



1N40-CB

Preliminary

Power MOSFET

**1.0A, 400V N-CHANNEL
POWER MOSFET**

■ DESCRIPTION

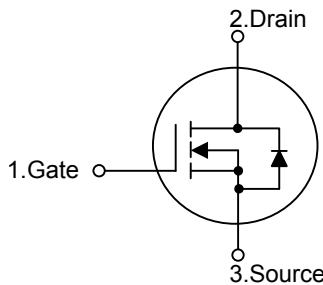
The UTC **1N40** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **1N40** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

■ FEATURES

- * $R_{DS(ON)} < 4.0\Omega @ V_{GS} = 10V, I_D = 0.5A$
- * High Switching Speed
- * 100% Avalanche Tested

■ SYMBOL

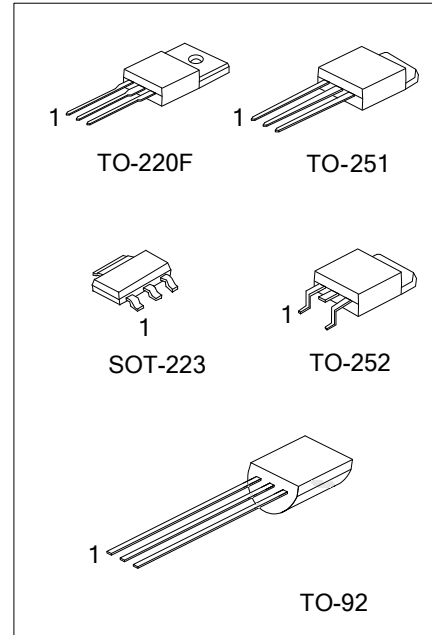


■ ORDERING INFORMATION

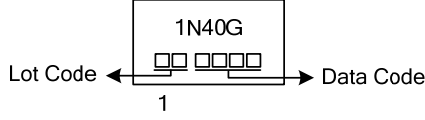
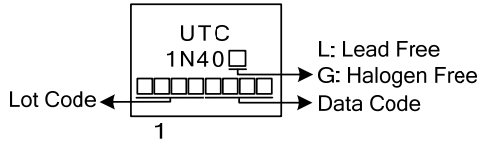
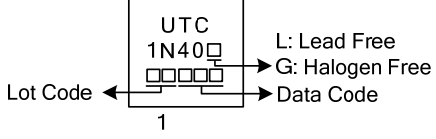
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	1N40G-AA3-R	SOT-223	G	D	S	Tape Reel
1N40L-TF3-T	1N40G-TF3-T	TO-220F	G	D	S	Tube
1N40L-TM3-T	1N40G-TM3-T	TO-251	G	D	S	Tube
1N40L-TN3-R	1N40G-TN3-R	TO-252	G	D	S	Tape Reel
1N40L-T92-B	1N40G-T92-B	TO-92	G	D	S	Tape Box
1N40L-T92-K	1N40G-T92-K	TO-92	G	D	S	Bulk

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

<p>1N40G-AA3-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel, T: Tube, B: Tape Box, K: Bulk</p> <p>(2) AA3: SOT-223, TF3: TO-220F, TM3: TO-251</p> <p>TN3: TO-252, T92: TO-92</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

Package	Marking
SOT-223	 <p>Marking diagram for SOT-223 package. The marking consists of a central box containing '1N40G' and a '1' below it. To the left of the box is 'Lot Code' with an arrow pointing left, and to the right is 'Data Code' with an arrow pointing right. Below the box is a '1'.</p>
TO-220F / TO-251 / TO-252	 <p>Marking diagram for TO-220F / TO-251 / TO-252 package. The marking consists of a central box containing 'UTC' and '1N40' above a '1'. To the left of the box is 'Lot Code' with an arrow pointing left, and to the right is 'Data Code' with an arrow pointing right. Below the box is a '1'. To the right of the box are 'L: Lead Free' and 'G: Halogen Free' with arrows pointing right.</p>
TO-92	 <p>Marking diagram for TO-92 package. The marking consists of a central box containing 'UTC' and '1N40' above a '1'. To the left of the box is 'Lot Code' with an arrow pointing left, and to the right is 'Data Code' with an arrow pointing right. Below the box is a '1'. To the right of the box are 'L: Lead Free' and 'G: Halogen Free' with arrows pointing right.</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	400	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current ($T_C=25^\circ\text{C}$)	Continuous	I_D	1	A
	Pulsed (Note 2)	I_{DM}	4	A
Avalanche Current (Note 2)		I_{AR}	1.5	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	15	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5	V/ns
Power Dissipation ($T_C=25^\circ\text{C}$)	TO-223	P_D	1	W
	TO-220F		15	W
	TO-251/TO-252		25	W
	TO-92		1	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. $L = 13 \text{ mH}$, $I_{AS} = 1.5 \text{ A}$, $V_{DD} = 50 \text{ V}$, $R_G = 25 \Omega$, 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	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-220F		62.5	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
	TO-92		160	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	θ_{JC}	125	$^\circ\text{C}/\text{W}$
	TO-220F		8.3	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		5	$^\circ\text{C}/\text{W}$
	TO-92		125	$^\circ\text{C}/\text{W}$

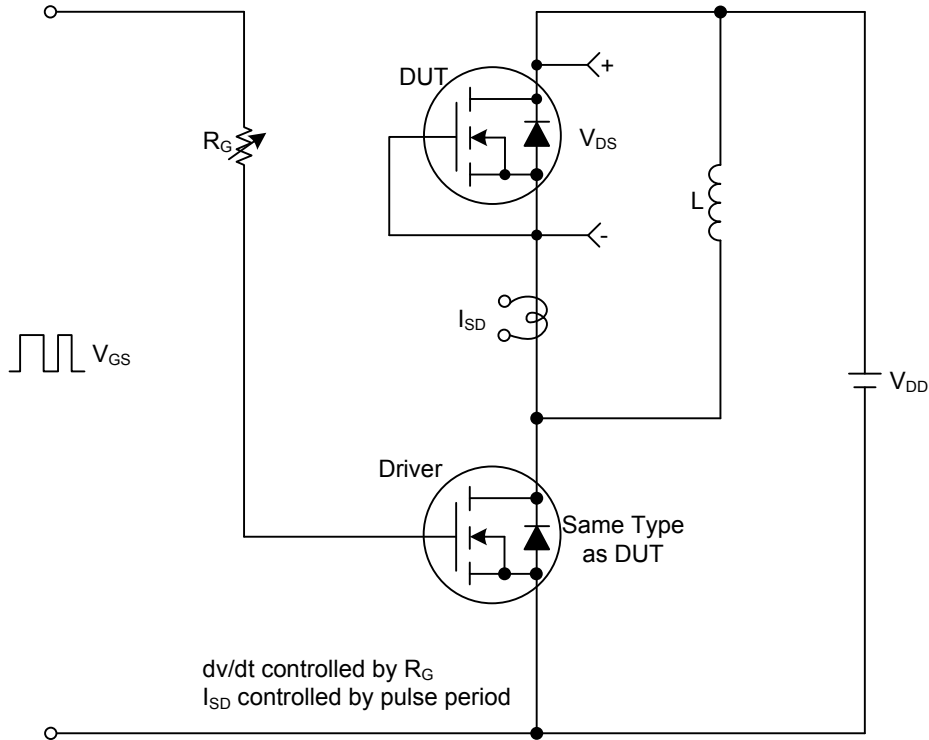
■ ELECTRICAL CHARACTERISTICS ($T_c=25^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	400			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=400\text{V}$, $V_{GS}=0\text{V}$			1	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	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=0.5\text{A}$			4.0	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$		165		pF
Output Capacitance	C_{OSS}			35		pF
Reverse Transfer Capacitance	C_{RSS}			20		pF
SWITCHING PARAMETERS						
Total Gate Charge	Q_G	$V_{DS}=50\text{V}$, $V_{GS}=10\text{V}$, $I_D=1.3\text{A}$, $I_G=100\mu\text{A}$ (Note 1, 2)		13.5		nC
Gate to Source Charge	Q_{GS}			1.5		nC
Gate to Drain Charge	Q_{GD}			1.5		nC
Turn-ON Delay Time	$t_{D(ON)}$	$V_{DD}=30\text{V}$, $V_{GS}=10\text{V}$, $I_D=0.5\text{A}$, $R_G=25\Omega$ (Note 1, 2)		30		ns
Rise Time	t_R			20		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			60		ns
Fall-Time	t_F			13		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				1	A
Maximum Body-Diode Pulsed Current	I_{SM}				4	A
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{V}$, $I_S=1.0\text{A}$			1.4	V
Reverse Recovery Time	t_{rr}	$V_{GS}=0\text{V}$, $I_S=1.0\text{A}$		160		ns
Reverse Recovery Charge	Q_{rr}	$dI_F/dt=100\text{A}/\mu\text{s}$ (Note 1)		0.28		μC

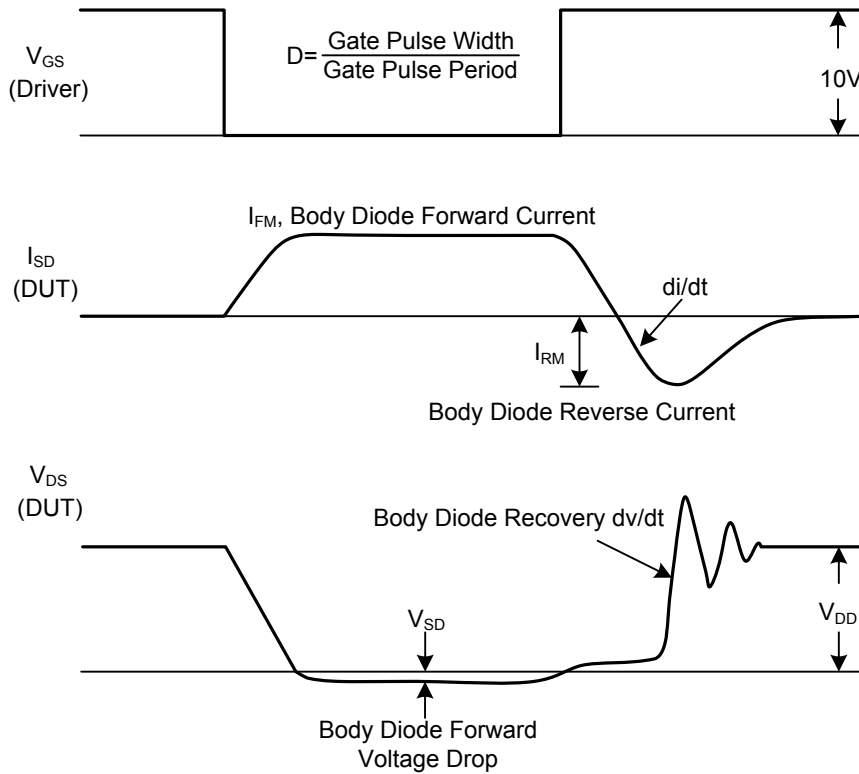
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

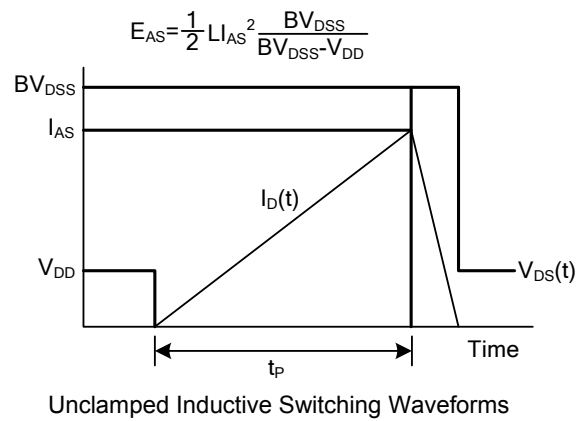
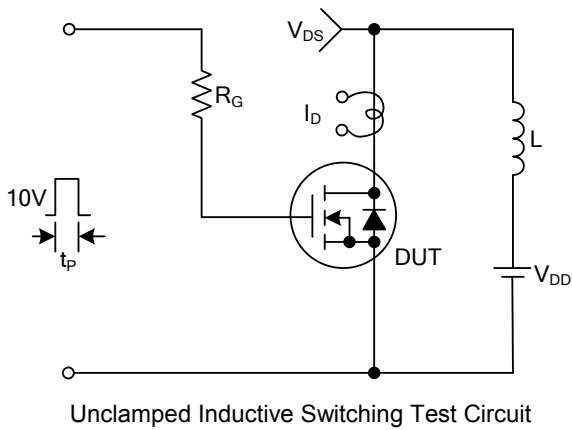
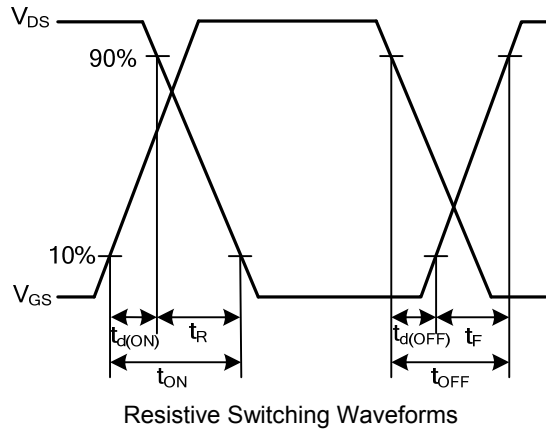
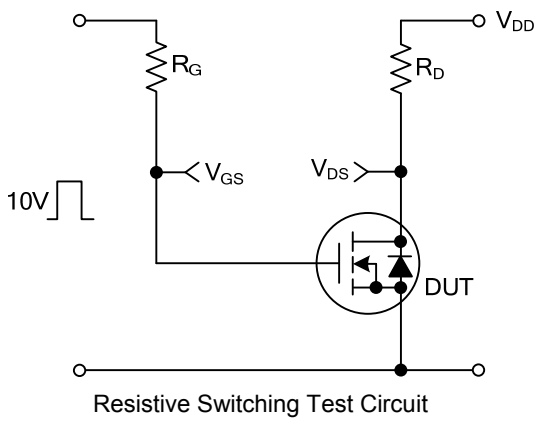
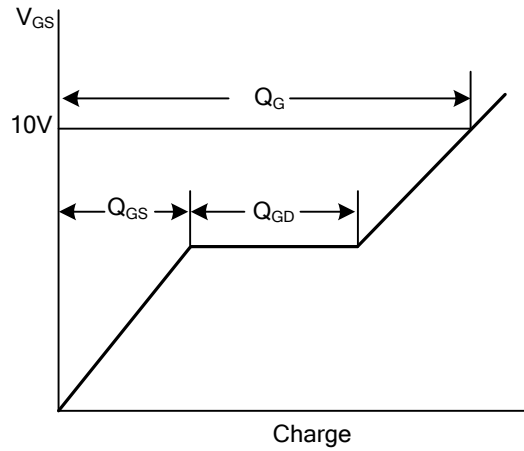
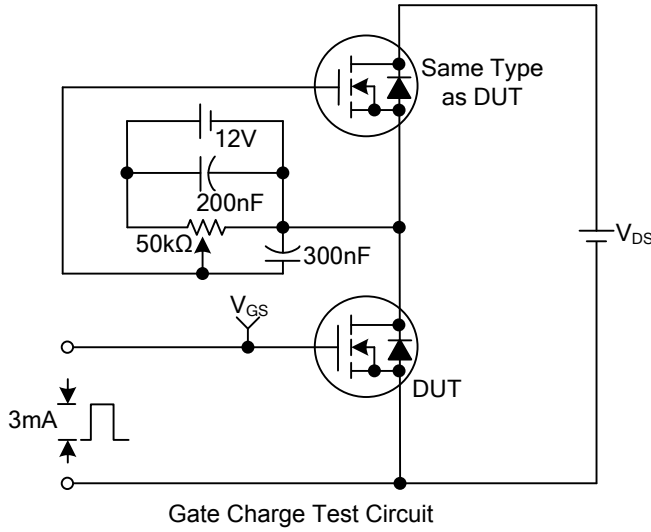
■ TEST CIRCUITS AND WAVEFORMS



Peak Diode Recovery dv/dt Test Circuit & Waveforms



■ TEST CIRCUITS AND WAVEFORMS (Cont.)



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