



## 2NN60-CBS

Preliminary

Power MOSFET

### DUAL N-CHANNEL ENHANCEMENT MODE

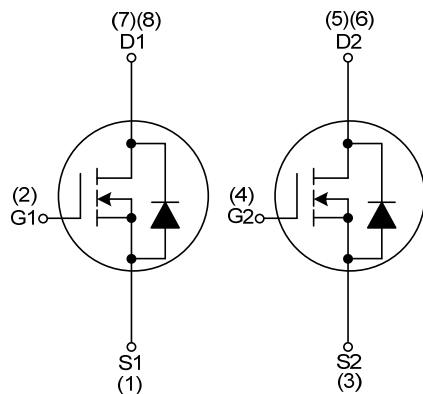
#### DESCRIPTION

The UTC **2NN60-CBS** 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

- \*  $R_{DS(ON)} < 8.5\Omega$  @  $V_{GS} = 10V$ ,  $I_D = 1.0A$
- \* Fast switching capability
- \* Avalanche energy specified
- \* Improved  $dv/dt$  capability, high ruggedness

#### SYMBOL

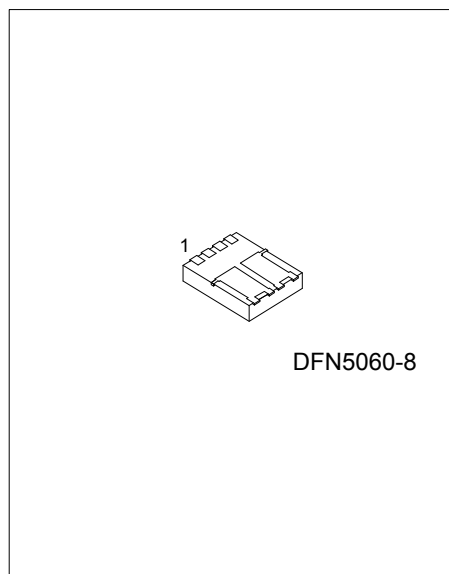


#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
2NN60L-K08-5060-R	2NN60G-K08-5060-R	DFN5060-8	S1	G1	S2	G2	D2	D2	D1	D1	Tape Reel

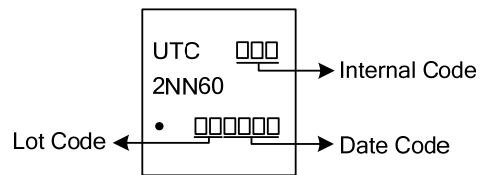
Note: Pin Assignment: G: Gate D: Drain S: Source

2NN60G-K08-5060-R		(1)Packing Type	(1) R: Tape Reel
		(2)Package Type	(2) K08-5060: DFN5060-8
		(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free



DFN5060-8

## ■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DS}$	600	V
Gate-Source Voltage		$V_{GS}$	$\pm 30$	V
Continuous Drain Current	Continuous	$I_D$	2.0	A
Pulsed Drain Current	Pulsed (Note 2)	$I_{DM}$	8.0	A
Avalanche Current (Note 3)		$I_{AR}$	1.5	A
Avalanche energy	Single Pulsed (Note 3)	$E_{AS}$	11	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/nS
Power Dissipation		$P_D$	22	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature Range		$T_{STG}$	-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.  $L=10\text{mH}$ ,  $I_{AS}=1.5\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$ .

4.  $I_{SD} \leq 2.0\text{A}$ ,  $di/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J = 25^{\circ}\text{C}$ .

■ THERMAL CHARACTERISTICS

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		$\theta_{JA}$	75	$^{\circ}\text{C}/\text{W}$
Junction to Case		$\theta_{JC}$	5.7	$^{\circ}\text{C}/\text{W}$

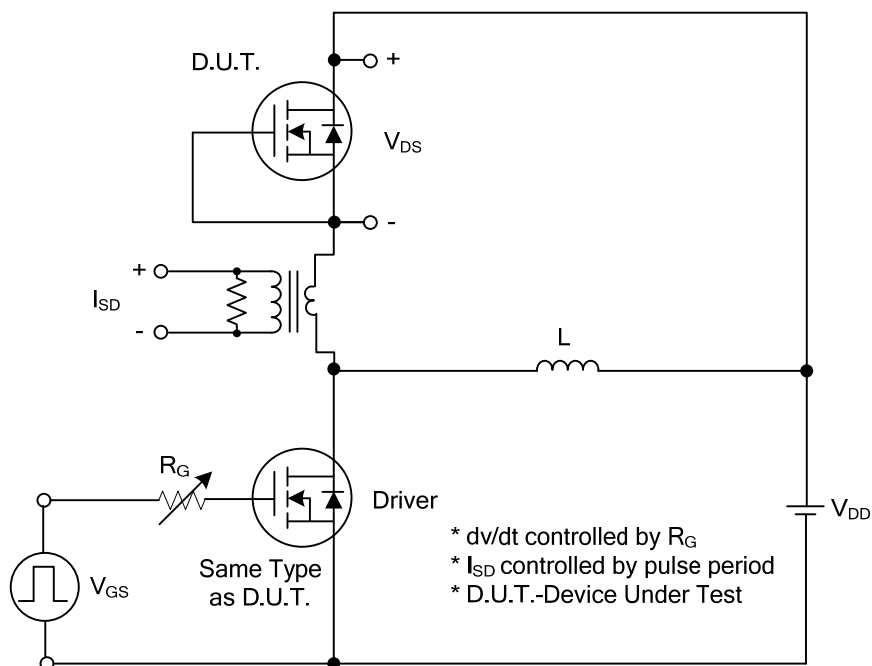
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV <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>	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V			100	nA
	Reverse		V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V			-100	nA
ON CHARACTERISTICS							
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> =1.0A			8.5	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f =1MHz		177		pF
Output Capacitance		C <sub>OSS</sub>			26		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>			7.4		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q <sub>G</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, I <sub>D</sub> =100μA (Note 1, 2)		15		nC
Gate to Source Charge		Q <sub>GS</sub>			1.7		nC
Gate to Drain Charge		Q <sub>GD</sub>			1.7		nC
Turn-on Delay Time (Note 1)		t <sub>D(ON)</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		42		ns
Rise Time		t <sub>R</sub>			32		ns
Turn-off Delay Time		t <sub>D(OFF)</sub>			80		ns
Fall-Time		t <sub>F</sub>			34		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I <sub>SD</sub>				2.0	A
Maximum Body-Diode Pulsed Current		I <sub>SM</sub>				8.0	A
Drain-Source Diode Forward Voltage (Note 1)		V <sub>SD</sub>	I <sub>S</sub> =2.0A, V <sub>GS</sub> =0V			1.4	V
Reverse Recovery Time (Note 1)		t <sub>rr</sub>	I <sub>S</sub> =2.0A, V <sub>GS</sub> =0V,		340		ns
Reverse Recovery Charge		Q <sub>rr</sub>	dl <sub>F</sub> /dt=100A/μs		680		nC

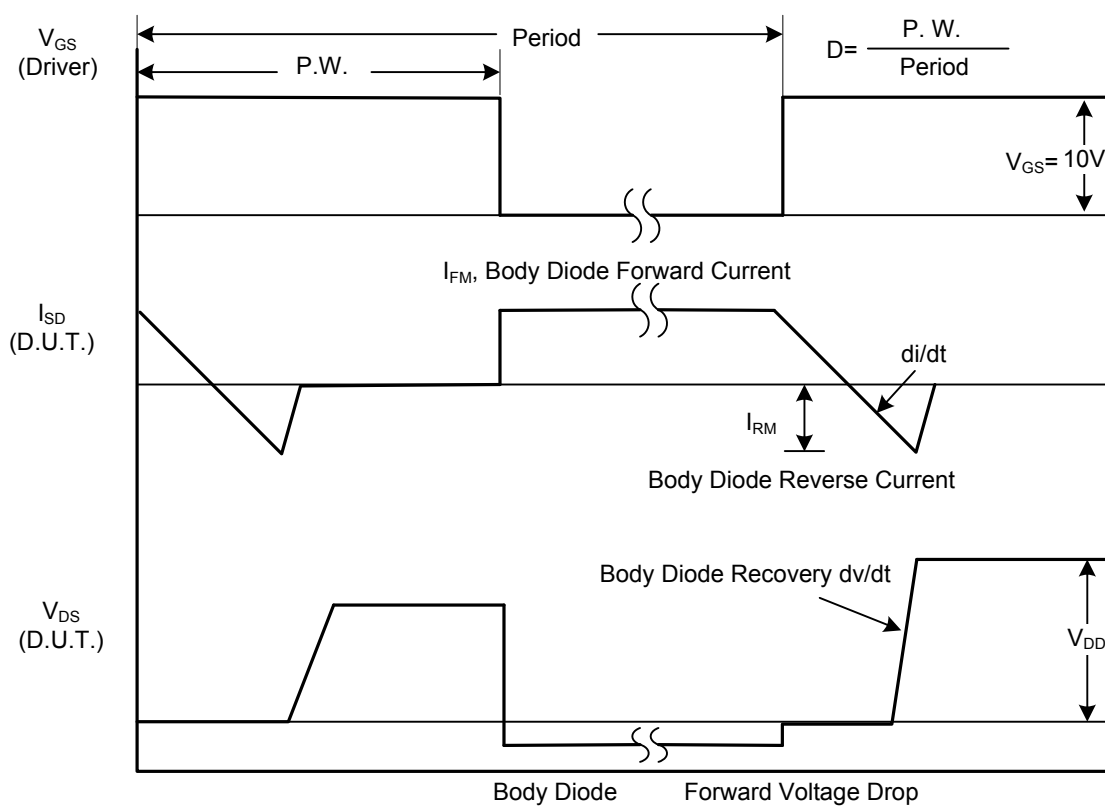
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

# ■ TEST CIRCUITS AND WAVEFORMS

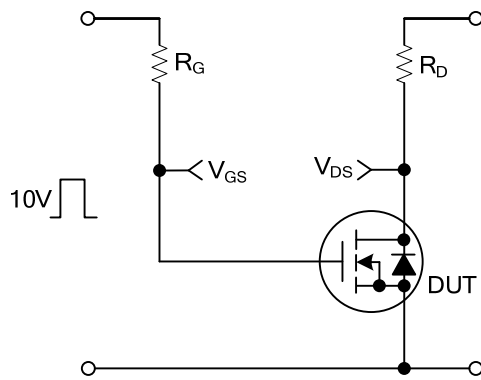


Peak Diode Recovery  $dv/dt$  Test Circuit

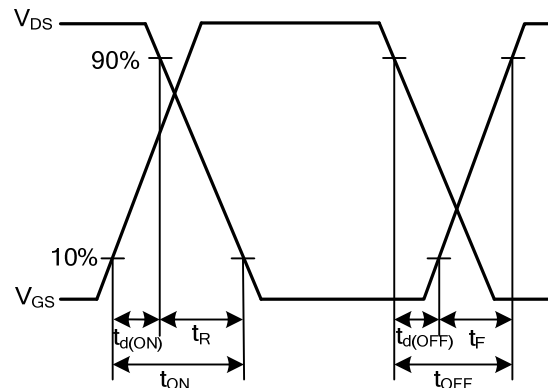


Peak Diode Recovery  $dv/dt$  Waveforms

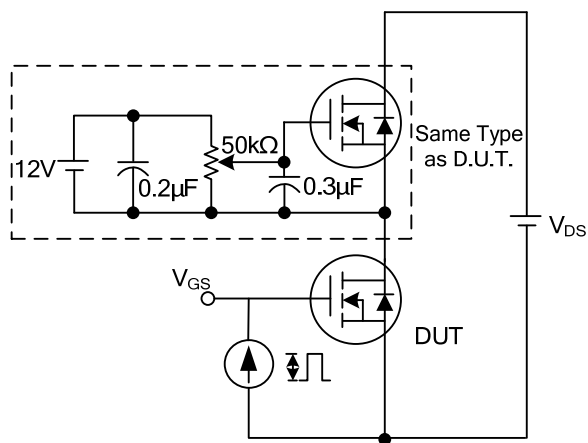
# ■ TEST CIRCUITS AND WAVEFORMS (Cont.)



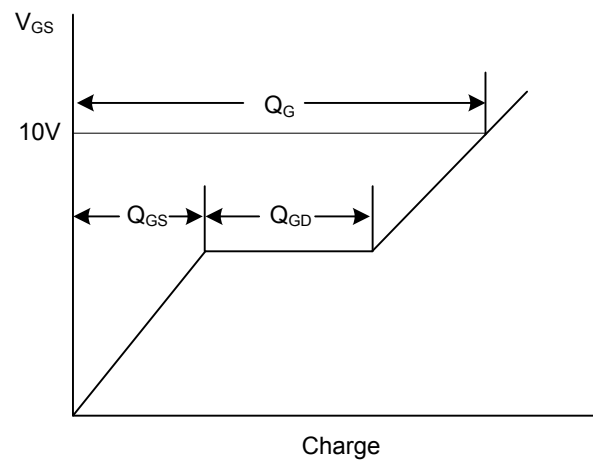
Switching Test Circuit



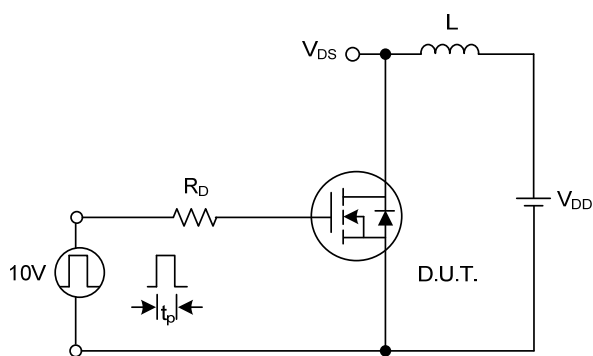
Switching Waveforms



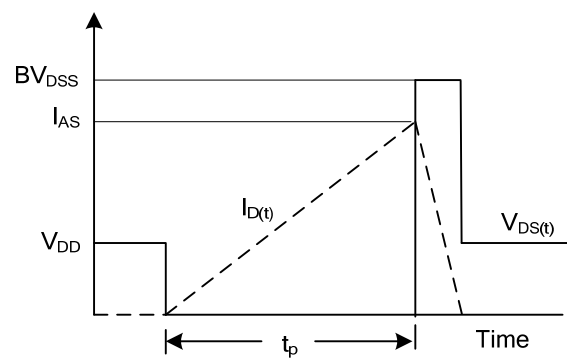
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

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