



## 3NM80-Q

Preliminary

Power MOSFET

### 3.0A, 800V N-CHANNEL SUPER-JUNCTION MOSFET

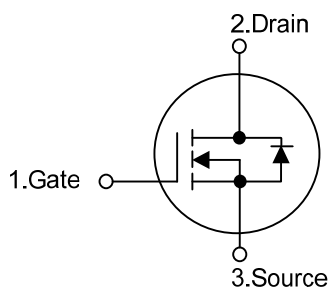
#### DESCRIPTION

The **UTC 3NM80-Q** 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

- \*  $R_{DS(ON)} \leq 3.0 \Omega$  @  $V_{GS}=10V$ ,  $I_D=1.5A$
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL

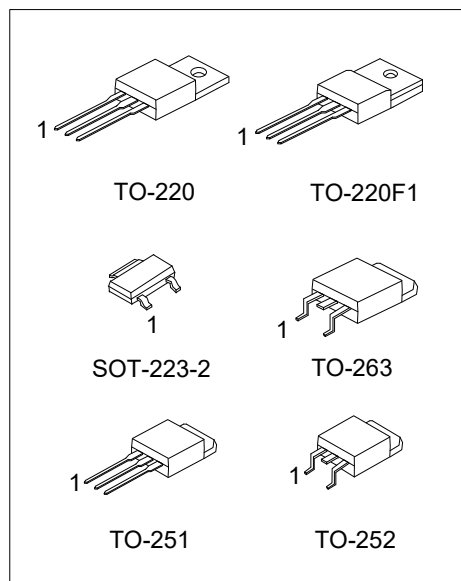


#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
3NM80L-AA2-R	3NM80G-AA2-R	SOT-223-2	G	D	S	Tape Reel
3NM80L-TA3-T	3NM80G-TA3-T	TO-220	G	D	S	Tube
3NM80L-TF1-T	3NM80G-TF1-T	TO-220F1	G	D	S	Tube
3NM80L-TM3-T	3NM80G-TM3-T	TO-251	G	D	S	Tube
3NM80L-TN3-R	3NM80G-TN3-R	TO-252	G	D	S	Tape Reel
3NM80L-T2Q-T	3NM80G-T2Q-T	TO-262	G	D	S	Tube
3NM80L-TQ2-R	3NM80G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>3NM80G-AA2-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) AA2: SOT-223-2, TA3: TO-220, TF1: TO-220F1</p> <p>TM3: TO-251, TN3: TO-252, TQ2: TO-263</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

SOT-223-2	TO-220 / TO-220F1 TO-251 / TO-252 / TO-263
<div><div>3NM80</div><div>Lot Code ← 1 → Date Code</div><div>L: Lead Free G: Halogen Free</div></div>	<div><div>UTC 3NM80</div><div>Lot Code ← 1 → Date Code</div><div>L: Lead Free G: Halogen Free</div></div>

■ ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DS}$	800	V
Gate-Source Voltage		$V_{GS}$	$\pm 30$	V
Continuous Drain Current	Continuous	$I_D$	3	A
Pulsed Drain Current	Pulsed (Note 2)	$I_{DM}$	6	A
Single Pulsed Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	72	mJ
Peak Diode Recovery $dv/dt$ (Note 4)		$dv/dt$	2.7	V/ns
Power Dissipation	SOT-223-2	$P_D$	1.8	W
	TO-220/TO-263		27	W
	TO-220F1		15	W
	TO-251/TO-252		16	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.  $L = 100\text{mH}$ ,  $I_{AS} = 1.2\text{A}$ ,  $V_{DD} = 90\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$ .

4.  $I_{SD} \leq 3.0\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$ .

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223-2	$\theta_{JA}$	150	$^\circ\text{C}/\text{W}$
	TO-220/TO-220F1		62.5	$^\circ\text{C}/\text{W}$
	TO-263			
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223-2	$\theta_{JC}$	69.4	$^\circ\text{C}/\text{W}$
	TO-220/TO-263		4.63	$^\circ\text{C}/\text{W}$
	TO-220F1		8.33	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		7.8 (Note)	$^\circ\text{C}/\text{W}$

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

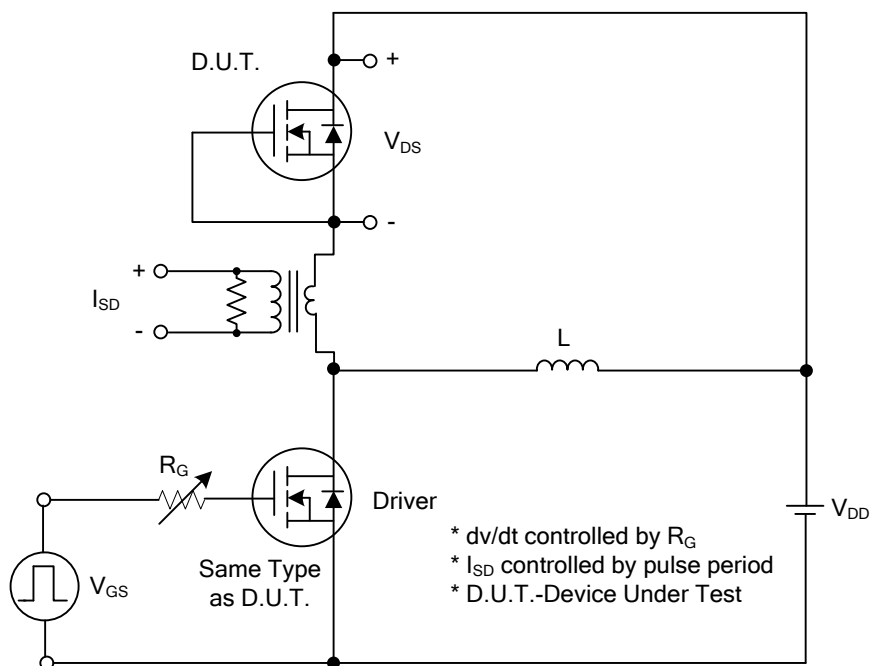
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

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	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>	V <sub>GS</sub> =30V, V <sub>DS</sub> =0V			100	nA
	Reverse		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-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
Static Drain-Source On-State Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1.5A			3.0	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =50V, f=1.0MHz		200		pF
Output Capacitance		C <sub>OSS</sub>			29		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			2.7		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q <sub>G</sub>	V <sub>DS</sub> =640V, V <sub>GS</sub> =10V, I <sub>D</sub> =3.0A (Note 1, 2)		16		nC
Gate to Source Charge		Q <sub>GS</sub>			5		nC
Gate to Drain Charge		Q <sub>GD</sub>			4		nC
Turn-ON Delay Time (Note 1)		t <sub>D(ON)</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =3.0A, R <sub>G</sub> =25Ω (Note 1, 2)		4.8		nS
Rise Time		t <sub>R</sub>			16		nS
Turn-OFF Delay Time		t <sub>D(OFF)</sub>			30		nS
Fall-Time		t <sub>F</sub>			28		nS
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I <sub>S</sub>				3	A
Maximum Pulsed Drain-Source Diode Forward Current		I <sub>SM</sub>				6	A
Drain-Source Diode Forward Voltage (Note 1)		V <sub>SD</sub>	I <sub>S</sub> =3.0A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t <sub>rr</sub>	I <sub>S</sub> =3.0A, V <sub>GS</sub> =0V,		270		nS
Body Diode Reverse Recovery Charge		Q <sub>rr</sub>	dlf/dt=100A/μs		1.5		μC

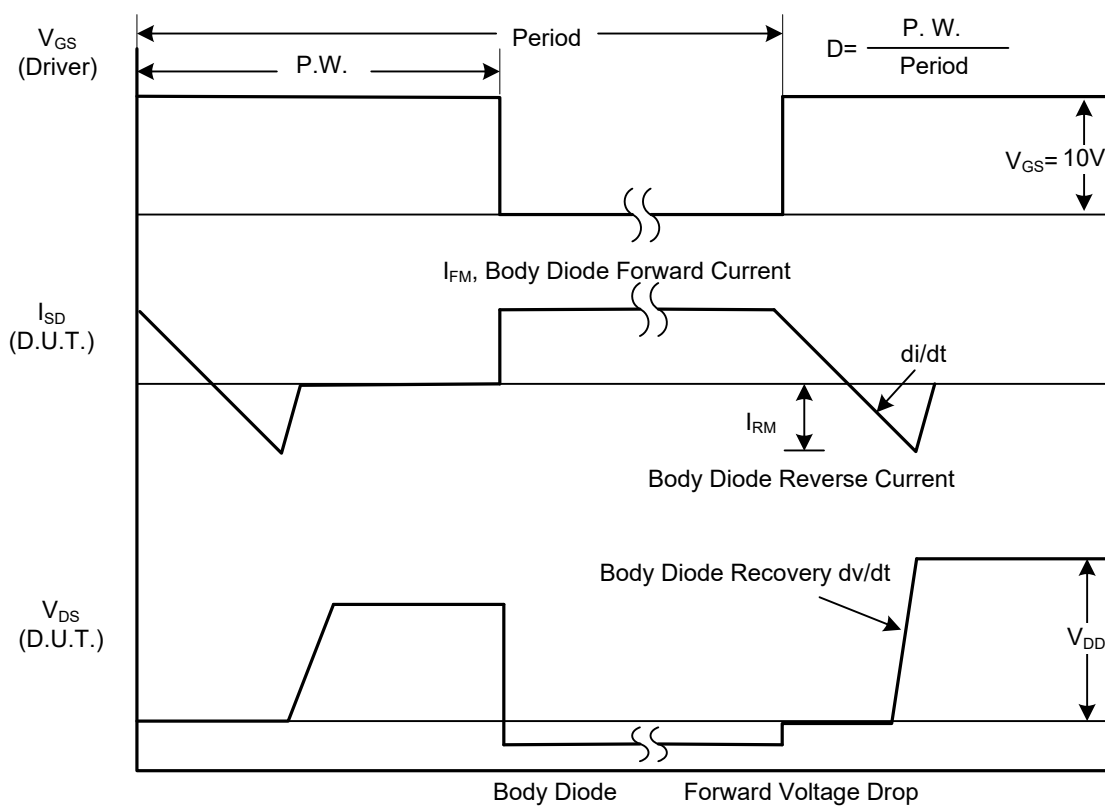
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating ambient temperature.

# ■ TEST CIRCUITS AND WAVEFORMS

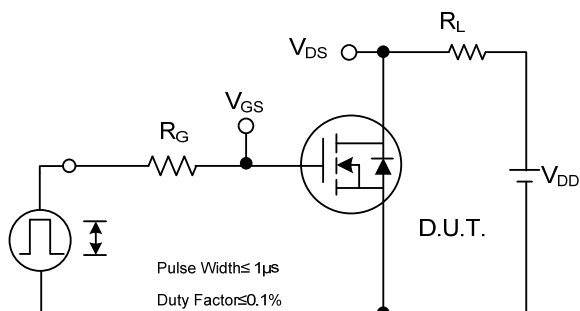


Peak Diode Recovery dv/dt Test Circuit

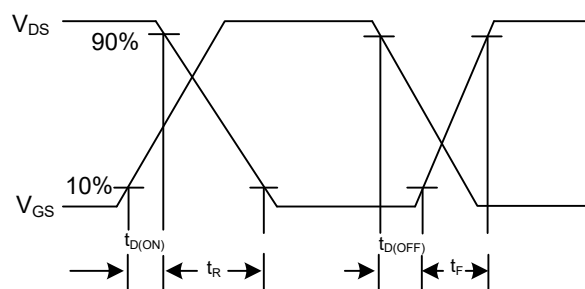


Peak Diode Recovery dv/dt Waveforms

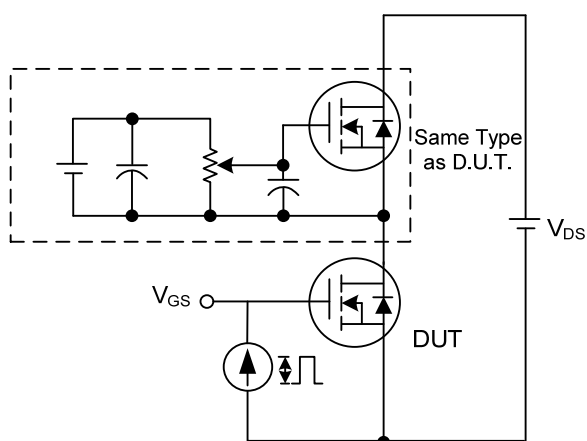
# ■ TEST CIRCUITS AND WAVEFORMS



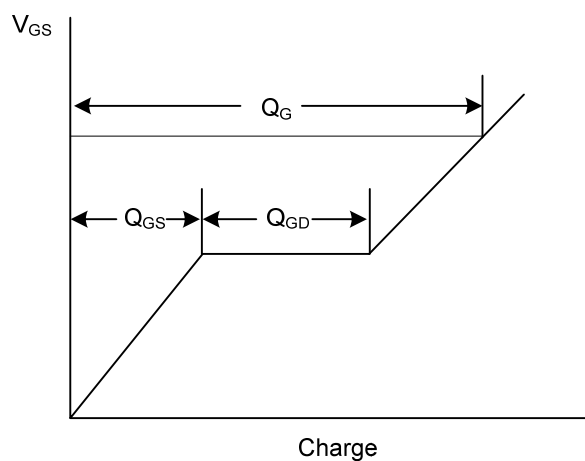
Switching Test Circuit



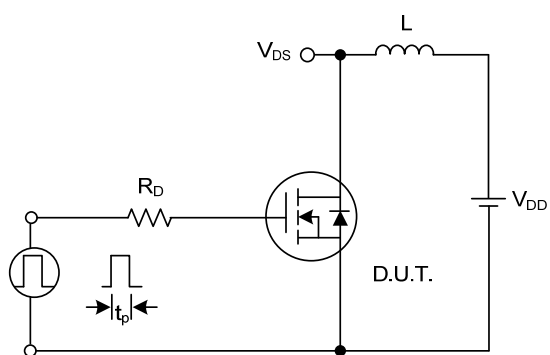
Switching Waveforms



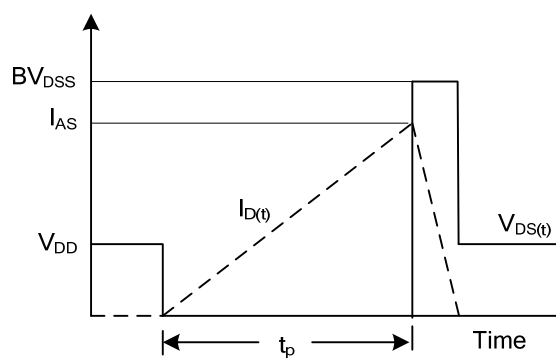
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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