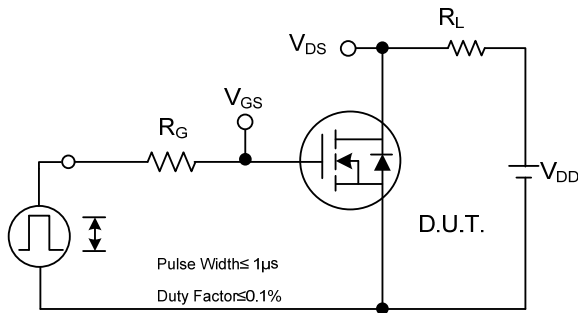


**Peak Diode Recovery dv/dt Test Circuit**

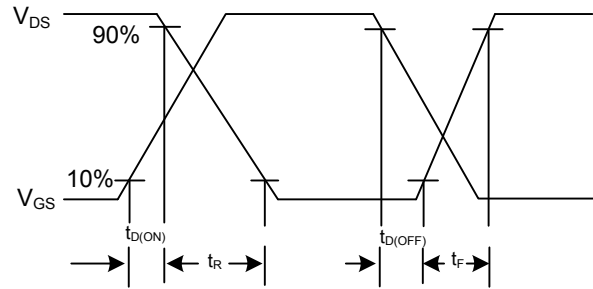


**Peak Diode Recovery dv/dt Waveforms**

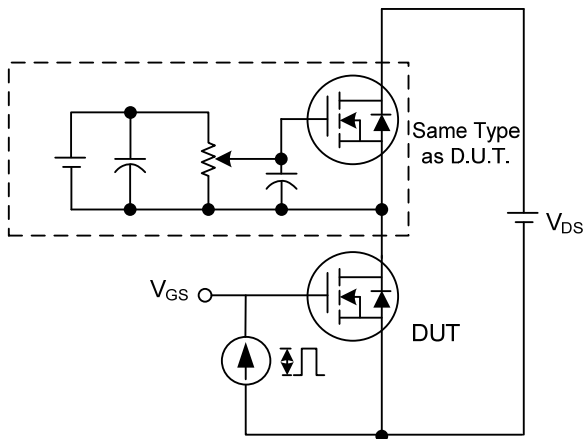
## TEST CIRCUITS AND WAVEFORMS (Cont.)



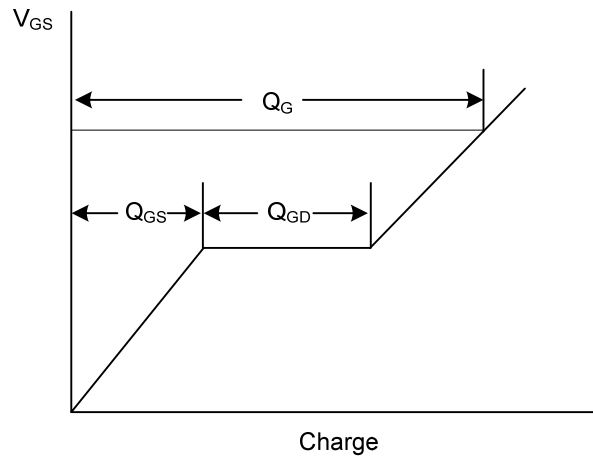
**Switching Test Circuit**



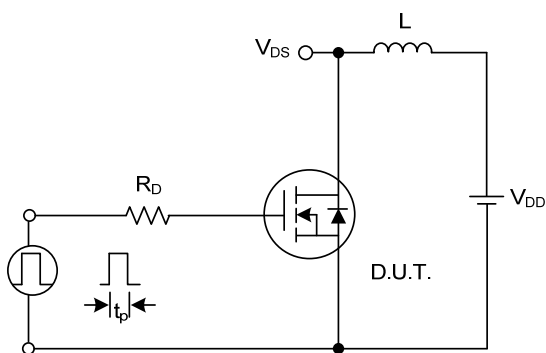
**Switching Waveforms**



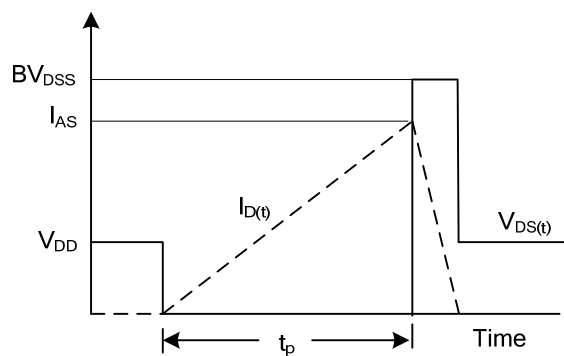
**Gate Charge Test Circuit**



**Gate Charge Waveform**

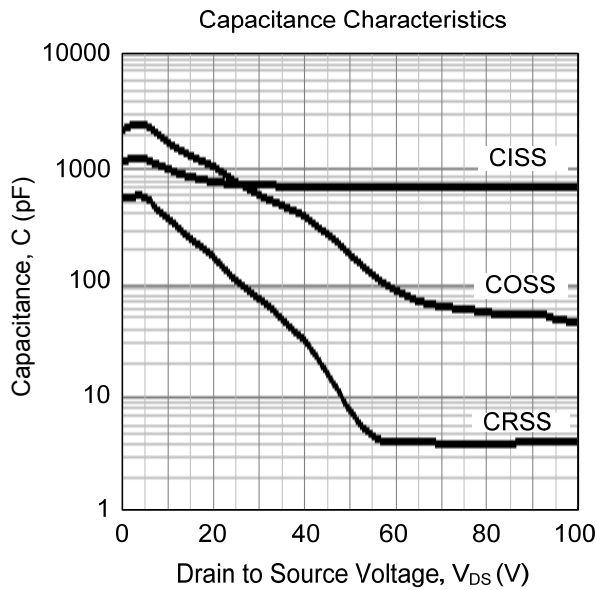


**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

■ TYPICAL CHARACTERISTICS



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