



1N60-MS

Preliminary

Power MOSFET

1.0A, 600V N-CHANNEL POWER MOSFET

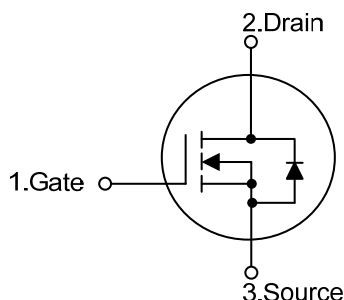
DESCRIPTION

The UTC **1N60-MS** is a high voltage power MOSFET 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 of switching power supplies and adaptors.

FEATURES

- * $R_{DS(ON)} \leq 14 \Omega$ @ $V_{GS}=10V$, $I_D=0.5A$
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

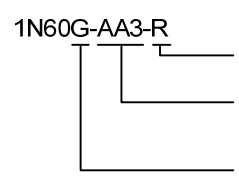
SYMBOL

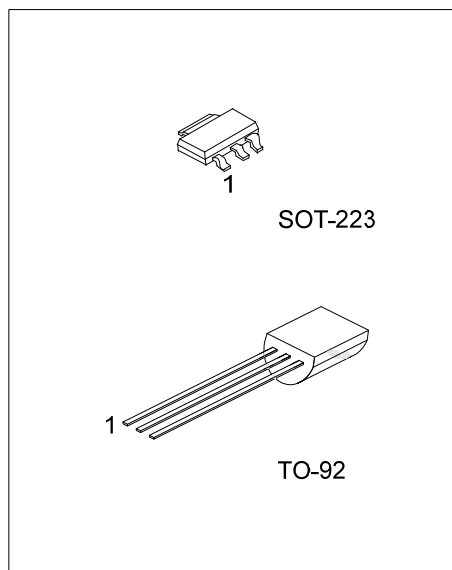


ORDERING INFORMATION

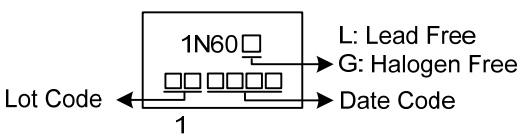
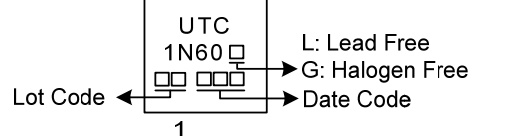
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N60L-AA3-R	1N60G-AA3-R	SOT-223	G	D	S	Tape Reel
1N60L-T92-B	1N60G-T92-B	TO-92	G	D	S	Tape Box
1N60L-T92-K	1N60G-T92-K	TO-92	G	D	S	Bulk

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

		(1) R: Tape Reel, B: Tape Box, K: Bulk (2) AA3: SOT-223, T92: TO-92 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING

SOT-223	TO-92
 <p>Diagram of SOT-223 marking: A rectangular package with '1N60' and a small square symbol on the top surface. Below the package, four small squares represent the Lot Code, and four small squares represent the Date Code. Arrows point from the Lot Code and Date Code labels to their respective squares. To the right of the package, 'L: Lead Free' and 'G: Halogen Free' are listed with arrows pointing to the top surface. A '1' is printed below the package.</p>	 <p>Diagram of TO-92 marking: A rectangular package with 'UTC' and '1N60' and a small square symbol on the top surface. Below the package, four small squares represent the Lot Code, and four small squares represent the Date Code. Arrows point from the Lot Code and Date Code labels to their respective squares. To the right of the package, 'L: Lead Free' and 'G: Halogen Free' are listed with arrows pointing to the top surface. A '1' is printed below the package.</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
Continuous Drain Current	I_D	1	A
Pulsed Drain Current (Note 2)	I_{DM}	2	A
Avalanche Energy (Note 3)	Single Pulsed E_{AS}	21	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.8	V/ns
Power Dissipation	SOT-223	8	W
	TO-92	1.5	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. $L=30\text{mH}$, $I_{AS}=1.2\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 1.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

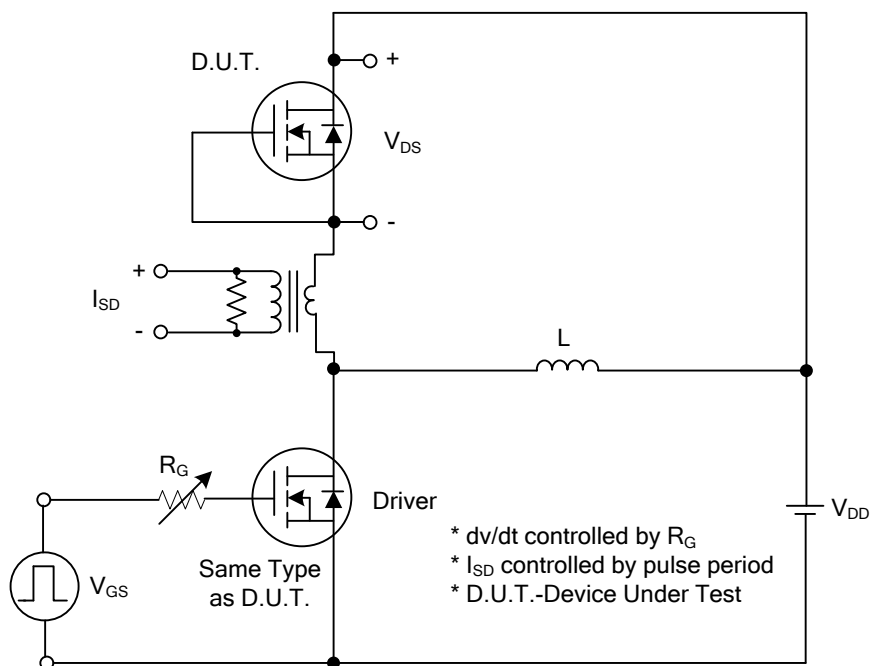
PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	150	$^\circ\text{C}/\text{W}$
	TO-92	140	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	15.6	$^\circ\text{C}/\text{W}$
	TO-92	80	$^\circ\text{C}/\text{W}$

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

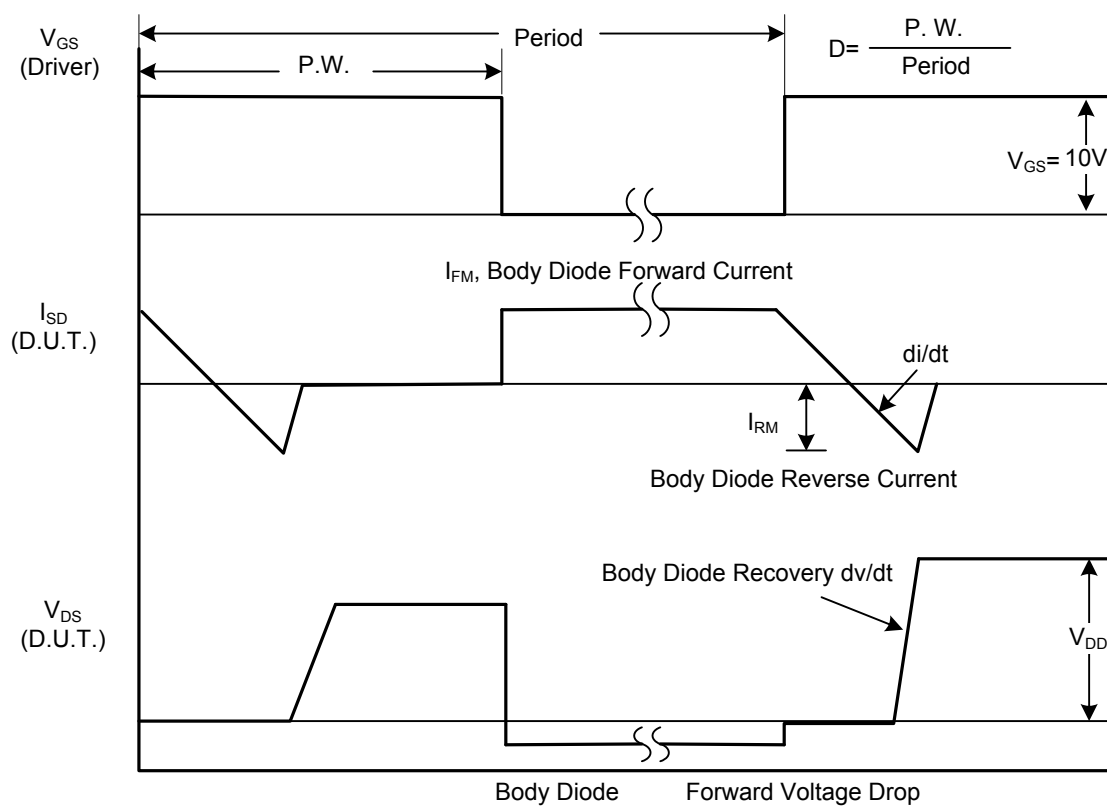
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V, V _{DS} =0V			100	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	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =0.5A			14	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f =1MHz		86		pF
Output Capacitance		C _{OSS}			16		pF
Reverse Transfer Capacitance		C _{RSS}			2		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q _G	V _{DS} =480V, V _{GS} =10V, I _D =1.0A, I _G =1mA (Note 1, 2)		8		nC
Gate-Source Charge		Q _{GS}			3.5		nC
Gate-Drain Charge		Q _{GD}			1.4		nC
Turn-On Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =1.0A, R _G =25Ω (Note 1, 2)		2.5		ns
Turn-On Rise Time		t _R			16		ns
Turn-Off Delay Time		t _{D(OFF)}			12		ns
Turn-Off Fall Time		t _F			36		ns
DRAIN-SOURCE DIODE CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				1	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SD}				2	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =1.0A, V _{GS} =0V			1.4	V
Reverse Recovery Time		t _{rr}	I _F =1.0A, V _{DD} =100V		170		ns
Reverse Recovery Charge		Q _{rr}	di/dt = 100A/μs		1.2		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

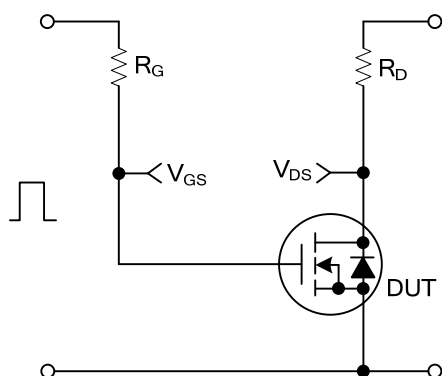


Peak Diode Recovery dv/dt Test Circuit

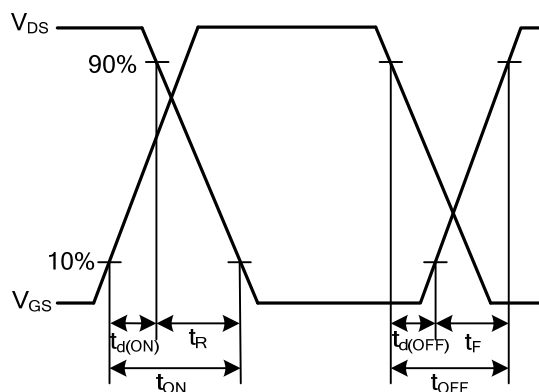


Peak Diode Recovery dv/dt Waveforms

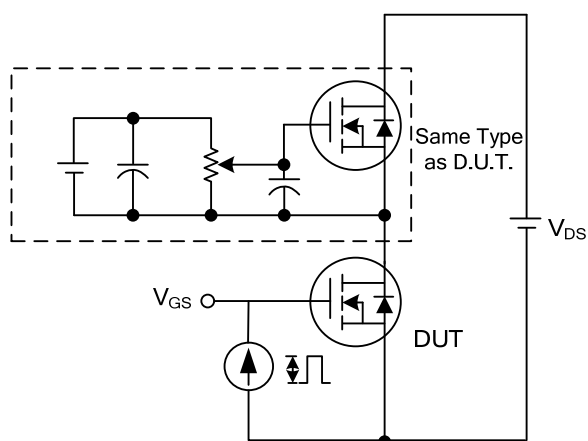
■ TEST CIRCUITS AND WAVEFORMS



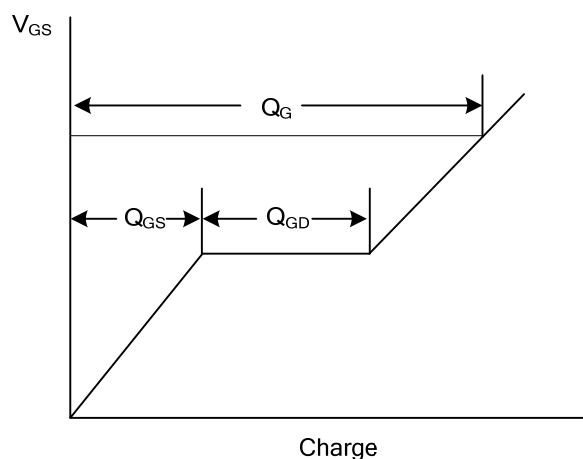
Switching Test Circuit



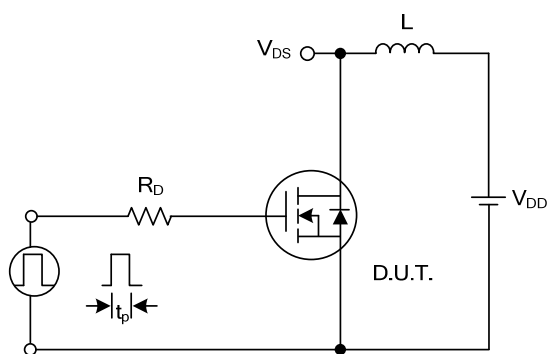
Switching Waveforms



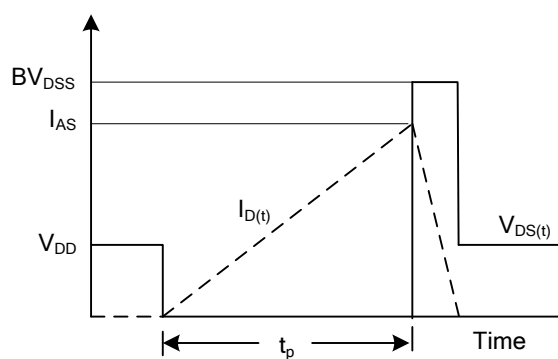
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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