



2N60Q-TA

Preliminary

Power MOSFET

2A, 600V N-CHANNEL POWER MOSFET

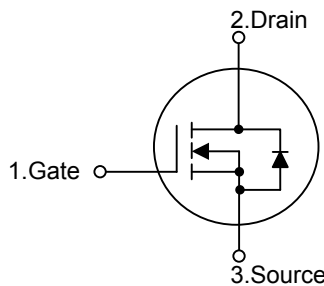
DESCRIPTION

The UTC **2N60Q-TA** is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} \leq 12 \Omega @ V_{GS}=10V, I_D=1.0A$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL

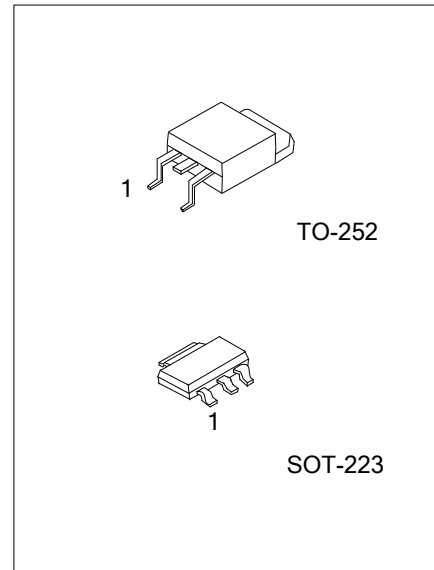


ORDERING INFORMATION

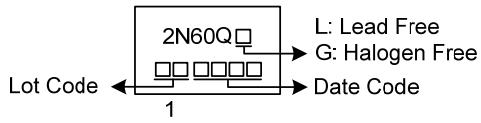
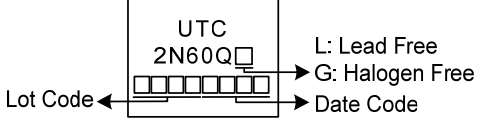
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N60QL-AA3-R	2N60QG-AA3-R	SOT-223	G	D	S	Tape Reel
2N60QL-TN3-R	2N60QG-TN3-R	TO-252	G	D	S	Tape Reel

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

2N60QG-AA3-R	(1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) AA3: SOT-223, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

SOT-223	TO-252
 <p>Diagram of SOT-223 marking: A rectangular package with '2N60Q' and a small square symbol on the top surface. Below the package are four small squares representing a lot code and four small squares representing a date code. Arrows point from the lot code to 'Lot Code' and from the date code to 'Date Code'. A '1' is centered below the package. To the right, 'L: Lead Free' and 'G: Halogen Free' are listed.</p>	 <p>Diagram of TO-252 marking: A rectangular package with 'UTC' and '2N60Q' and a small square symbol on the top surface. Below the package are eight small squares representing a lot code and four small squares representing a date code. Arrows point from the lot code to 'Lot Code' and from the date code to 'Date Code'. A '1' is centered below the package. To the right, 'L: Lead Free' and 'G: Halogen Free' are listed.</p>

■ 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 ($T_C=25^\circ\text{C}$)	I_D	2	A
	Pulsed (Note 2)	I_{DM}	4	A
Avalanche Energy	Single Pulsed	E_{AS}	36.3	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.7	V/ns
Power Dissipation ($T_C=25^\circ\text{C}$)	SOT-223	P_D	2.1	W
	TO-252		32	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. $L=30\text{mH}$, $I_{AS}=1.5\text{A}$, $V_{DD}=80\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 2.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	160	$^\circ\text{C}/\text{W}$
	TO-252		110	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	θ_{JC}	59.5	$^\circ\text{C}/\text{W}$
	TO-252		3.9	$^\circ\text{C}/\text{W}$

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

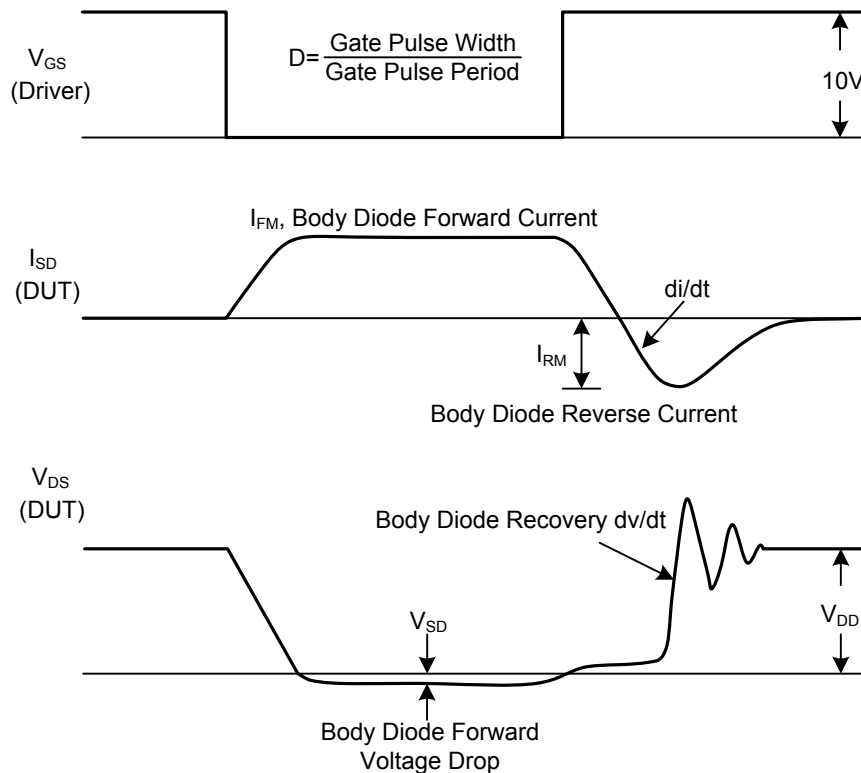
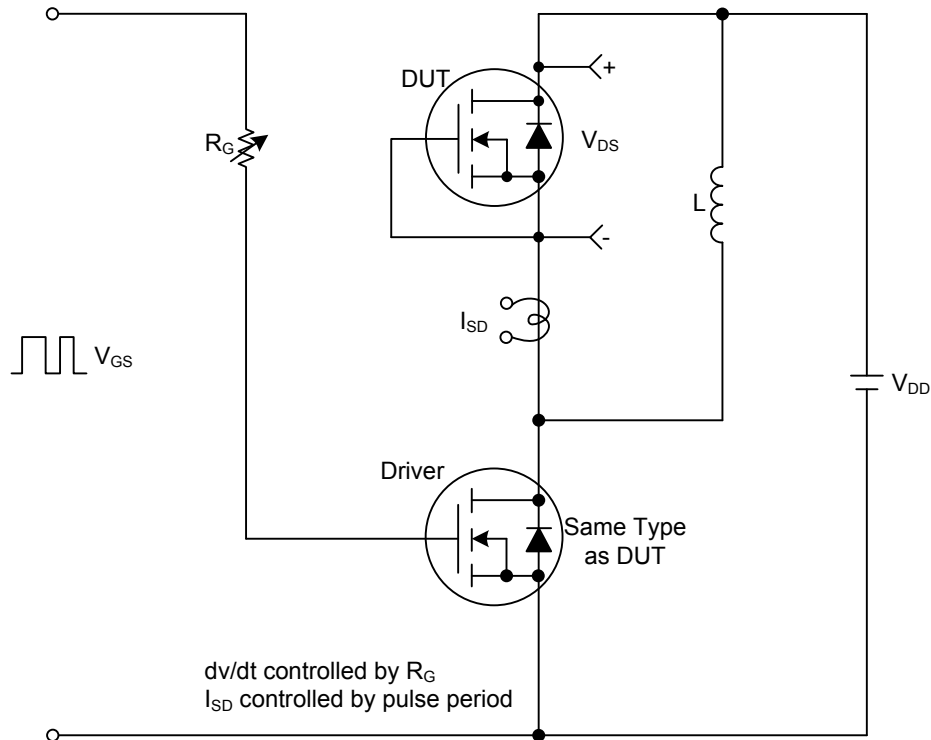
■ ELECTRICAL CHARACTERISTICS ($T_c=25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=600\text{V}$, $V_{GS}=0\text{V}$			10	μA
Gate- Source Leakage Current	Forward	I_{GSS}			+100	nA
	Reverse				-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=1.0\text{A}$			12	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		133.8		pF
Output Capacitance	C_{OSS}			21.1		pF
Reverse Transfer Capacitance	C_{RSS}			3.3		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{DS}=480\text{V}$, $V_{GS}=10\text{V}$, $I_D=2.0\text{A}$, $I_G=1\text{mA}$ (Note 1, 2)		10.1		nC
Gate to Source Charge	Q_{GS}			3.9		nC
Gate to Drain Charge	Q_{GD}			2		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=100\text{V}$, $V_{GS}=10\text{V}$, $I_D=2.0\text{A}$, $R_G=25\Omega$ (Note 1, 2)		4.2		ns
Rise Time	t_R			14.9		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			16.1		ns
Fall-Time	t_F			26.5		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				2	A
Maximum Body-Diode Pulsed Current	I_{SM}				4	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=2.0\text{A}$, $V_{GS}=0\text{V}$			1.4	V
Reverse Recovery Time	t_{rr}	$I_S=2.0\text{A}$, $V_{GS}=0\text{V}$, $di/dt=100\text{A}/\mu\text{s}$		246.6		ns
Reverse Recovery Charge	Q_{rr}			1.9		μC

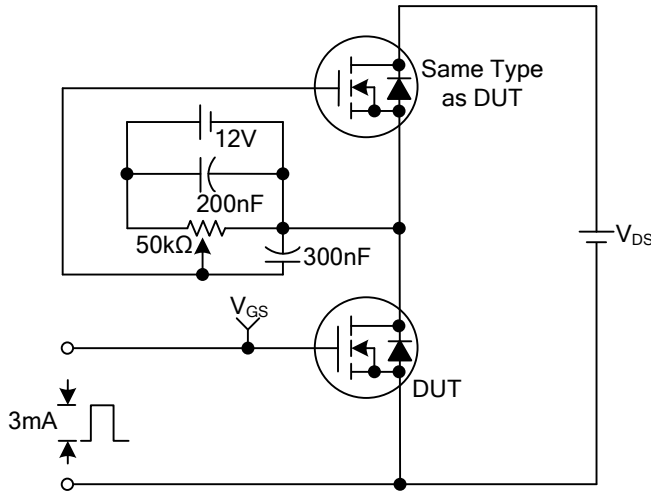
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

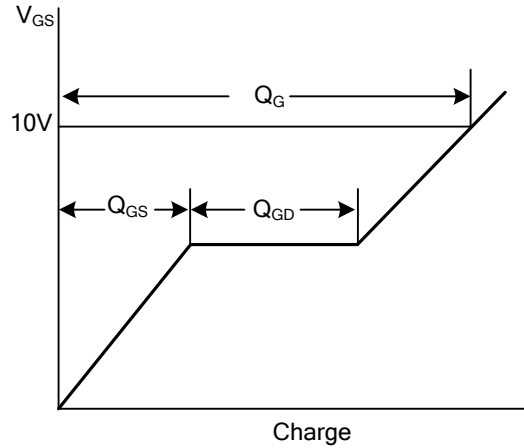
■ TEST CIRCUITS AND WAVEFORMS



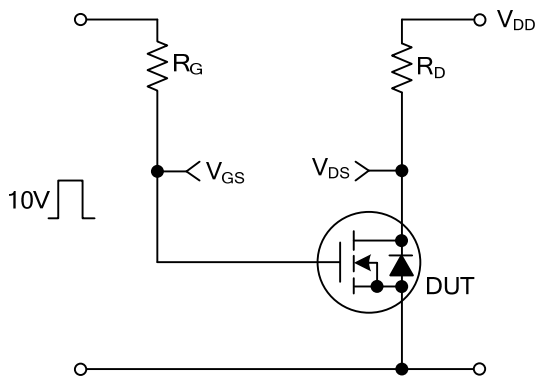
■ TEST CIRCUITS AND WAVEFORMS



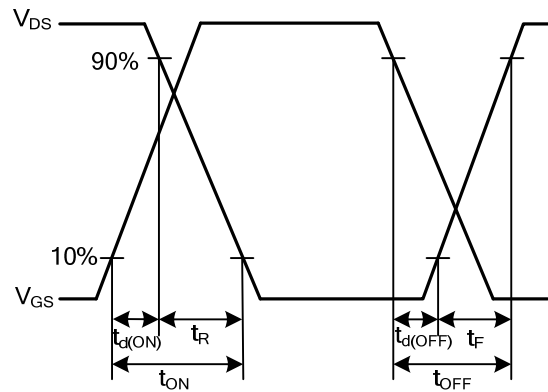
Gate Charge Test Circuit



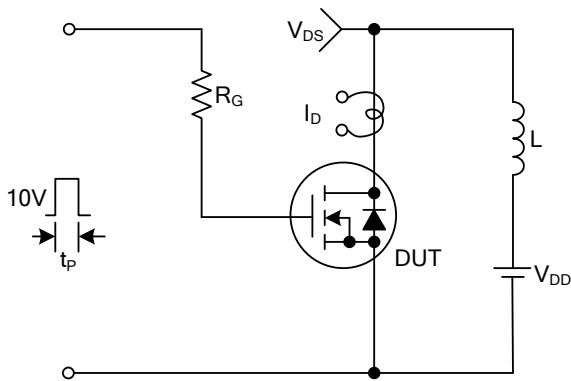
Gate Charge Waveforms



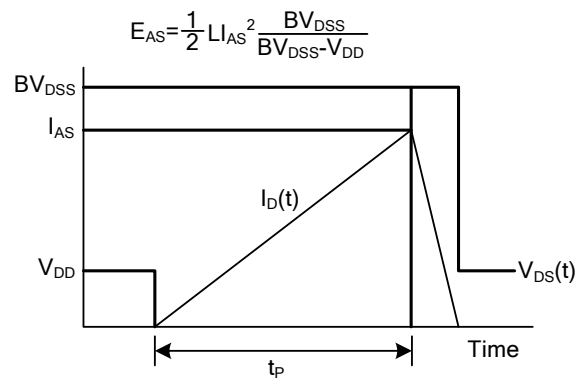
Resistive Switching Test Circuit



Resistive Switching Waveforms



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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