



1N60Z

Power MOSFET

1.2A, 600V N-CHANNEL POWER MOSFET

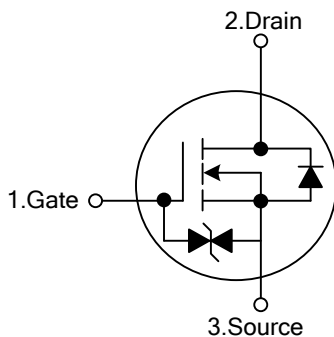
DESCRIPTION

The UTC **1N60Z** 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 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

- * $R_{DS(ON)} \leq 11.5 \Omega @ V_{GS}=10V, I_D=0.6A$
- * Ultra Low gate charge (typical 5.0nC)
- * Low reverse transfer capacitance (C_{RSS} = typical 3.0 pF)
- * Fast switching capability
- * Avalanche energy specified
- * Improved dv/dt capability, high ruggedness

SYMBOL

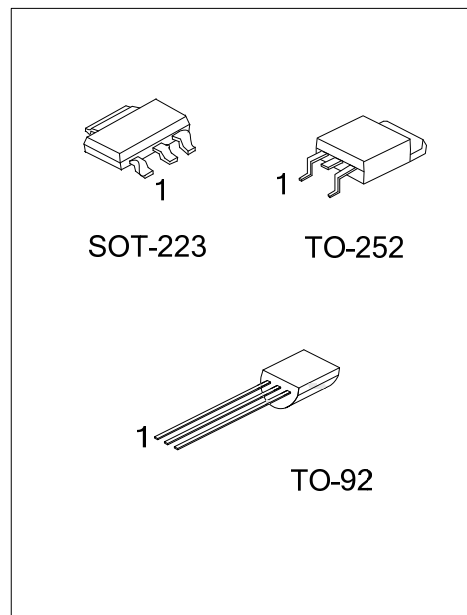


ORDERING INFORMATION

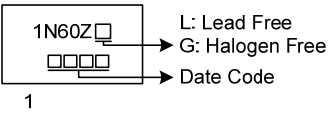
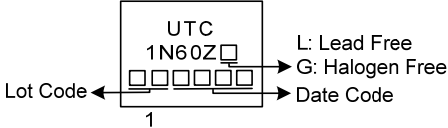
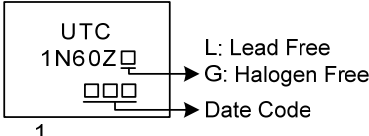
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
1N60ZL-AA3-R	1N60ZG-AA3-R	SOT-223	G	D	S	Tape Reel
1N60ZL-T92-B	1N60ZG-T92-B	TO-92	G	D	S	Tape Box
1N60ZL-T92-K	1N60ZG-T92-K	TO-92	G	D	S	Bulk
1N60ZL-TN3-R	1N60ZG-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>1N60ZG-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, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

PACKAGE	MARKING
SOT-223	 <p>1N60Z □ □□□□</p> <p>1</p> <p>L: Lead Free G: Halogen Free Date Code</p>
TO-252	 <p>UTC 1N60Z □ □□□□□□</p> <p>Lot Code ← 1 → Date Code</p> <p>L: Lead Free G: Halogen Free Date Code</p>
TO-92	 <p>UTC 1N60Z □ □□□</p> <p>1</p> <p>L: Lead Free G: Halogen Free Date Code</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}	± 20	V
Avalanche Current (Note 2)	I_{AR}	1.2	A
Continuous Drain Current	I_D	1.2	A
Pulsed Drain Current (Note 2)	I_{DM}	4.8	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	50
	Repetitive (Note 2)	E_{AR}	4.0
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Power Dissipation ($T_A=25^\circ\text{C}$)	SOT-223	P_D	0.8
	TO-252		1.5
	TO-92		1
Junction Temperature	T_J	+150	$^\circ\text{C}$
Operating Temperature	T_{OPR}	-55 ~ +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. $L = 60\text{mH}$, $I_{AS} = 1\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 1.2\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150
	TO-252		100
	TO-92		140

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

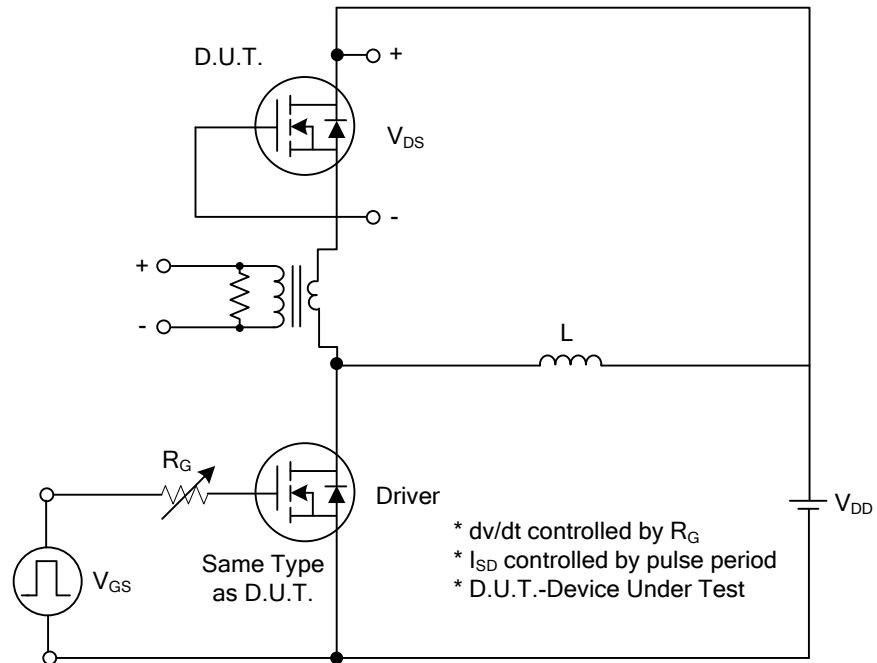
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS} V _{GS} =20V, V _{DS} =0V			+5	μA
	Reverse		V _{GS} =-20V, V _{DS} =0V			-5
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D =250μA		0.4		V/°C
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 =0.6A		9.3	11.5	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		120	150	pF
Output Capacitance	C _{OSS}			20	25	pF
Reverse Transfer Capacitance	C _{RSS}			3.0	4.0	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	V _{DD} =300V, I _D =1.2A, R _G =50Ω (Note 2,3)		5	20	ns
Turn-On Rise Time	t _R			25	60	ns
Turn-Off Delay Time	t _{D(OFF)}			7	25	ns
Turn-Off Fall Time	t _F			25	60	ns
Total Gate Charge	Q _G	V _{DS} =480V, V _{GS} =10V, I _D =1.2A (Note 2,3)		5.0	6.0	nC
Gate-Source Charge	Q _{GS}			1.0		nC
Gate-Drain Charge	Q _{GD}			2.6		nC
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =1.2A			1.4	V
Maximum Continuous Drain-Source Diode Forward Current	I _S				1.2	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				4.8	A
Reverse Recovery Time	t _{rr}	V _{GS} =0V, I _S =1.2A		160		ns
Reverse Recovery Charge	Q _{RR}	dI _F /dt=100A/μs (Note 1)		0.3		μC

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

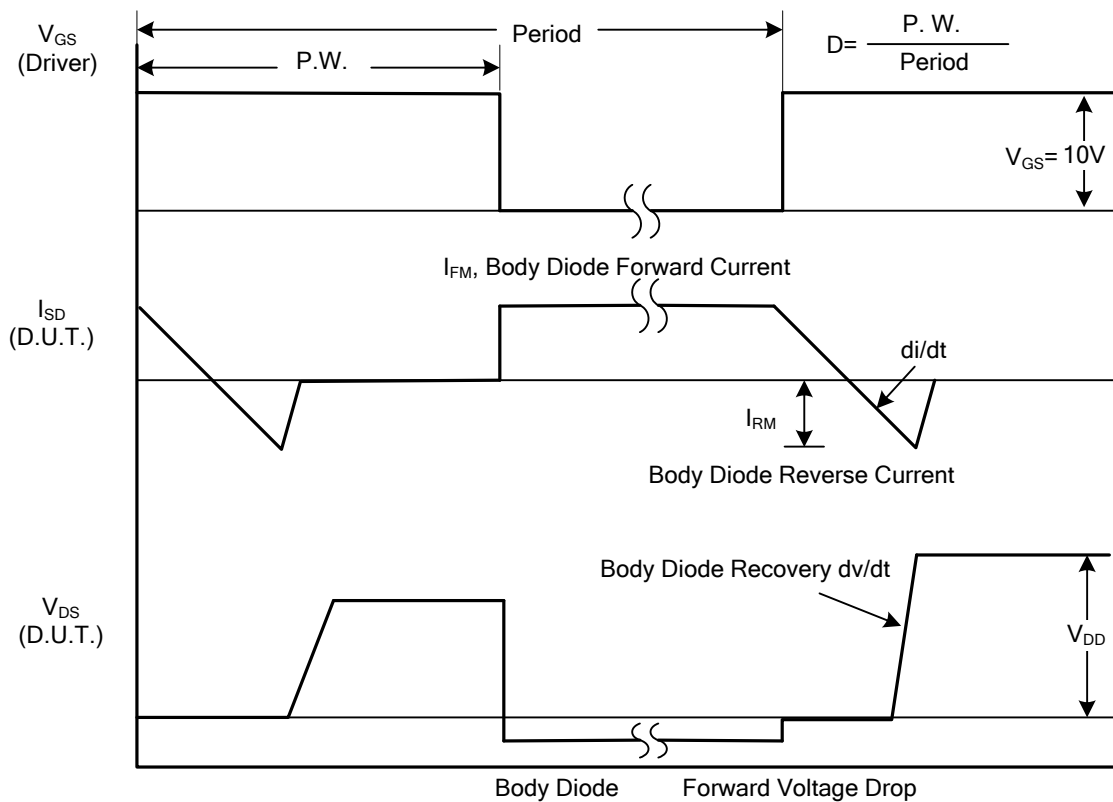
2. Pulse Test: Pulse Width ≤300μs, Duty Cycle≤2%

3. Essentially Independent of Operating Temperature

■ TEST CIRCUITS AND WAVEFORMS

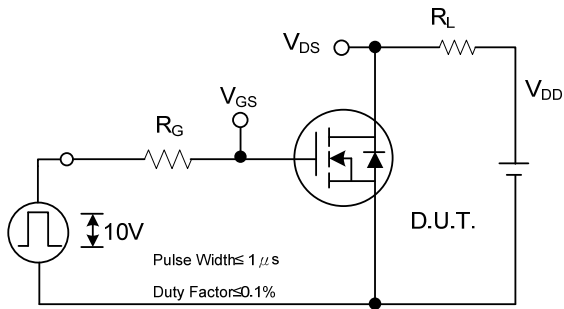


Peak Diode Recovery dv/dt Test Circuit

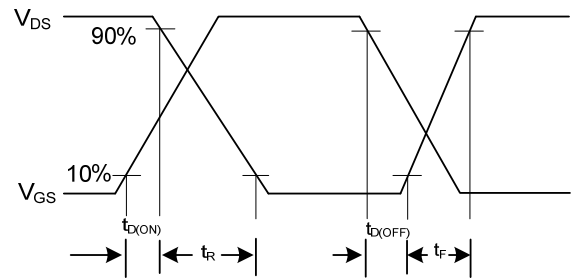


Peak Diode Recovery dv/dt Waveforms

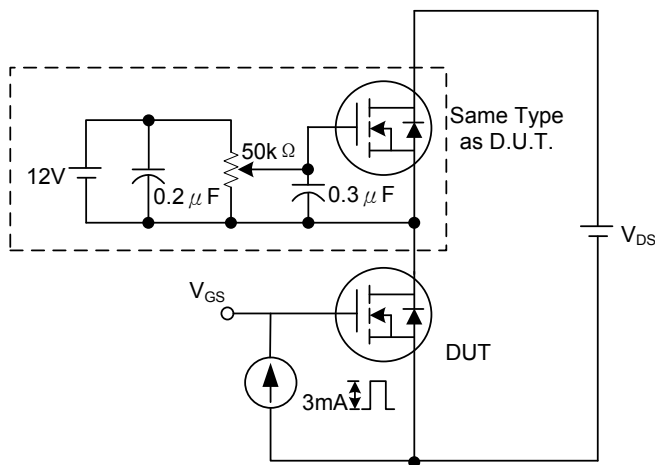
TEST CIRCUITS AND WAVEFORMS (Cont.)



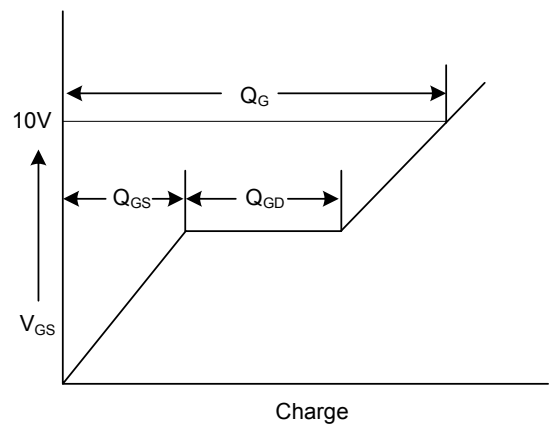
Switching Test Circuit



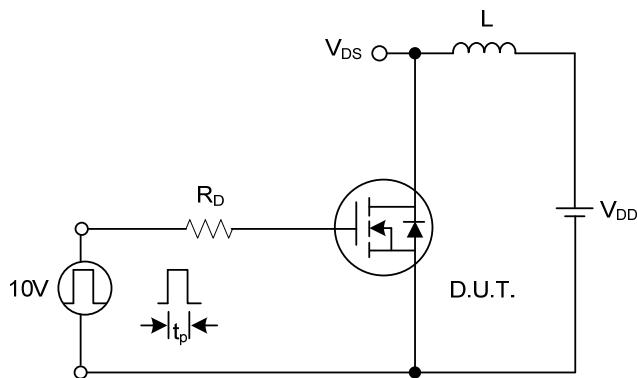
Switching Waveforms



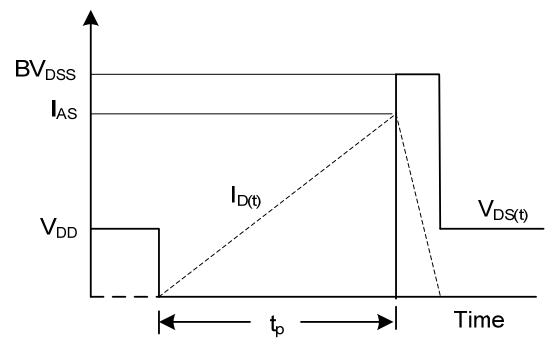
Gate Charge Test Circuit



Gate Charge Waveform

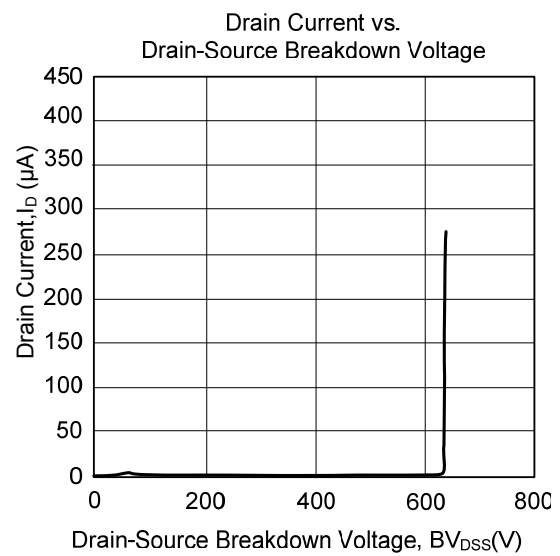
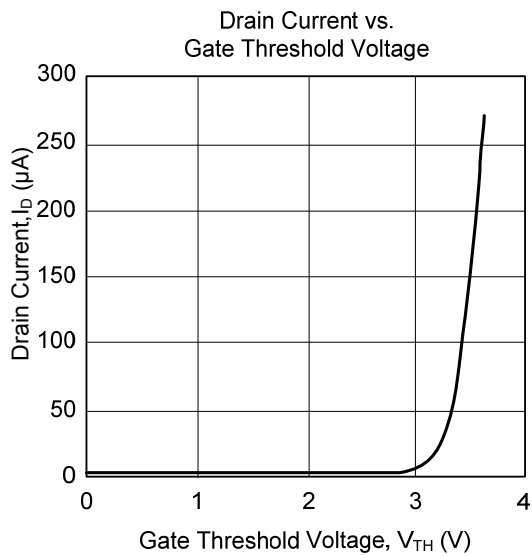
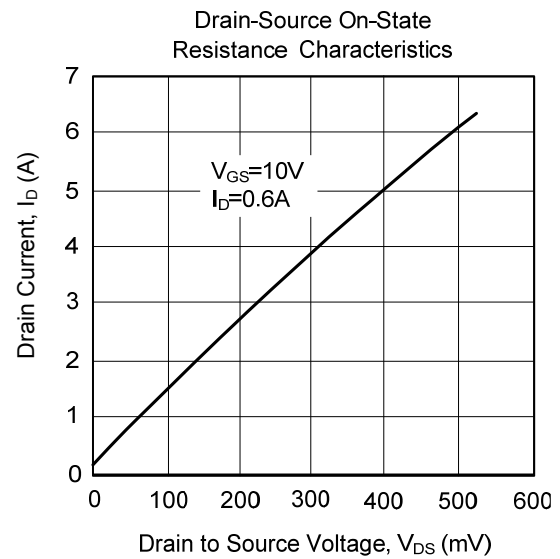
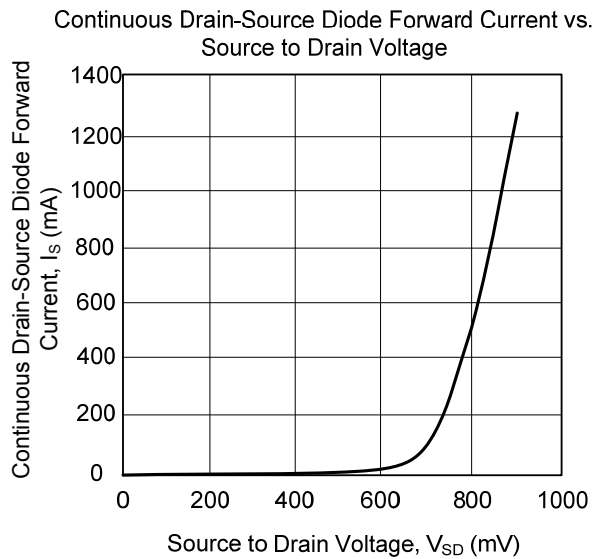


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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