



## 05N60-CB

Preliminary

Power MOSFET

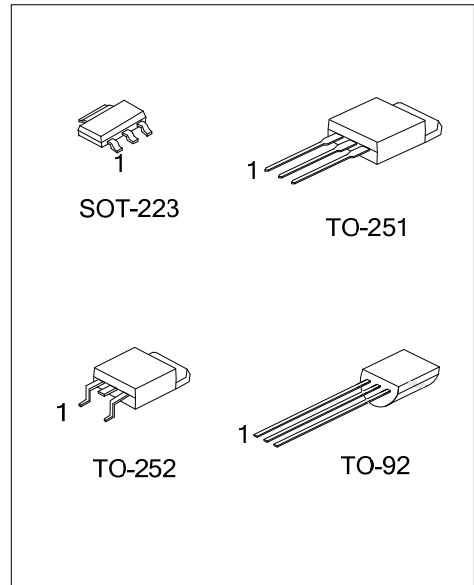
### 0.5A, 600V N-CHANNEL POWER MOSFET

#### DESCRIPTION

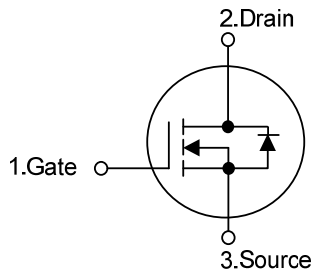
The UTC **05N60-CB** is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

#### FEATURES

- \*  $R_{DS(ON)} < 23\Omega @ V_{GS} = 10V, I_D = 0.25A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved dv/dt capability, high ruggedness



#### SYMBOL



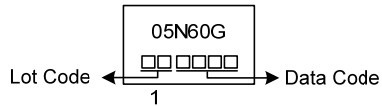
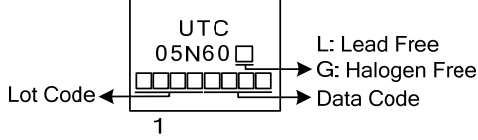
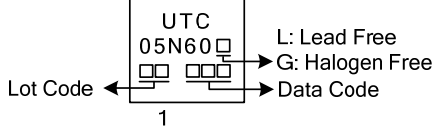
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
-	05N60G-AA3-R	SOT-223	G	D	S	Tape Reel
05N60L-TM3-T	05N60G-TM3-T	TO-251	G	D	S	Tube
05N60L-TN3-R	05N60G-TN3-R	TO-252	G	D	S	Tape Reel
05N60L-T92-B	05N60G-T92-B	TO-92	G	D	S	Tape Box
05N60L-T92-K	05N60G-T92-K	TO-92	G	D	S	Bulk

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

05N60G-AA3-R	(1)Packing Type (2)Package Type (3)Green Package	(1) B: Tape Box, K: Bulk, T: Tube, R: Tape Reel (2) AA3: SOT-223, TM3: TO-251, TN3: TO-252 T92: TO-92 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

PACKAGE	MARKING
SOT-223	 <p>05N60G                      Lot Code ← [ ] [ ] [ ] [ ] → Data Code                      1</p>
TO-251 / TO-252	 <p>UTC                      05N60                      Lot Code ← [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] → Data Code                      L: Lead Free                      G: Halogen Free                      1</p>
TO-92	 <p>UTC                      05N60                      Lot Code ← [ ] [ ] [ ] [ ] → Data Code                      L: Lead Free                      G: Halogen Free                      1</p>

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■ 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
Continuous Drain Current		$I_D$	0.5	A
Pulsed Drain Current (Note 2)		$I_{DM}$	2	A
Avalanche Energy	Single Pulse(Note 3)	$E_{AS}$	25	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/ dt	4.5	V/ns
Power Dissipation	SOT-223	$P_D$	6	W
	TO-251/TO-252		27	W
	TO-92		1.4	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.  $L=150\text{mH}$ ,  $I_{AS}=0.5\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=0\Omega$ , 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	$\theta_{JA}$	150	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		110	$^\circ\text{C}/\text{W}$
	TO-92		160	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223	$\theta_{JC}$	20	$^\circ\text{C}/\text{W}$
	TO-251/TO-252		4.63	$^\circ\text{C}/\text{W}$
	TO-92		88	$^\circ\text{C}/\text{W}$

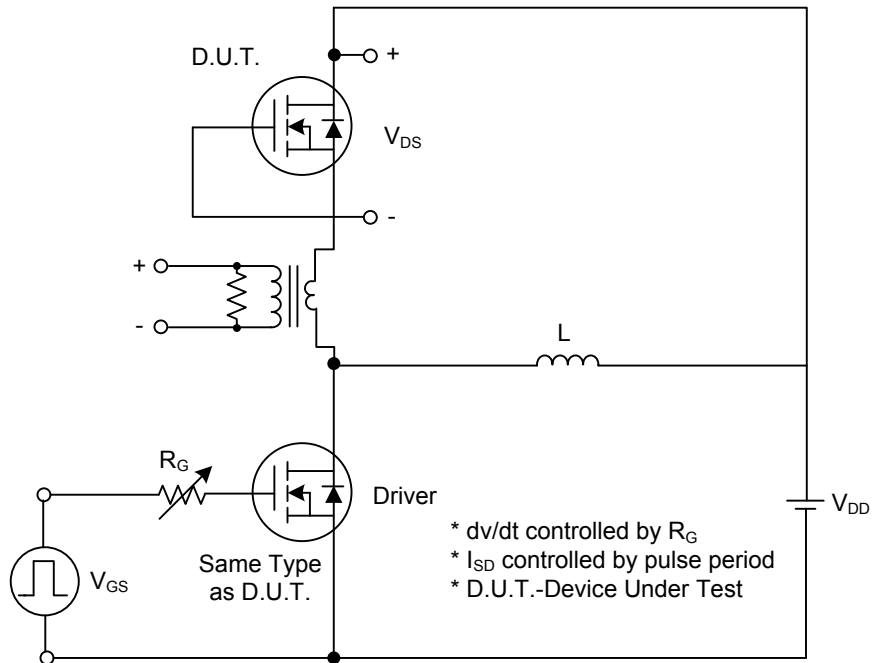
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Drain-Source Leakage Current ( $T_J=25^\circ\text{C}$ )	$I_{DSS}$	$V_{DS} = 600V, V_{GS} = 0V$			10	$\mu A$
Drain-Source Leakage Current ( $T_J=125^\circ\text{C}$ )					10	
Gate-Source Leakage Current	Forward	$V_{GS} = 30V, V_{DS} = 0V$ $V_{GS} = -30V, V_{DS} = 0V$			100	nA
	Reverse				-100	
<b>ON CHARACTERISTICS</b>						
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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 0.25A$			23	$\Omega$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	$C_{ISS}$	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$		87		pF
Output Capacitance	$C_{OSS}$			12		pF
Reverse Transfer Capacitance	$C_{RSS}$			5		pF
<b>SWITCHING CHARACTERISTICS</b>						
Total Gate Charge (Note 1)	$Q_G$	$V_{DS}=50V, V_{GS}=10V, I_D=1.3A,$ $I_G = 100\mu A$ (Note 1, 2)		7.0		nC
Gate-Source Charge	$Q_{GS}$			1.0		nC
Gate-Drain Charge	$Q_{GD}$			0.5		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=30V, V_{GS}=10V,$ $I_D=0.5A, R_G=25\Omega$ (Note 1, 2)		18		ns
Turn-On Rise Time	$t_R$			16		ns
Turn-Off Delay Time	$t_{D(OFF)}$			38		ns
Turn-Off Fall Time	$t_F$			28		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				1.0	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				4.0	A
Drain-Source Diode Forward Voltage (Note 1)	$V_{SD}$	$V_{GS}=0V, I_{SD} = 0.5A$			1.6	V
Reverse Recovery Time (Note 1)	$t_{rr}$	$V_{GS}=0V, I_{SD} = 1.0A$ $di/dt = 100A/\mu s$		375		ns
Reverse Recovery Charge	$Q_{rr}$			0.4		$\mu C$

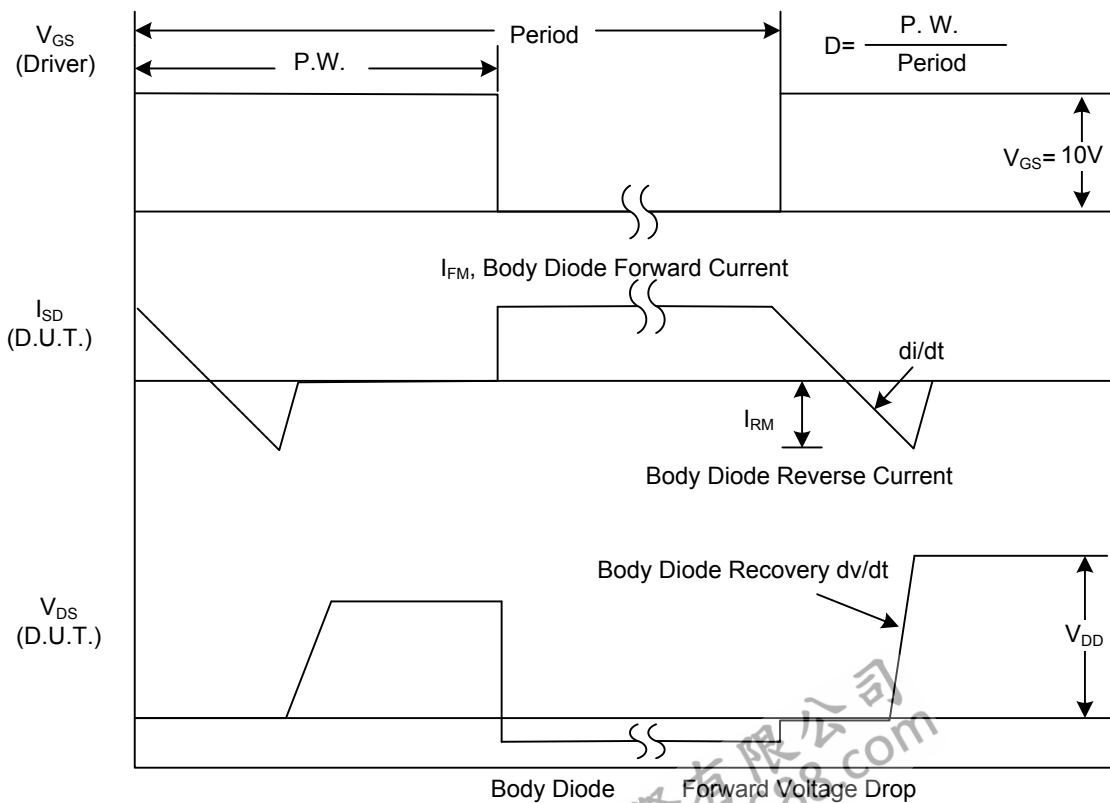
Notes: 1. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

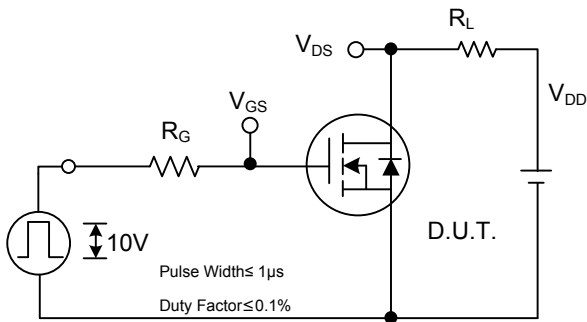


Peak Diode Recovery  $dv/dt$  Test Circuit

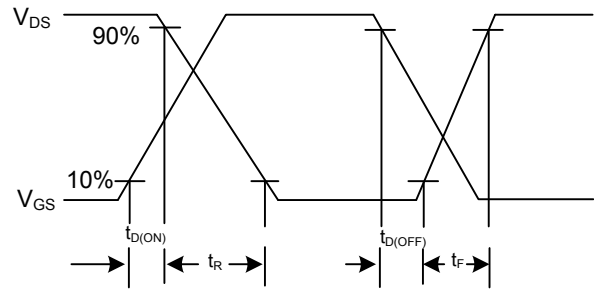


Peak Diode Recovery  $dv/dt$  Waveforms

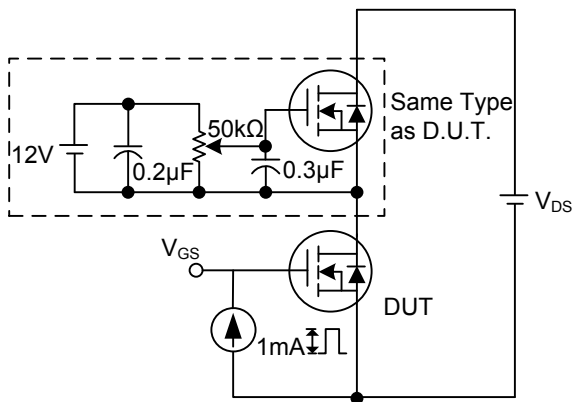
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



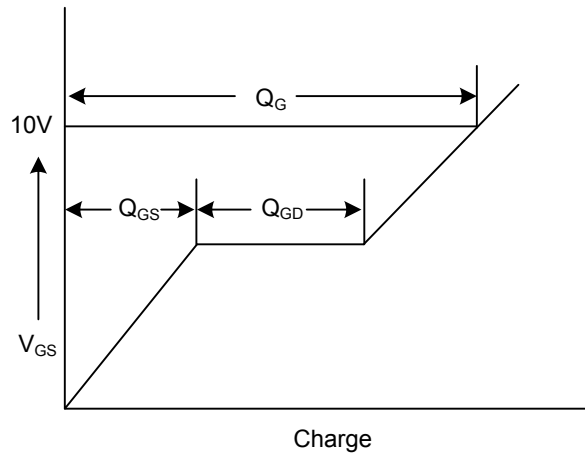
Switching Test Circuit



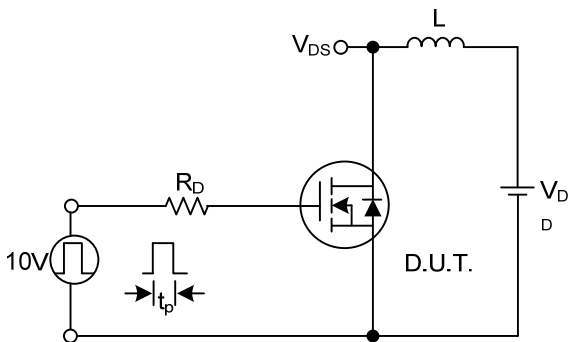
Switching Waveforms



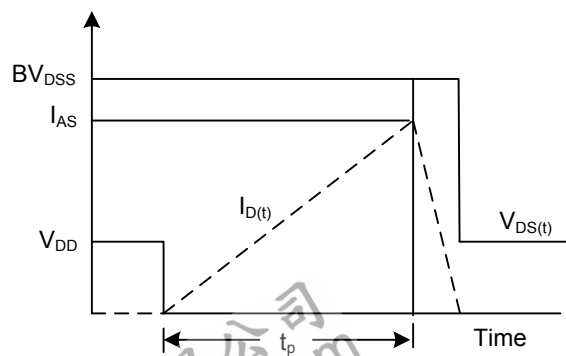
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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