



2NNPP06

Power MOSFET

60V COMPLEMENTARY ENHANCEMENT MODE MOSFET H-BRIDGE (N-CHANNEL/P-CHANNEL)

■ DESCRIPTION

The UTC **2NNPP06** is a complementary enhancement mode MOSFET H-BRIDGE, it uses UTC advanced technology to provide customers low on resistance, low gate charge and low threshold voltage.

The UTC **2NNPP06** is universally applied in DC-AC Inverters and DC Motor control.

■ FEATURES

* N-CHANNEL

- $R_{DS(on)} = 0.25\Omega @V_{GS} = 10V, I_D=1.8A$
- $R_{DS(on)} = 0.35\Omega @V_{GS} = 4.5V, I_D=1.3A$

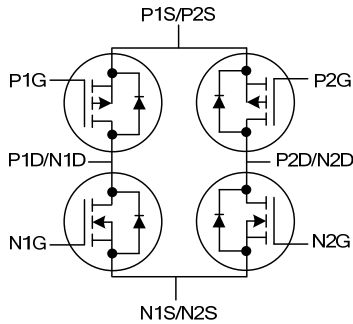
* P-CHANNEL

- $R_{DS(on)} = 0.4\Omega @V_{GS} = -10V, I_D=-0.9A$
- $R_{DS(on)} = 0.6\Omega @V_{GS} = -4.5V, I_D=-0.8A$

* High switching speed

* Low gate charge (N:-ch Typ.=3.2nC, P-ch: Typ.=5.1nC)

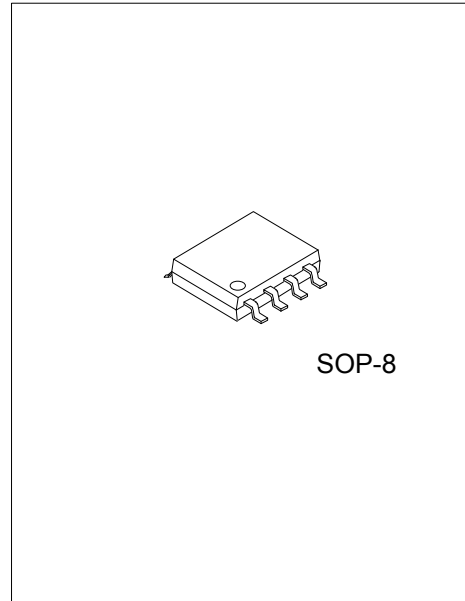
■ SYMBOL



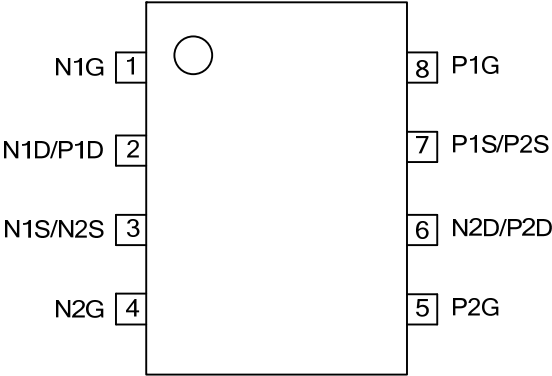
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
2NNPP06L-S08-R	2NNPP06G-S08-R	SOP-8	Tape Reel
2NNPP06L-S08-T	2NNPP06G-S08-T	SOP-8	Tube

<p>2NNPP06L-S08-R</p> <ul style="list-style-type: none"> (1)Packing Type (2)Package Type (3)Lead Free 	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) S08: SOP-8</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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■ PIN CONFIGURATION



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER			SYMBOL	RATINGS		UNIT
				N-CHANNEL	P-CHANNEL	
Gate-Source Voltage			V_{GSS}	±20	±20	V
Drain-Source Voltage			V_{DSS}	60	-60	V
Drain Current	Continuous	$V_{GS}=10V, T_A=25^{\circ}C, t \leq 10 \text{ sec}$	I_D	1.8	-1.42	A
	Pulsed	$V_{GS}=10V, T_A=25^{\circ}C$ (Note 1)	I_{DM}	7.1	-6.03	A
Power Dissipation			P_D	0.87		W
				6.94		mW/°C
Junction Temperature			T_J	-55~+150		°C
Storage Temperature Range			T_{STG}	-55~+150		°C

Note: 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.

■ THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient (Note 1)	θ_{JA}	144	°C/W

Notes: 1. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$. The pulse current is limited by the maximum junction temperature.

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

FOR N-CHANNEL

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}, V_{GS}=0V$	60			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$			0.5	μA
Gate-Source Leakage Current	I_{GSS}	Forward $V_{GS}=+20V, V_{DS}=0V$			+100	nA
		Reverse $V_{GS}=-20V, V_{DS}=0V$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1		3	V
Static Drain-Source On-State Resistance (Note 1)	$R_{DS(ON)}$	$V_{GS}=10V, I_D=1.8A$			0.25	Ω
		$V_{GS}=4.5V, I_D=1.3A$			0.35	Ω
DYNAMIC PARAMETERS						
Input Capacitance (Note 3)	C_{ISS}	$V_{GS}=0V, V_{DS}=25V,$ $f=1.0\text{MHz}$		166		pF
Output Capacitance (Note 3)	C_{OSS}			19.5		pF
Reverse Transfer Capacitance (Note 3)	C_{RSS}			8.7		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 3)	Q_G	$V_{GS}=10V, V_{DS}=30V,$ $I_D=1.8A$		3.2		nC
Gate to Source Charge (Note 3)	Q_{GS}			0.67		nC
Gate to Drain Charge (Note 3)	Q_{GD}			0.82		nC
Turn-ON Delay Time (Note 2, 3)	$t_{D(ON)}$	$V_{DD}=30V, I_D=1A, R_G \approx 6\Omega,$ $V_{GS}=10V$		1.8		ns
Rise Time (Note 2, 3)	t_R			1.4		ns
Turn-OFF Delay Time (Note 2, 3)	$t_{D(OFF)}$			4.9		ns
Fall-Time (Note 2, 3)	t_F			2.0		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S	$T_A=25^{\circ}C$ (Note 2)			1.8	A
Maximum Body-Diode Pulsed Current	I_{SM}	$T_A=25^{\circ}C$ (Note 3)			7.1	A
Drain-Source Diode Forward Voltage(Note 1)	V_{SD}	$I_S=0.45A, V_{GS}=0V$		0.8	0.95	V

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

FOR P-CHANNEL

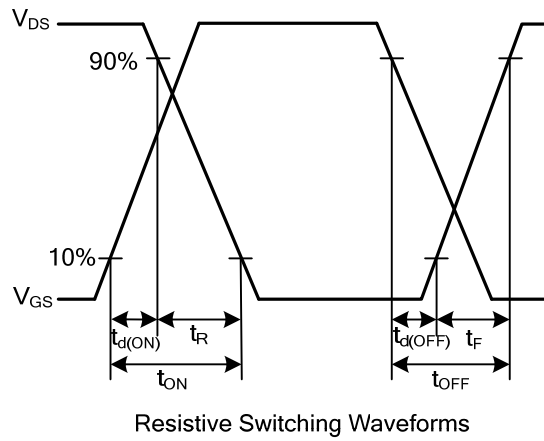
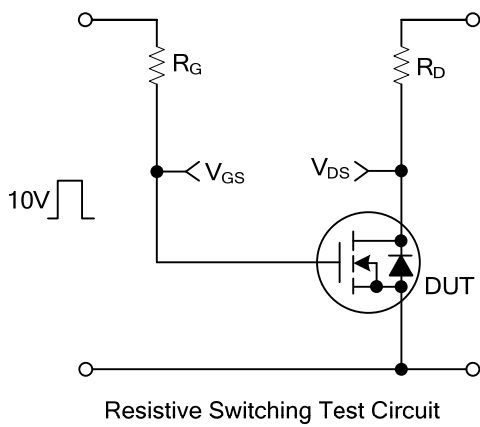
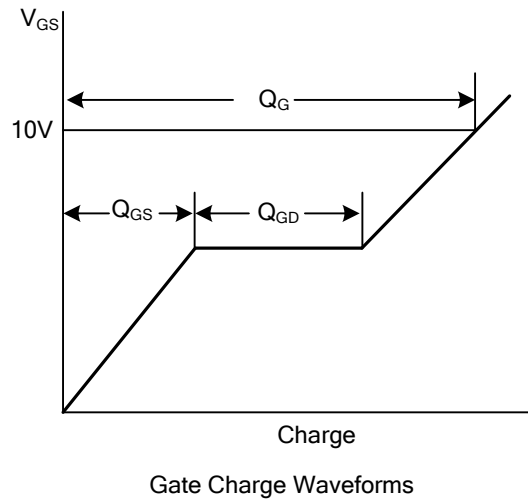
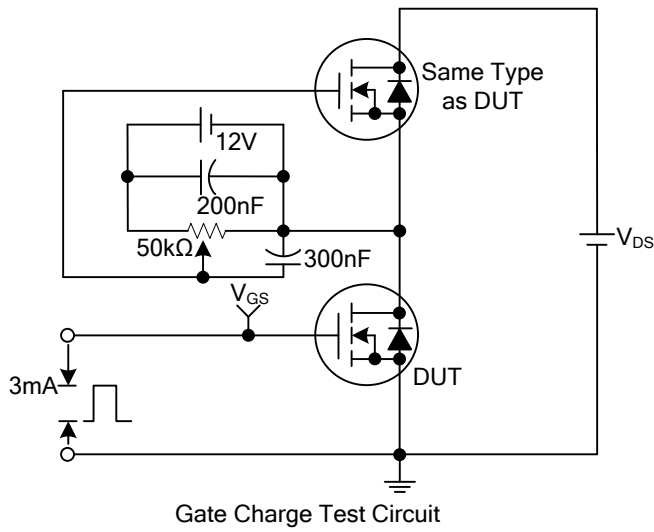
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-60			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-60\text{V}$, $V_{GS}=0\text{V}$			-0.5	μA
Gate-Source Leakage Current	Forward	$V_{GS}=+20\text{V}$, $V_{DS}=0\text{V}$			+100	nA
	Reverse	$V_{GS}=-20\text{V}$, $V_{DS}=0\text{V}$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1		-3	V
Static Drain-Source On-State Resistance (Note 1)	$R_{DS(ON)}$	$V_{GS}=-10\text{V}$, $I_D=-0.9\text{A}$			0.4	Ω
		$V_{GS}=-4.5\text{V}$, $I_D=-0.8\text{A}$			0.6	Ω
DYNAMIC PARAMETERS						
Input Capacitance (Note 3)	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=-25\text{V}$, $f=1.0\text{MHz}$		141		pF
Output Capacitance (Note 3)	C_{OSS}			13.1		pF
Reverse Transfer Capacitance (Note 3)	C_{RSS}			10.8		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 3)	Q_G	$V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $I_D=-0.9\text{A}$		5.1		nC
Gate to Source Charge (Note 3)	Q_{GS}			0.7		nC
Gate to Drain Charge (Note 3)	Q_{GD}			0.7		nC
Turn-ON Delay Time (Note 2, 3)	$t_{D(ON)}$	$V_{DD}=-30\text{V}$, $I_D=-1\text{A}$, $R_G\approx 6\Omega$, $V_{GS}=-10\text{V}$		1.6		ns
Rise Time (Note 2, 3)	t_R			2.3		ns
Turn-OFF Delay Time (Note 2, 3)	$t_{D(OFF)}$			13		ns
Fall-Time (Note 2, 3)	t_F			5.8		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S	$T_A=25^\circ\text{C}$ (Note 2)			-1.42	A
Maximum Body-Diode Pulsed Current	I_{SM}	$T_A=25^\circ\text{C}$ (Note 3)			-6.03	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=-0.8\text{A}$, $V_{GS}=0\text{V}$		-0.85	-0.95	V

Notes: 1. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.

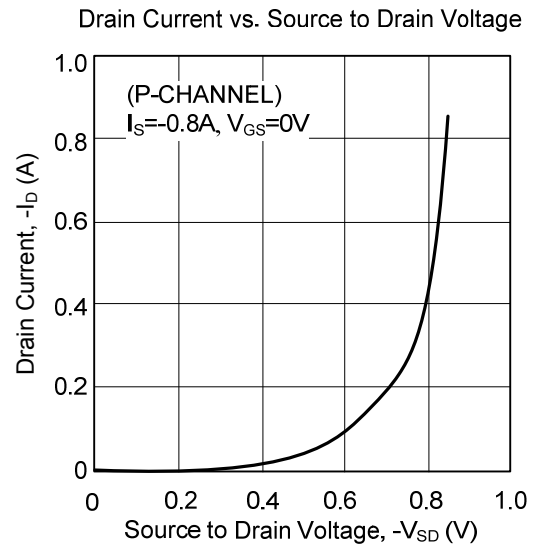
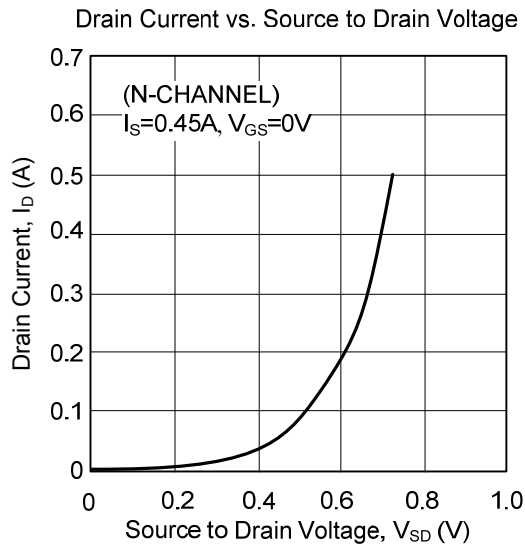
2. Switching characteristics are independent of operating junction temperature

3. For design aid only, not subject to production testing

■ TEST CIRCUITS AND WAVEFORMS



■ TYPICAL CHARACTERISTICS



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