



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

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

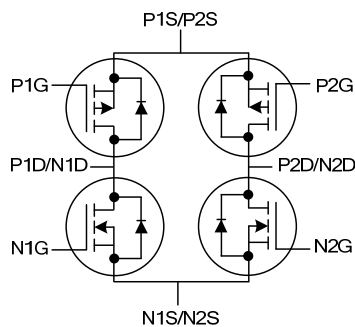
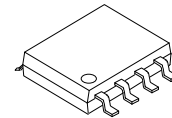
* P-CHANNEL

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

* High switching speed

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

SYMBOL



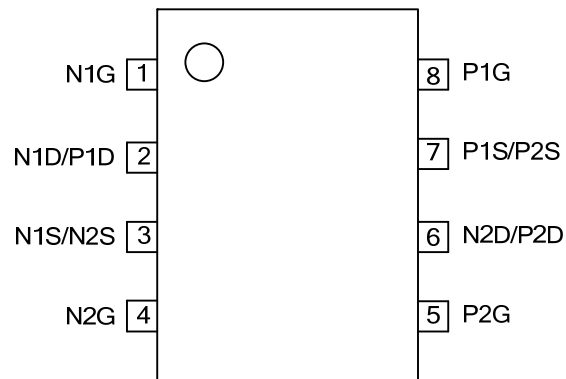
SOP-8

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

2NNPP06L-S08-R	(1)Packing Type (2)Package Type (3)Lead Free	(1) R: Tape Reel, T: Tube (2) S08: SOP-8 (3) G: Halogen Free, L: Lead Free
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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	$V_{GS}=10V, T_A=25^\circ C \text{ (Note 1)}$	I_{DM}	7.1	-6.03	A
Power Dissipation		$T_A=25^\circ C$	P_D	0.87		W
		Derating		6.94		mW/°C
Junction Temperature			T_J	$-55 \sim +150$		°C
Storage Temperature Range			T_{STG}	$-55 \sim +150$		°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 $\leq 300\mu s$; 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 =250μA, V _{GS} =0V	60			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =60V, V _{GS} =0V			0.5	μA
Gate-Source Leakage Current	Forward	I _{GSS}	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 =250μA	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=1.0MHz		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 ≈6Ω, 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°C (Note 2)			1.8	A
Maximum Body-Diode Pulsed Current		I _{SM}	T _A =25°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

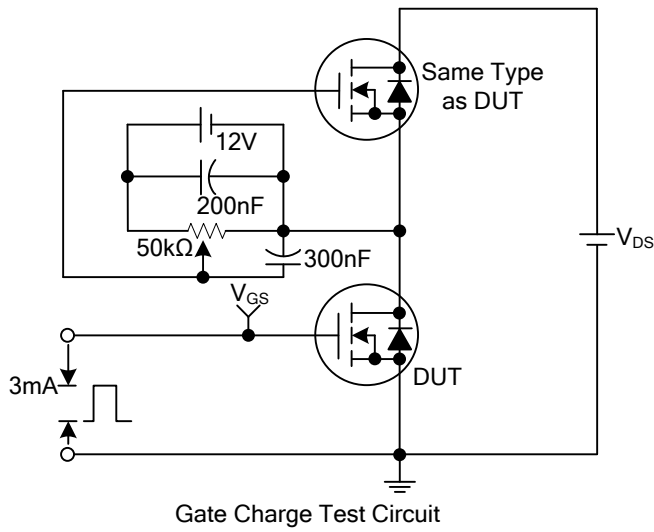
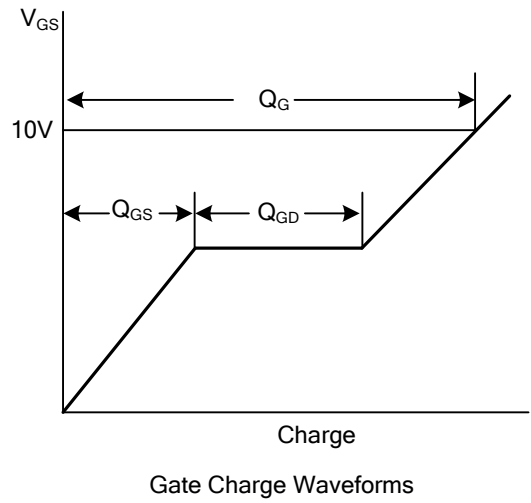
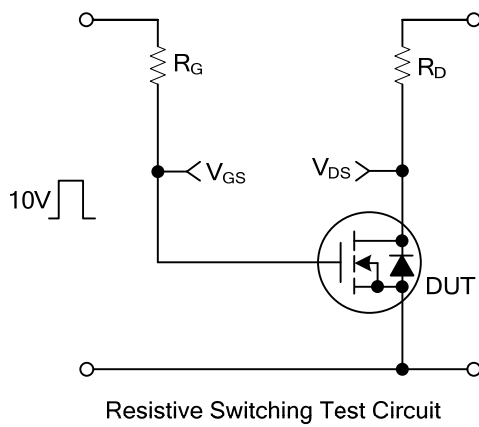
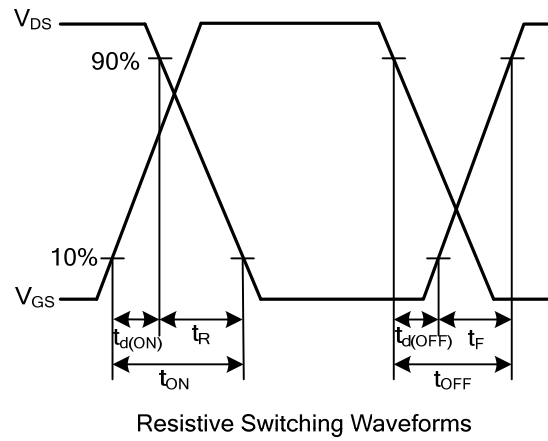
■ ELECTRICAL CHARACTERISTICS(CONT.) ($T_A=25^\circ\text{C}$, unless otherwise specified)

FOR P-CHANNEL

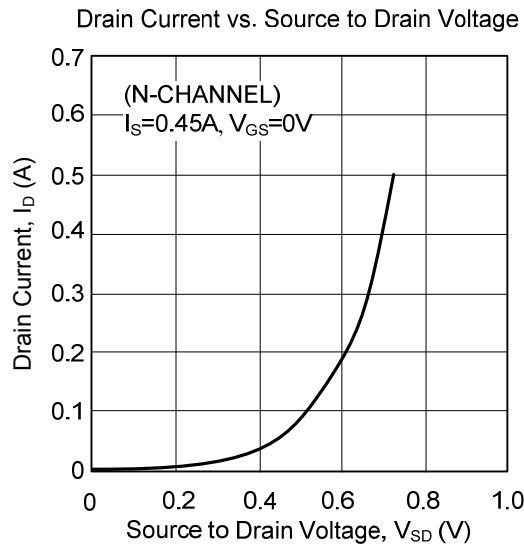
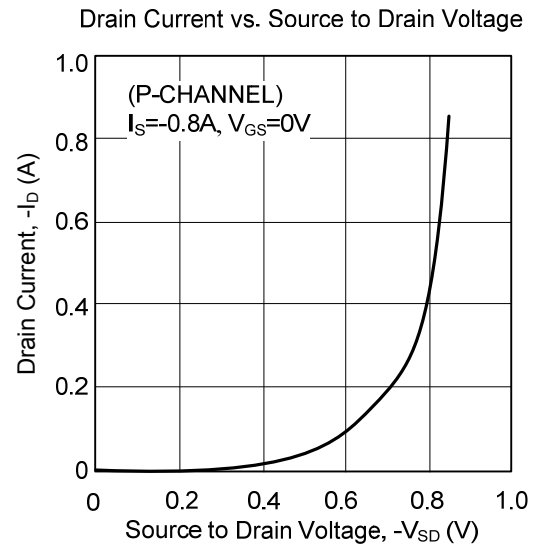
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =-250μA, V _{GS} =0V	-60			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =-60V, V _{GS} =0V			-0.5	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+20V, V _{DS} =0V			+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 =-250μA	-1		-3	V
Static Drain-Source On-State Resistance (Note 1)		R _{DS(ON)}	V _{GS} =-10V, I _D =-0.9A			0.4	Ω
			V _{GS} =-4.5V, I _D =-0.8A			0.6	Ω
DYNAMIC PARAMETERS							
Input Capacitance (Note 3)		C _{ISS}	V _{GS} =0V, V _{DS} =-25V, f=1.0MHz		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} =-10V, V _{DS} =-30V, I _D =-0.9A		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} =-30V, I _D =-1A, R _G ≈6Ω, V _{GS} =-10V		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°C (Note 2)			-1.42	A
Maximum Body-Diode Pulsed Current		I _{SM}	T _A =25°C (Note 3)			-6.03	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =-0.8A, V _{GS} =0V		-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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