



## 1N60-TB

Preliminary

Power MOSFET

### 1.0A, 600V N-CHANNEL POWER MOSFET

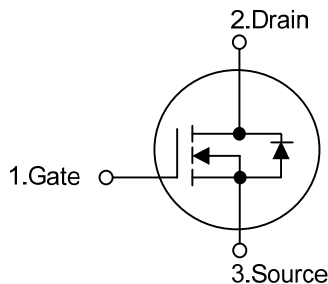
#### DESCRIPTION

The UTC **1N60-TB** 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 AC to DC converters and bridge circuits.

#### FEATURES

- \*  $R_{DS(ON)} \leq 8.0 \Omega @ V_{GS}=10V, I_D=0.5A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness

#### SYMBOL

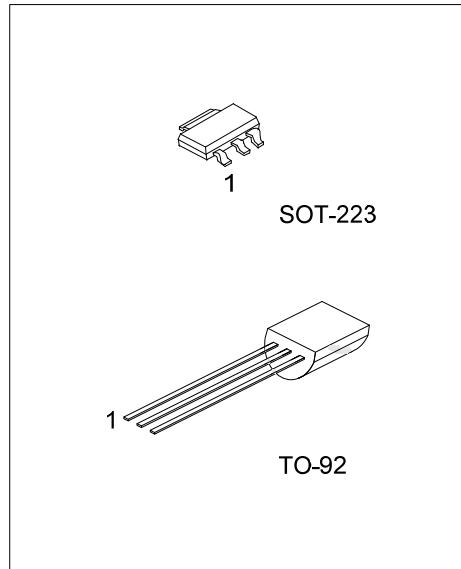


#### ORDERING INFORMATION

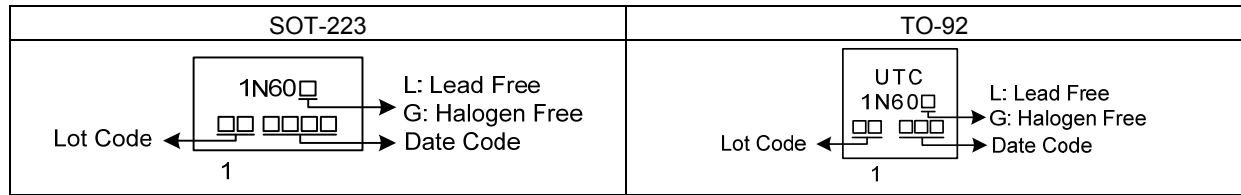
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N60L-AA3-R	1N60G-AA3-R	SOT-223	G	D	S	Tape Reel
1N60L-T92-B	1N60G-T92-B	TO-92	G	D	S	Tape Box
1N60L-T92-K	1N60G-T92-K	TO-92	G	D	S	Bulk

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

<p>1N60G-AA3-R</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(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</p>
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### MARKING



■ 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		$V_{GSS}$	$\pm 30$	V
Drain Current	Continuous	$I_D$	1.0	A
	Pulsed (Note 2)	$I_{DM}$	4.0	A
Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	108	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.7	V/ns
Power Dissipation	SOT-223	$P_D$	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.  $L = 110\text{mH}$ ,  $I_{AS} = 1.4\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

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

■ THERMAL DATA

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

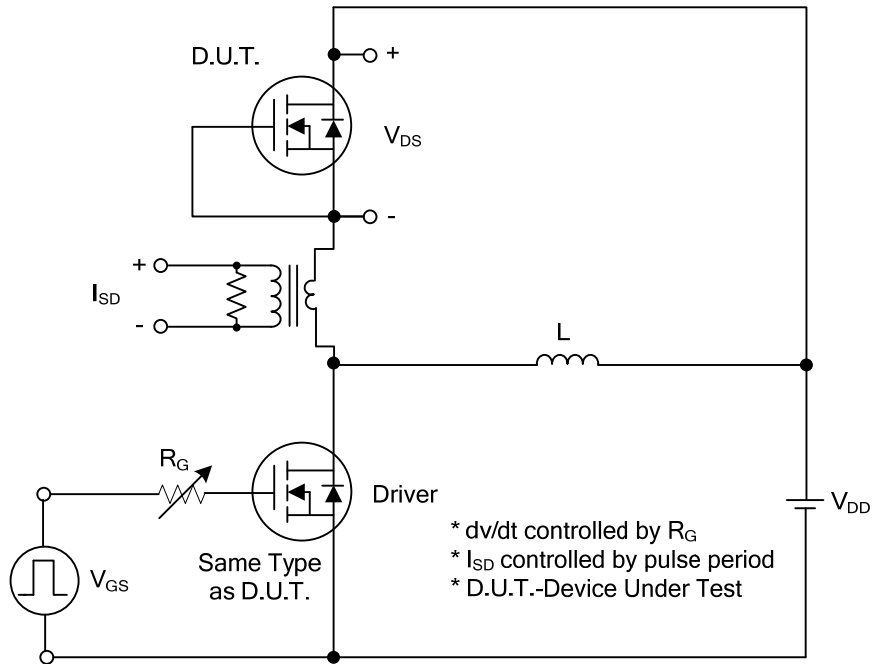
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C, unless otherwise specified)

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	600			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V			1	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>			100	nA
	Reverse					
		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V			-100	nA
<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	2.0		4.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A			8.0	Ω
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz		178		pF
Output Capacitance	C <sub>OSS</sub>			21		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			3.7		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, I <sub>G</sub> =100μA (Note 1, 2)		7.7		nC
Gate to Source Charge	Q <sub>GS</sub>			1.2		nC
Gate to Drain Charge	Q <sub>GD</sub>			0.7		nC
Turn-on Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		28		ns
Rise Time	t <sub>R</sub>			6.4		ns
Turn-off Delay Time	t <sub>D(OFF)</sub>			60		ns
Fall-Time	t <sub>F</sub>			19		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Pulsed Current	I <sub>S</sub>				1.0	A
Drain-Source Diode Forward Voltage (Note 1)	I <sub>SM</sub>				4.0	A
Maximum Body-Diode Continuous Current	V <sub>SD</sub>	I <sub>S</sub> =0.5A, V <sub>GS</sub> =0V			1.4	V
Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =1.0A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs		150		ns
Reverse Recovery Charge	Q <sub>rr</sub>				0.35	

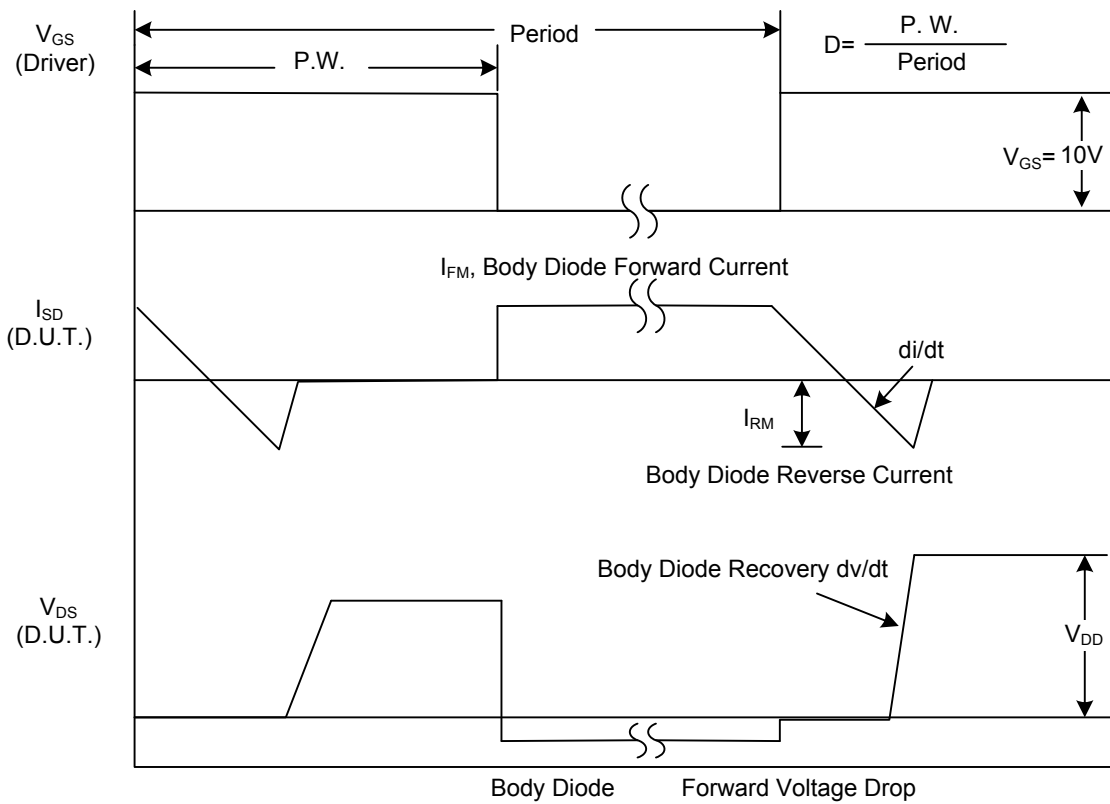
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

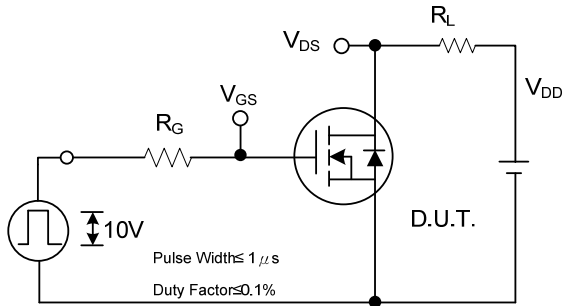


Peak Diode Recovery  $dv/dt$  Test Circuit

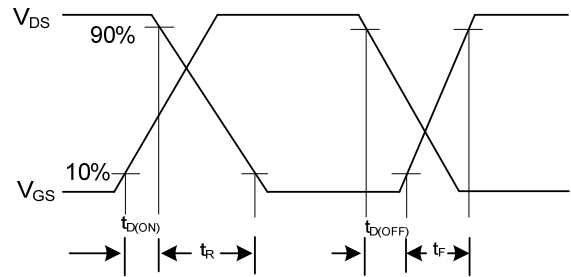


Peak Diode Recovery  $dv/dt$  Waveforms

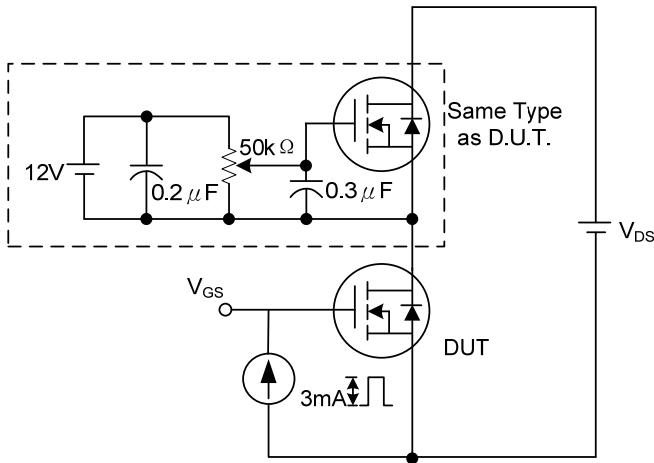
■ TEST CIRCUITS AND WAVEFORMS



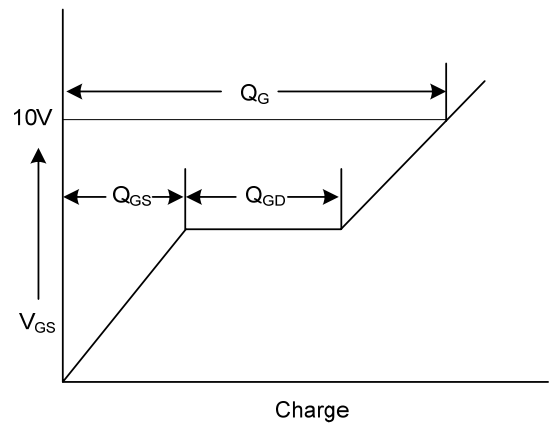
Switching Test Circuit



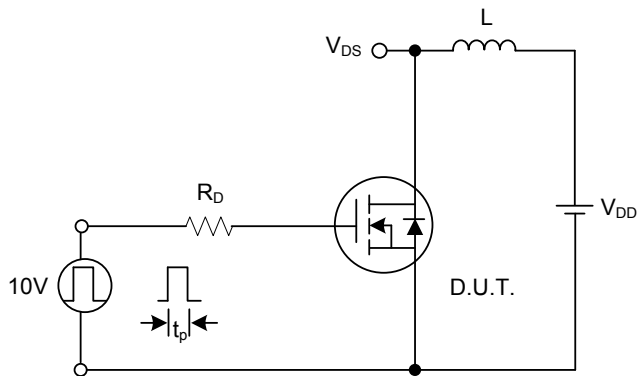
Switching Waveforms



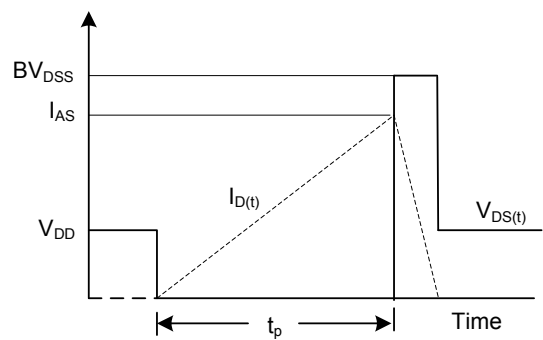
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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