



## 4NM80

Power MOSFET

### 4A, 800V N-CHANNEL SUPER-JUNCTION MOSFET

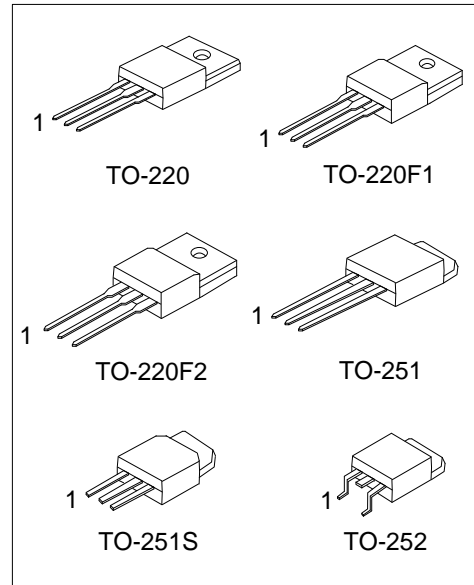
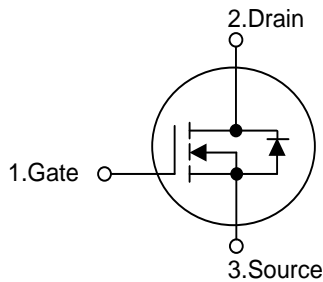
#### DESCRIPTION

The UTC 4NM80 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

- \*  $R_{DS(ON)} \leq 2.52 \Omega @ V_{GS}=10V, I_D=2.0A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL



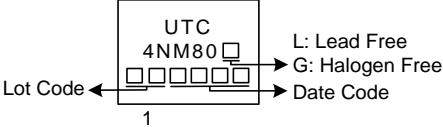
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4NM80L-TA3-T	4NM80G-TA3-T	TO-220	G	D	S	Tube
4NM80L-TF1-T	4NM80G-TF1-T	TO-220F1	G	D	S	Tube
4NM80L-TF2-T	4NM80G-TF2-T	TO-220F2	G	D	S	Tube
4NM80L-TM3-T	4NM80G-TM3-T	TO-251	G	D	S	Tube
4NM80L-TMS-T	4NM80G-TMS-T	TO-251S	G	D	S	Tube
4NM80L-TN3-R	4NM80G-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>4NM80G-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2 TM3: TO-251, TMS: TO-251S, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	800	V
Gate-Source Voltage		V <sub>GSS</sub>	±30	V
Drain Current	Continuous	I <sub>D</sub>	4.0	A
	Pulsed (Note 2)	I <sub>DM</sub>	16	A
Avalanche Current (Note 2)		I <sub>AR</sub>	1.5	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	179	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.93	V/ns
Power Dissipation	TO-220	P <sub>D</sub>	38	W
	TO-220F1/TO-220F2		21	W
	TO-251/TO-251S		22	W
	TO-252			
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-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=159mH, I<sub>AS</sub>=1.5A, V<sub>DD</sub>=50V, R<sub>G</sub>=25 Ω, Starting T<sub>J</sub> = 25°C

4. I<sub>SD</sub>≤4.0A, di/dt≤200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F1 TO-220F2	θ <sub>JA</sub>	62.5	°C/W
	TO-251/TO-251S TO-252		110	°C/W
Junction to Case	TO-220	θ <sub>JC</sub>	3.29	°C/W
	TO-220F1/TO-220F2		5.95	°C/W
	TO-251/TO-251S		5.68 (Note)	°C/W
	TO-252			

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

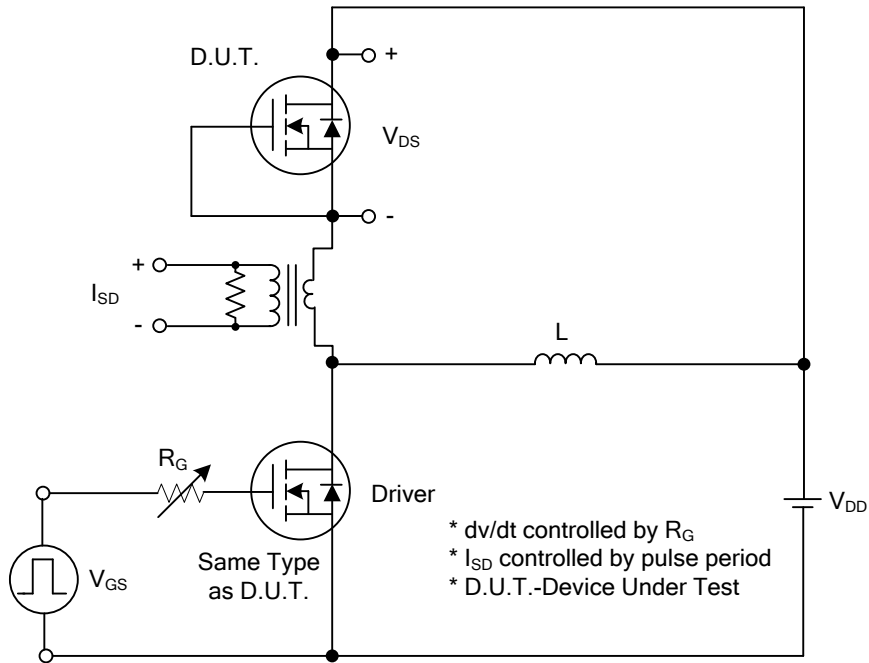
### ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

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	800			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 800V, V <sub>GS</sub> = 0V			10	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>			100	nA
	Reverse				V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V	-100
<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
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 2.0A			2.52	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		250		pF
Output Capacitance	C <sub>OSS</sub>			100		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			7		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =50V, I <sub>D</sub> =1.3A, I <sub>G</sub> =100μA V <sub>GS</sub> =10V (Note 1,2)		43		nC
Gate to Source Charge	Q <sub>GS</sub>			3.5		nC
Gate to Drain Charge	Q <sub>GD</sub>			9.5		nC
Turn-ON Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω, V <sub>GS</sub> =10V (Note 1,2)		35		nS
Rise Time	t <sub>R</sub>			50		nS
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			120		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>				4	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				16	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =4.0A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =4.0A, V <sub>GS</sub> =0V		370		nS
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		di <sub>F</sub> /dt=100A/μs		2.68	

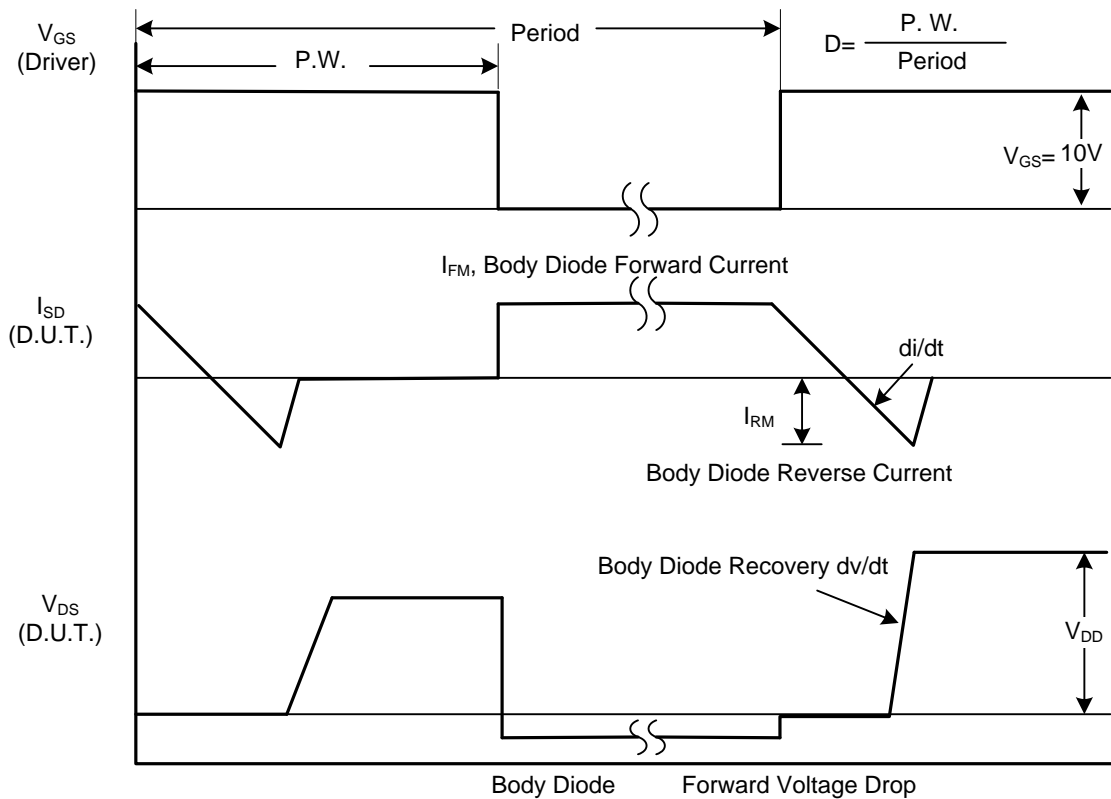
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating ambient temperature.

## TEST CIRCUITS AND WAVEFORMS

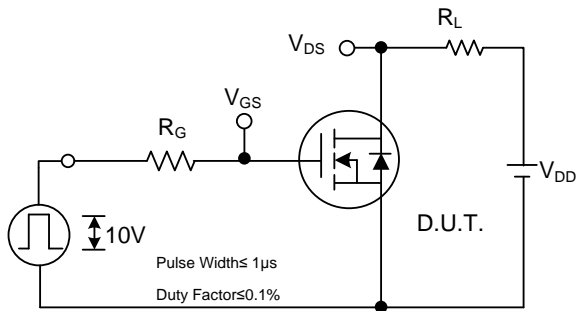


Peak Diode Recovery  $dv/dt$  Test Circuit

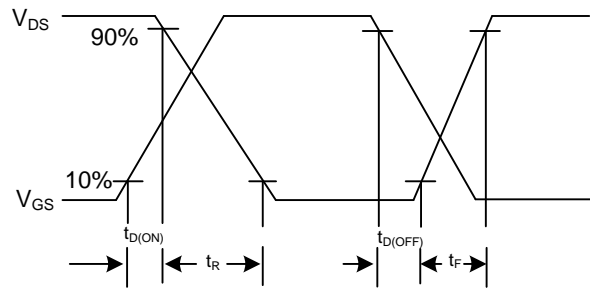


Peak Diode Recovery  $dv/dt$  Waveforms

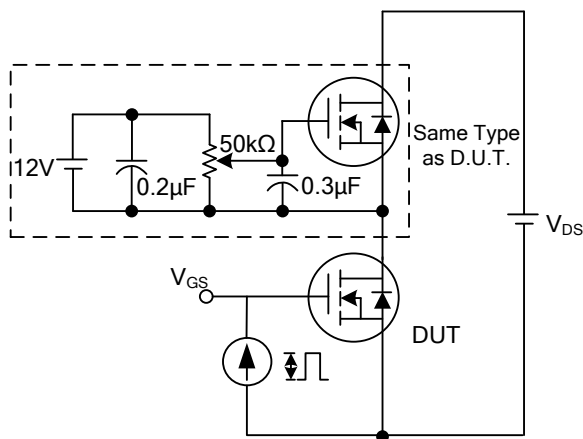
## TEST CIRCUITS AND WAVEFORMS (Cont.)



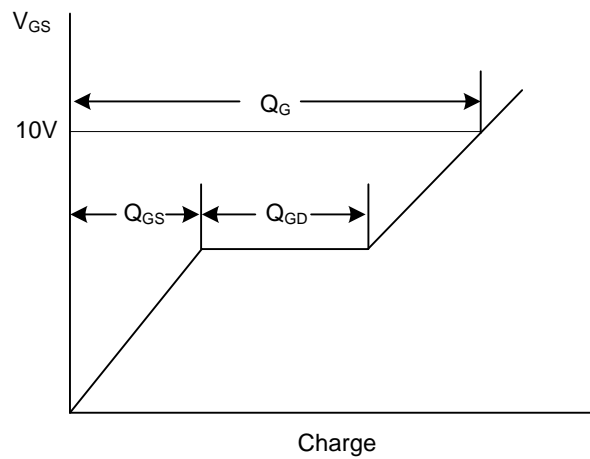
Switching Test Circuit



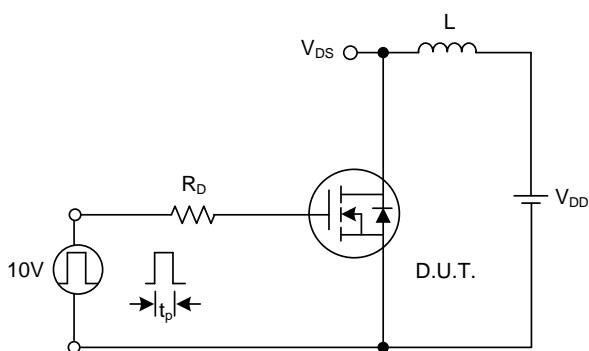
Switching Waveforms



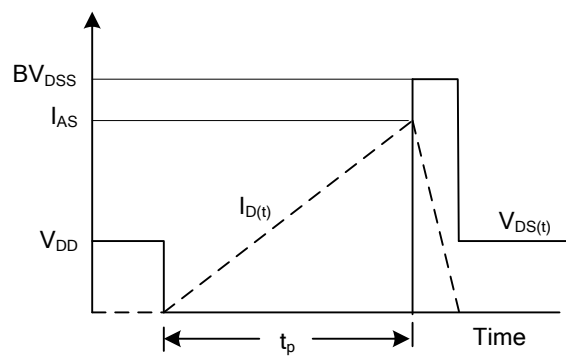
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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