



2N60-CBQ

Power MOSFET

2A, 600V N-CHANNEL POWER MOSFET

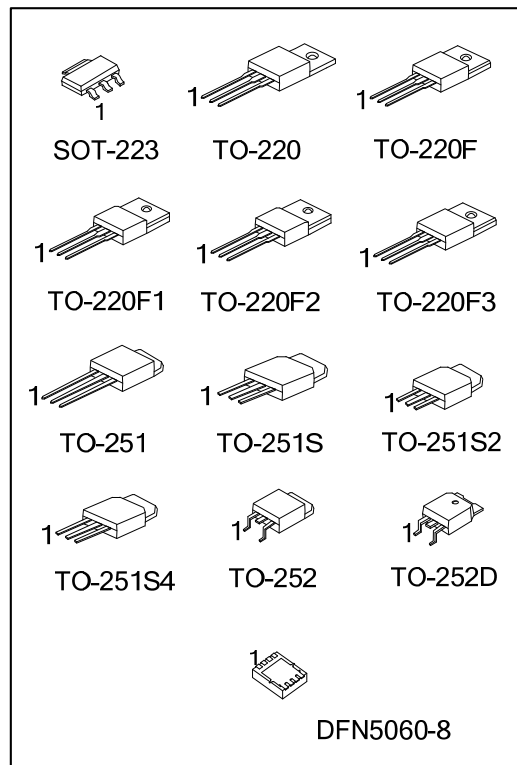
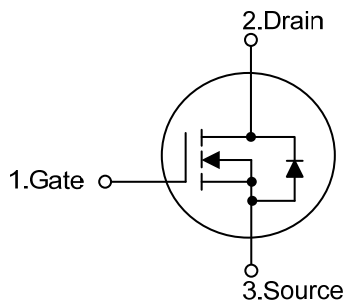
DESCRIPTION

The UTC **2N60-CBQ** is a high voltage power 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

- * $R_{DS(ON)} < 5.6\Omega @ V_{GS} = 10V, I_D = 1.0A$
- * 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	4	5	6	7	8	
2N60L-AA3-R	2N60G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
2N60L-TA3-T	2N60G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
2N60L-TF3-T	2N60G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
2N60L-TF1-T	2N60G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
2N60L-TF2-T	2N60G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	Tube
2N60L-TF3T-T	2N60G-TF3T-T	TO-220F3	G	D	S	-	-	-	-	-	Tube
2N60L-TM3-T	2N60G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
2N60L-TMS-T	2N60G-TMS-T	TO-251S	G	D	S	-	-	-	-	-	Tube
2N60L-TMS2-T	2N60G-TMS2-T	TO-251S2	G	D	S	-	-	-	-	-	Tube
2N60L-TMS4-T	2N60G-TMS4-T	TO-251S4	G	D	S	-	-	-	-	-	Tube
2N60L-TN3-R	2N60G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
2N60L-TND-R	2N60G-TND-R	TO-252D	G	D	S	-	-	-	-	-	Tape Reel
2N60L-K08-5060-R	2N60G-K08-5060-R	DFN5060-8	S	S	S	G	D	D	D	D	Tape Reel

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

	<p>(1) T: Tube, R: Tape Reel (2) AA3: SOT-223, TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TF3T: TO-220F3, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TND: TO-252D K08-5060: DFN5060-8 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

PACKAGE	MARKING
SOT-223	<p>Lot Code ← 2N60 □ □ □ □ □ □ □ □ → Data Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p>
TO-220 / TO-220F TO-220F1 / TO-220F2 TO-220F3 / TO-251 TO-251S / TO-251S2 TO-251S4 / TO-252 TO-252D	<p>Lot Code ← UTC 2N60 □ □ □ □ □ □ □ □ → Data Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free</p>
DFN5060-8	<p>Lot Code ← UTC □ □ □ □ □ □ □ □ → Internal Code</p> <p>2N60</p> <p>• □ □ □ □ □ □ □ □ → Date Code</p>

■ ABSOLUTE MAXIMUM RATINGS (T_C=25°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	I _D	2.0	A
	Pulsed (Note 2)	I _{DM}	8.0	A
Avalanche Current (Note 2)		I _{AR}	2	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	43	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	3.9	V/ns
Power Dissipation	SOT-223	P _D	9	W
	TO-220		54	W
	TO-220F/TO-220F1 TO-220F3		23	W
	TO-220F2		24	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		44	W
	DFN5060-8		22	W
	Junction Temperature		T _J	+150
Storage Temperature		T _{STG}	-55 ~ +150	°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=21.5mH, I_{AS}=2.0A, V_{DD}=50V, R_G=25 Ω, Starting T_J = 25°C

4. I_{SD} ≤ 2.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT		
Junction to Ambient	SOT-223	θ _{JA}	150	°C/W		
	TO-220/TO-220F TO-220F1/ TO-220F2 TO-220F3		62.5	°C/W		
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		100	°C/W		
	DFN5060-8		75	°C/W		
	Junction to Case		SOT-223	θ _{JC}	14	°C/W
			TO-220		2.32	°C/W
TO-220F/TO-220F1 TO-220F3		5.4	°C/W			
TO-220F2		5.2	°C/W			
TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.84	°C/W			
DFN5060-8		5.7	°C/W			

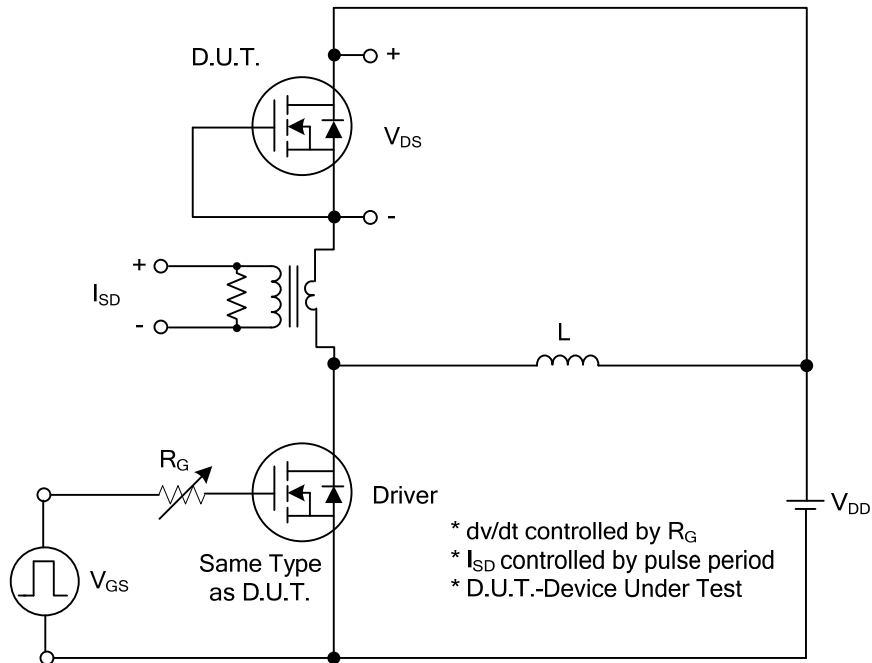
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS} = 600V, V_{GS} = 0V$			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}			100	nA
	Reverse				-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1.0A$			5.6	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1MHz$		246		pF
Output Capacitance	C_{OSS}			36		pF
Reverse Transfer Capacitance	C_{RSS}			3.0		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS} = 100V, V_{GS} = 10V, I_D = 2.0A$ $I_G = 100\mu A$ (Note 1, 2)		10		nC
Gate to Source Charge	Q_{GS}			5		nC
Gate to Drain Charge	Q_{GD}			2		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS} = 30V, V_{GS} = 10V, I_D = 2.0A,$ $R_G = 25\Omega$ (Note 1, 2)		4		ns
Rise Time	t_R			11		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			112		ns
Fall-Time	t_F			38		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_{SD}				2.0	A
Maximum Body-Diode Pulsed Current	I_{SM}				8.0	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S = 2.0A, V_{GS} = 0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S = 2.0A, V_{GS} = 0V,$ $di_F/dt = 100A/\mu s$		235		ns
Body Diode Reverse Recovery Charge	Q_{rr}			0.7		μC

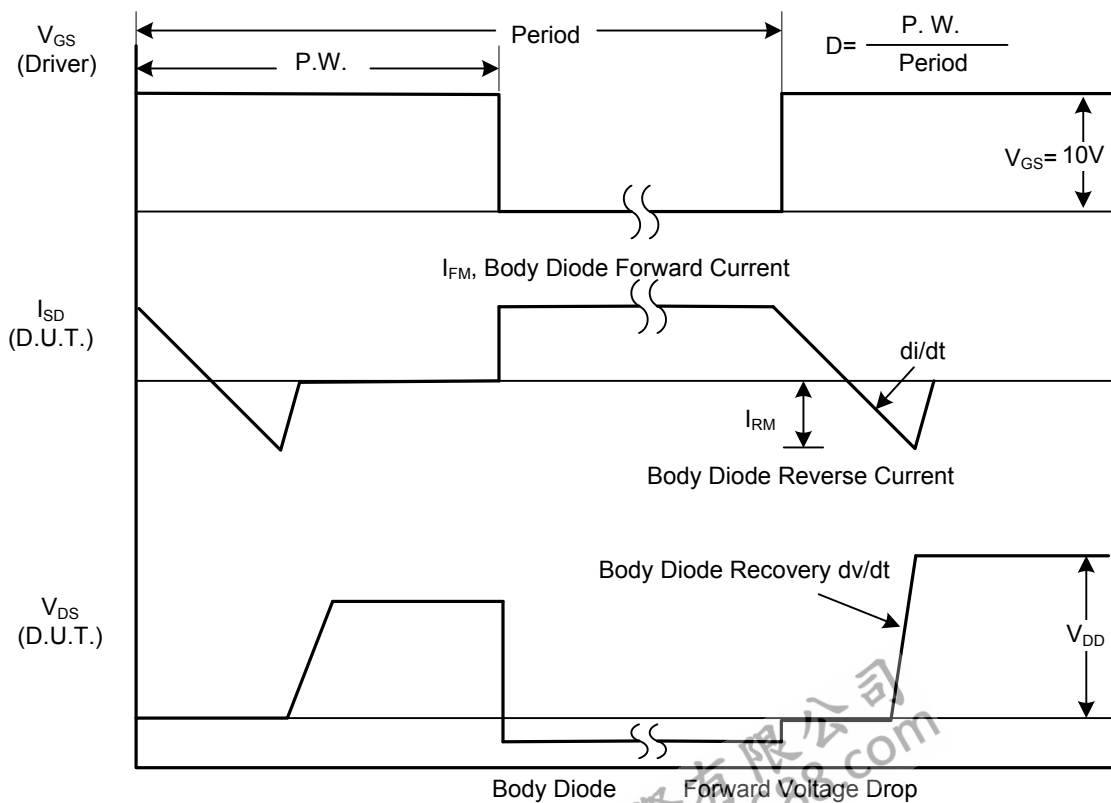
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

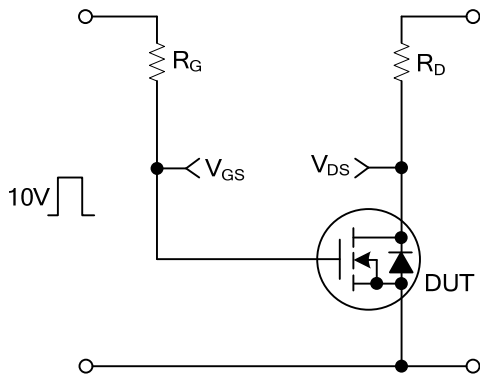


Peak Diode Recovery dv/dt Test Circuit

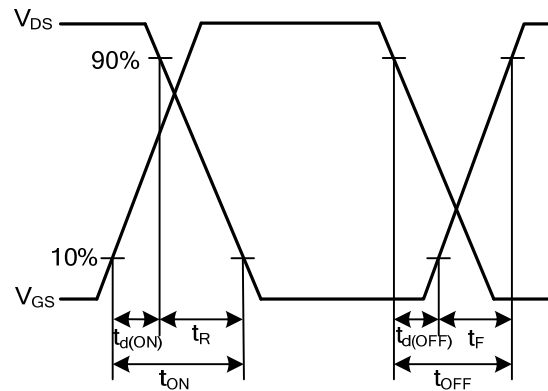


Peak Diode Recovery dv/dt Waveforms

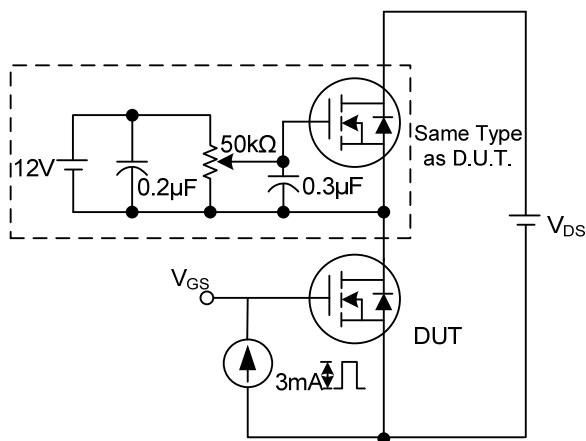
TEST CIRCUITS AND WAVEFORMS (Cont.)



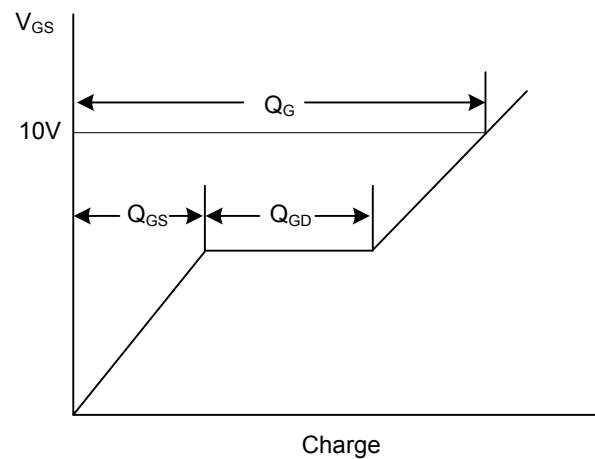
Switching Test Circuit



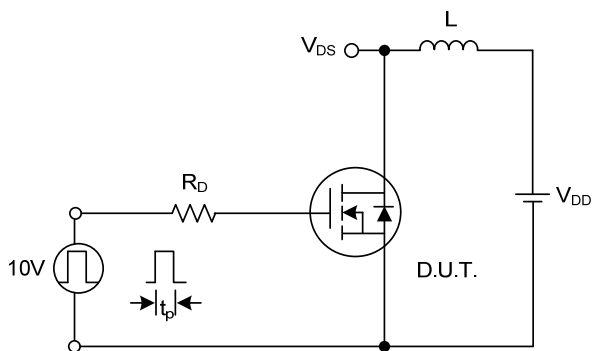
Switching Waveforms



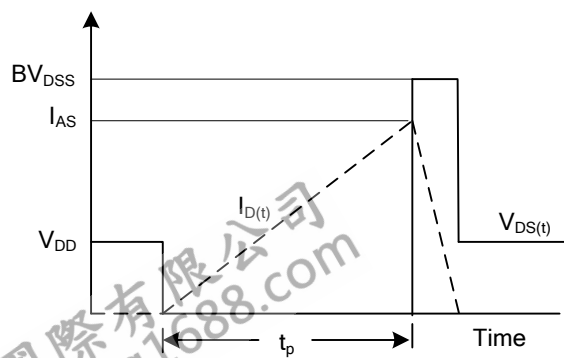
Gate Charge Test Circuit



Gate Charge Waveform

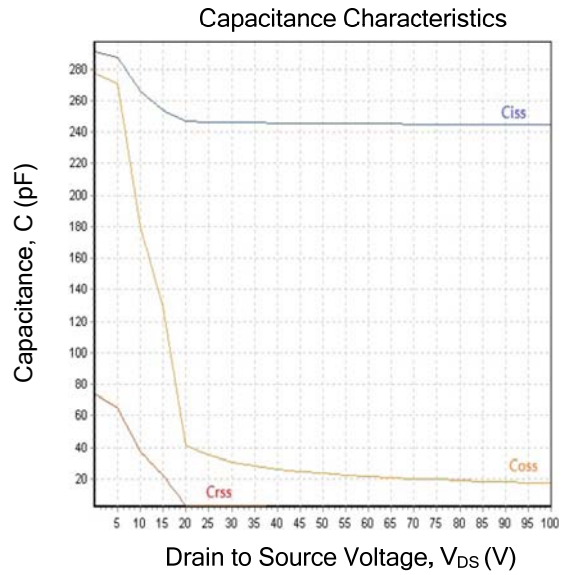
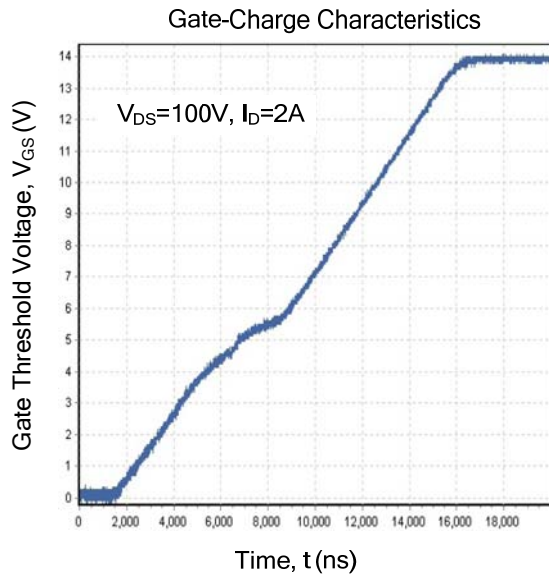


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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