



5NM60-U2

Power MOSFET

5A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

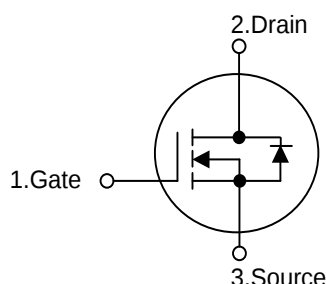
DESCRIPTION

The UTC **5NM60-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 high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications at power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} \leq 1.15\Omega$ @ $V_{GS}=10V$, $I_D=2.5A$
- * Fast Switching Capability
- * Improved dv/dt Capability, High Ruggedness

SYMBOL

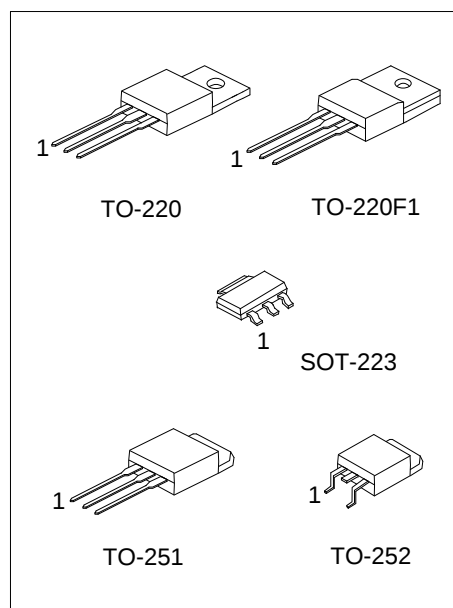


ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
5NM60L-AA3-R	5NM60G-AA3-R	SOT-223	G	D	S	Tape Reel
5NM60L-TA3-T	5NM60G-TA3-T	TO-220	G	D	S	Tube
5NM60L-TF1-T	5NM60G-TF1-T	TO-220F1	G	D	S	Tube
5NM60L-TM3-T	5NM60G-TM3-T	TO-251	G	D	S	Tube
5NM60L-TN3-R	5NM60G-TN3-R	TO-252	G	D	S	Tape Reel

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

5NM60G-AA3-R	(1)Packing Type	(1) R: Tape Reel, T: Tube (2) AA3: SOT-223, TA3: TO-220, TF1: TO-220F1, TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free
	(2)Package Type	
	(3)Green Package	



■ MARKING

SOT-223	TO-220 / TO-220F1 / TO-251 / TO-252
5NM60 L: Lead Free G: Halogen Free Lot Code 1 Date Code	UTC 5NM60 L: Lead Free G: Halogen Free Lot Code 1 Date Code

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	5.0	A
	Pulsed (Note 2)	I_{DM}	20	A
Avalanche Current (Note 2)		I_{AR}	1.2	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	104	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.6	V/ns
Power Dissipation	SOT-223	P_D	5	W
	TO-220		72	W
	TO-220F1		24	W
	TO-251/TO-252		48	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. $L = 144\text{mH}$, $I_{AS} = 1.2\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 5.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	75 (Note)	$^\circ\text{C/W}$
	TO-220/TO-220F1		62.5	$^\circ\text{C/W}$
	TO-251/TO-252		110 (Note)	$^\circ\text{C/W}$
Junction to Case	SOT-223	θ_{JC}	25 (Note)	$^\circ\text{C/W}$
	TO-220		1.73	$^\circ\text{C/W}$
	TO-220F1		5.2	$^\circ\text{C/W}$
	TO-251/TO-252		2.6 (Note)	$^\circ\text{C/W}$

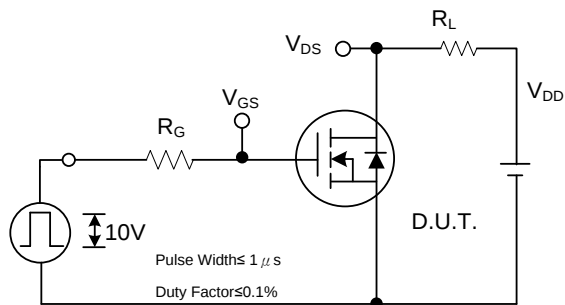
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

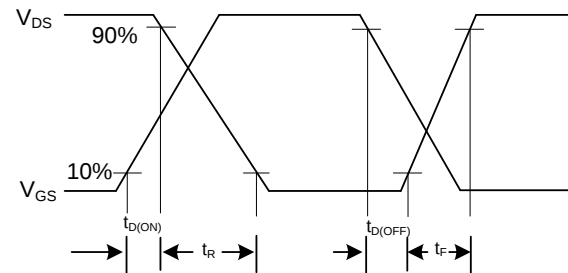
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+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 =2.5A			1.15	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		243		pF
Output Capacitance		C _{OSS}			205		pF
Reverse Transfer Capacitance		C _{RSS}			23		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =50V, V _{GS} =10V, I _D =1.3A, I _D =100μA (Note 1, 2)		40		nC
Gate to Source Charge		Q _{GS}			3.5		nC
Gate to Drain Charge		Q _{GD}			9.5		nC
Turn-on Delay Time (Note 1)		t _{D(ON)}	V _{DS} =30V, V _{GS} =10V, I _D =0.5A, R _G =25Ω (Note 1, 2)		42		ns
Rise Time		t _R			71		ns
Turn-off Delay Time		t _{D(OFF)}			126		ns
Fall-Time		t _F			51		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				5	A
Maximum Body-Diode Pulsed Current		I _{SM}				20	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =5.0A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _S =5.0A, V _{GS} =0V,		230		nS
Reverse Recovery Charge		Q _{rr}	dl _F /dt =100A/μs		1.81		μC

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

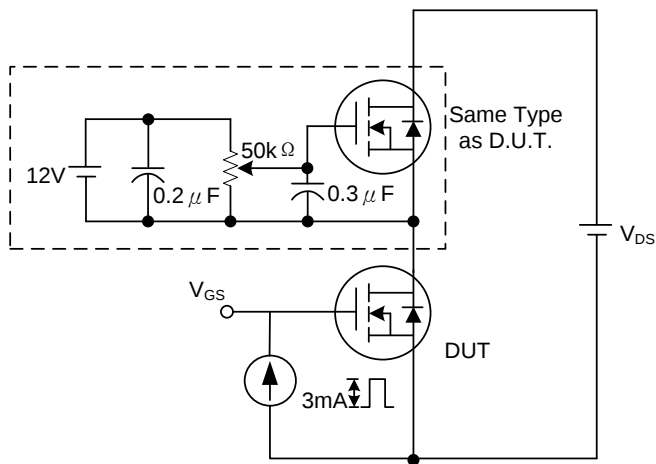
■ TEST CIRCUITS AND WAVEFORMS



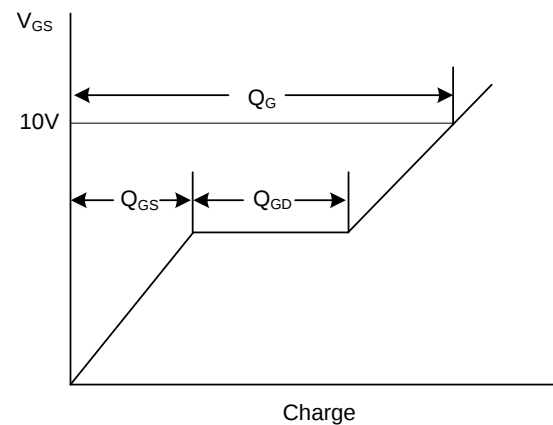
Switching Test Circuit



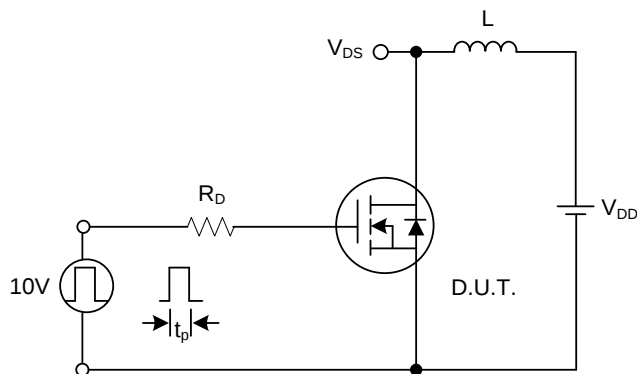
Switching Waveforms



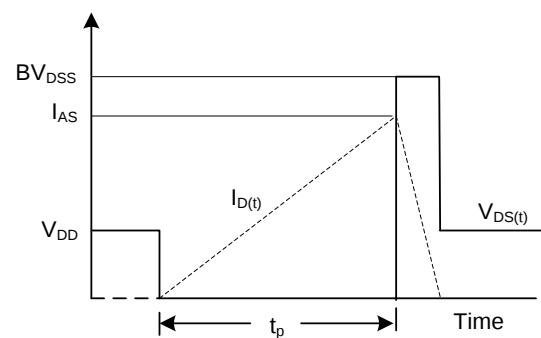
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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