



## 11A, 500V N-CHANNEL SUPER-JUNCTION MOSFET

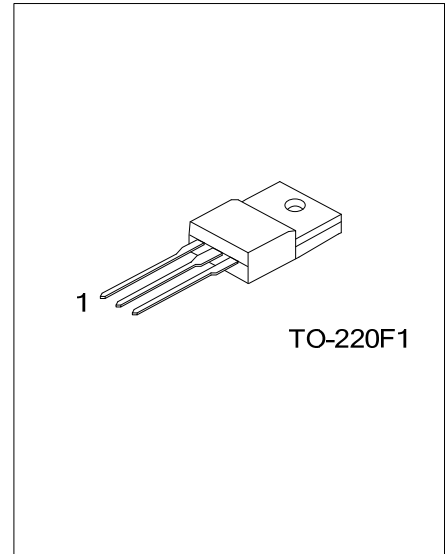
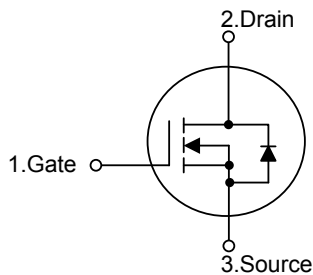
### DESCRIPTION

The **UTC 11NM50** 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

- \*  $R_{DS(ON)} < 0.32\Omega$  @  $V_{GS}=10V$ ,  $I_D=5.5A$
- \* High switching Speed
- \* 100% avalanche tested
- \* Improved dv/dt capability

### SYMBOL



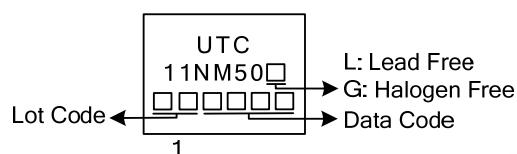
### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
11NM50L-TF1-T	11NM50G-TF1-T	TO-220F1	G	D	S	Tube

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

11NM50L-TF1-T	(1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube (2) TF1: TO-220F1 (3) L: Lead Free, G: Halogen Free and Lead Free
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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	$I_D$	11	A
	Pulsed (Note 2)	$I_{DM}$	44	A
Avalanche Current (Note 2)		$I_{AR}$	6.5	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	297	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.2	V/ns
Power Dissipation		$P_D$	40	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature		$T_{STG}$	-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.  $L = 22\text{mH}$ ,  $I_{AS} = 5.2\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$

4.  $I_{SD} \leq 11\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^{\circ}\text{C}$

■ THERMAL RESISTANCES CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	62.5	$^{\circ}\text{C}/\text{W}$
Junction to Case		$\theta_{JC}$	3.1	$^{\circ}\text{C}/\text{W}$

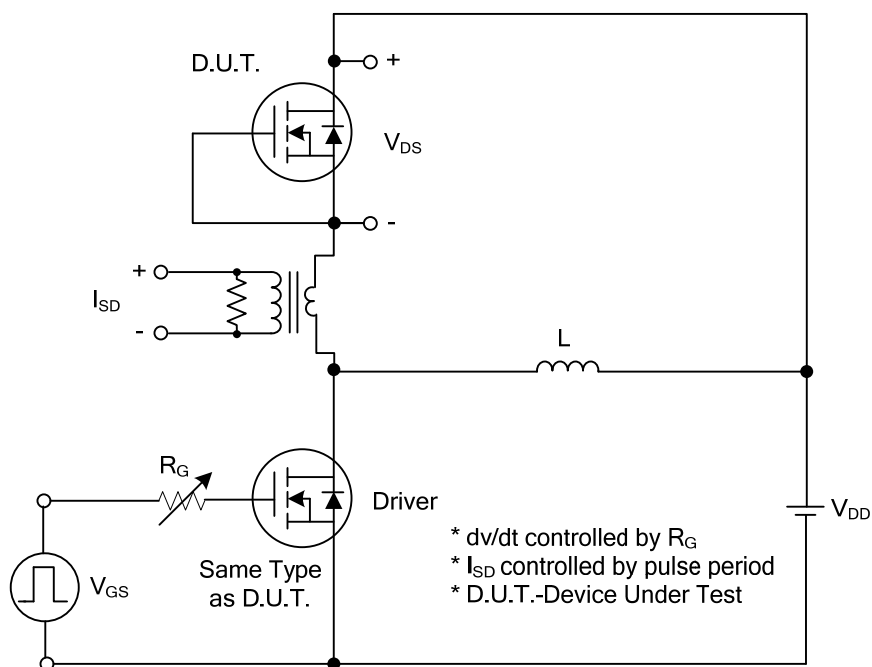
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
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	Forward	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =30V			+100	nA
	Reverse		V <sub>DS</sub> =0V, V <sub>GS</sub> =-30V			-100	nA
ON CHARACTERISTICS							
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> =5.5A			0.32	Ω
DYNAMIC PARAMETERS							
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>			630		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			62		pF
SWITCHING PARAMETERS							
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> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		58		ns
Rise Time		t <sub>R</sub>			139		ns
Turn-OFF Delay Time		t <sub>D(OFF)</sub>			218		ns
Fall-Time		t <sub>F</sub>			174		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Pulsed Current		I <sub>S</sub>				11	A
Drain-Source Diode Forward Voltage (Note 1)		I <sub>SM</sub>				44	A
Maximum Body-Diode Continuous Current		V <sub>SD</sub>	I <sub>S</sub> =11A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t <sub>rr</sub>	I <sub>S</sub> =11A, V <sub>GS</sub> =0V,		330		ns
Body Diode Reverse Recovery Charge		Q <sub>rr</sub>	dI <sub>F</sub> /dt=100A/μs		4.4		μC

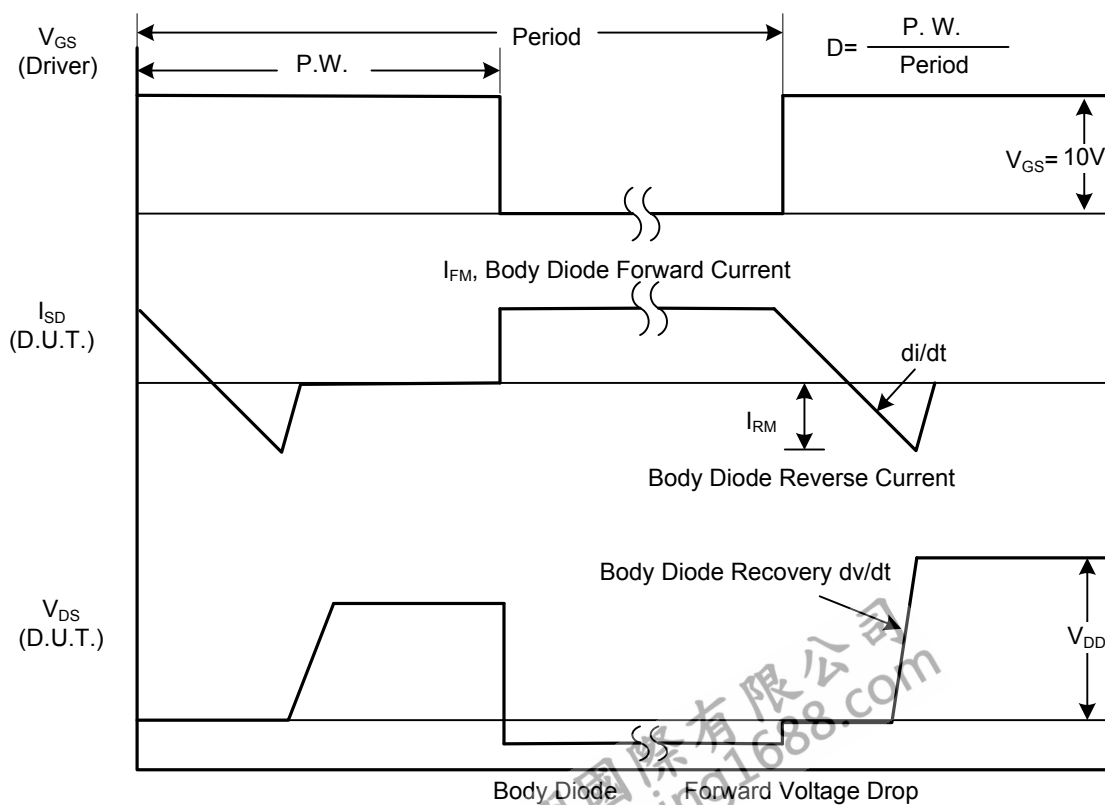
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

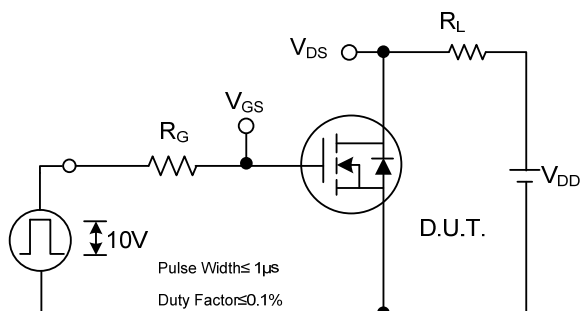


Peak Diode Recovery dv/dt Test Circuit

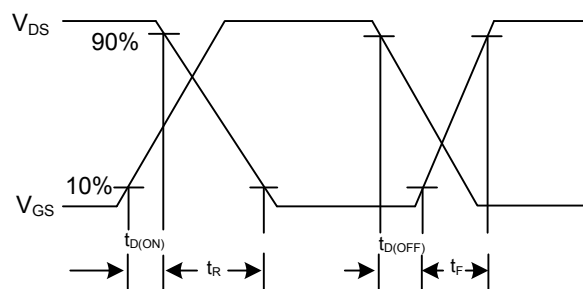


Peak Diode Recovery dv/dt Waveforms

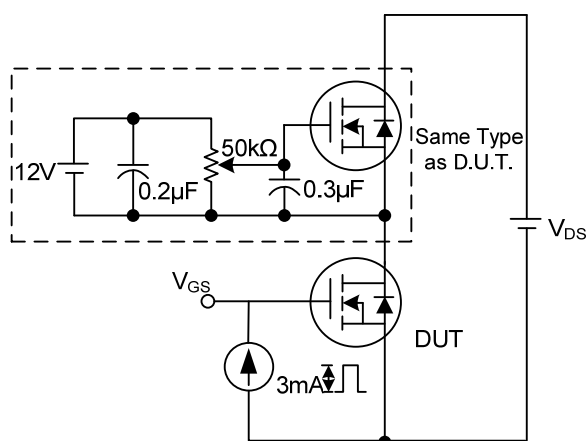
# ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



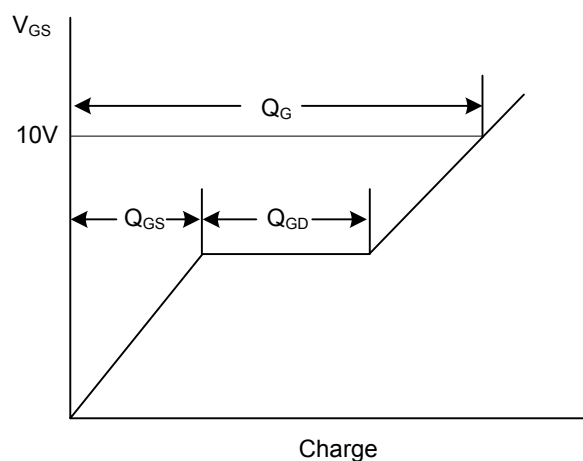
Switching Test Circuit



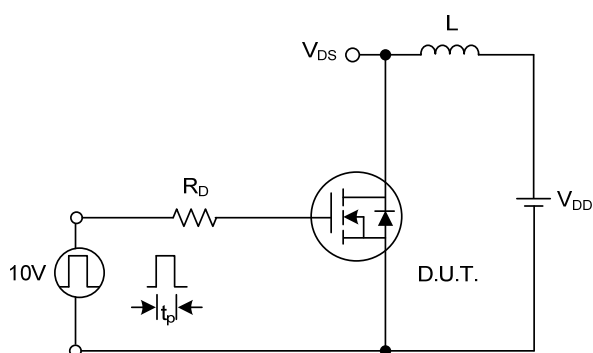
Switching Waveforms



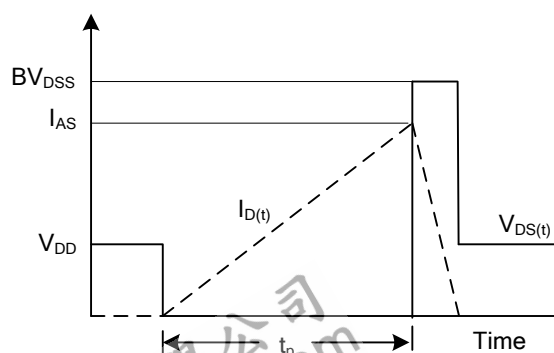
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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