



2NNPP06

Power MOSFET

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

DESCRIPTION

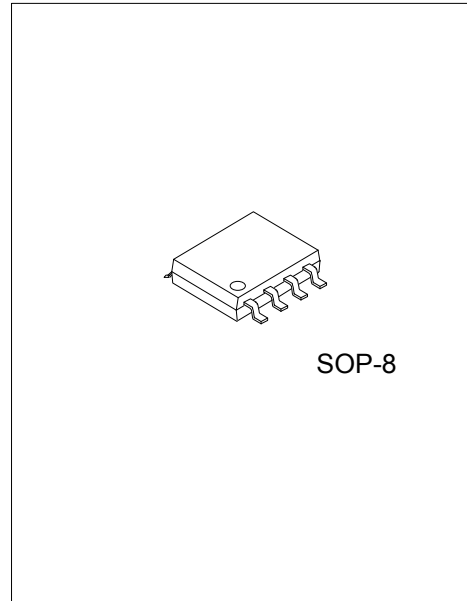
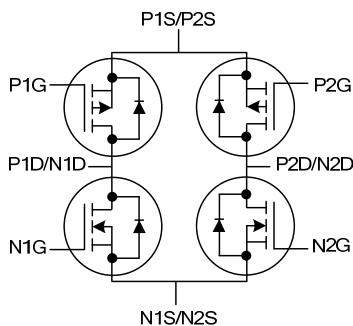
The UTC **2NNPP06** is a complementary enhancement mode MOSFET H-BRIDGE, it uses UTC advanced technology to provide customers low on resistance, low gate charge and low threshold voltage.

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

FEATURES

- * N-CHANNEL
 - I_D : 2A / V_{DSS} : 60V
- * P-CHANNEL
 - I_D : -1.9A / V_{DSS} : -60V
- * High switching speed

SYMBOL

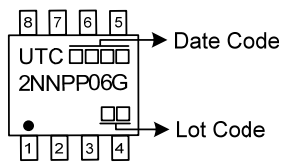


ORDERING INFORMATION

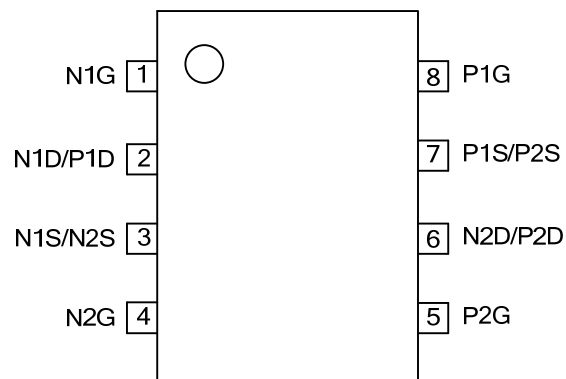
| Ordering Number | Package | Packing |
|-----------------|---------|-----------|
| 2NNPP06G-S08-R | SOP-8 | Tape Reel |

| | |
|---|---|
| <p>2NNPP06G-S08-R</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package | <ul style="list-style-type: none"> (1) R: Tape Reel (2) S08: SOP-8 (3) G: Halogen Free and Lead Free |
|---|---|

MARKING



PIN CONFIGURATION



■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER | | | SYMBOL | RATINGS | | UNIT |
|---------------------------|------------|--|-----------|-------------------|-----------|------|
| | | | | N-CHANNEL | P-CHANNEL | |
| Gate-Source Voltage | | | V_{GS} | ±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 | 2.0 | -1.9 | A |
| | Pulsed | $V_{GS}=10V, T_A=25^{\circ}C$ (Note 1) | I_{DM} | 7.1 | -6.03 | A |
| Power Dissipation | | | P_D | $T_A=25^{\circ}C$ | | 0.87 |
| | | | | Derating | | 6.94 |
| 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 |

Note: 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} | $I_D=250\mu A, V_{GS}=0V$ | 60 | | | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=60V, V_{GS}=0V$ | | | 0.5 | μA |
| Gate-Source Leakage Current | I_{GSS} | Forward | | | +100 | nA |
| | | Reverse | $V_{GS}=+20V, V_{DS}=0V$ | | | -100 |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1 | | 3 | V |
| Static Drain-Source On-State Resistance (Note 1) | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=2.5A$ | | | 0.25 | Ω |
| | | $V_{GS}=4.5V, I_D=1.3A$ | | | 0.35 | Ω |
| DYNAMIC PARAMETERS | | | | | | |
| Input Capacitance (Note 3) | C_{ISS} | $V_{GS}=0V, V_{DS}=25V, f=1.0MHz$ | | 350 | | pF |
| Output Capacitance (Note 3) | C_{OSS} | | | 62 | | pF |
| Reverse Transfer Capacitance (Note 3) | C_{RSS} | | | 30 | | pF |
| SWITCHING PARAMETERS | | | | | | |
| Turn-ON Delay Time (Note 2, 3) | $t_{D(ON)}$ | $V_{DD}=30V, I_D=1A, R_{\theta} \approx 6\Omega, V_{GS}=10V$ | | 30 | | ns |
| Rise Time (Note 2, 3) | t_R | | | 26 | | ns |
| Turn-OFF Delay Time (Note 2, 3) | $t_{D(OFF)}$ | | | 96 | | ns |
| Fall-Time (Note 2, 3) | t_F | | | 28 | | ns |
| Total Gate Charge (Note 3) | Q_G | $V_{GS}=10V, V_{DS}=30V, I_D=1.8A$ | | 19 | | nC |
| Gate to Source Charge (Note 3) | Q_{GS} | | | 2.6 | | nC |
| Gate to Drain Charge (Note 3) | Q_{GD} | | | 3.9 | | nC |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | |
| Maximum Body-Diode Continuous Current | I_S | $T_A=25^{\circ}C$ (Note 2) | | | 2 | 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} | $I_S=2.5A, V_{GS}=0V$ | | 0.9 | 1.1 | V |

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

FOR P-CHANNEL

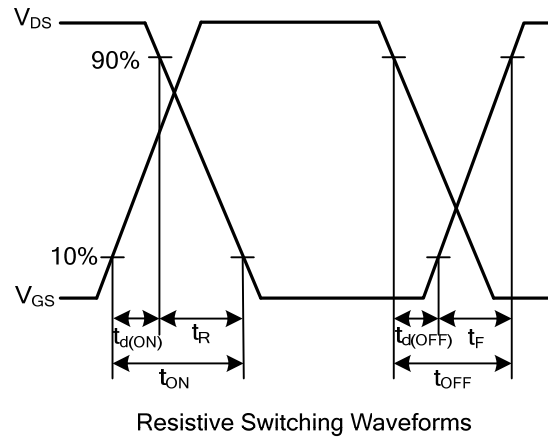
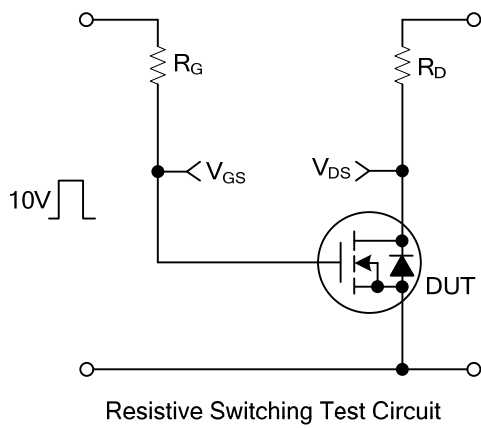
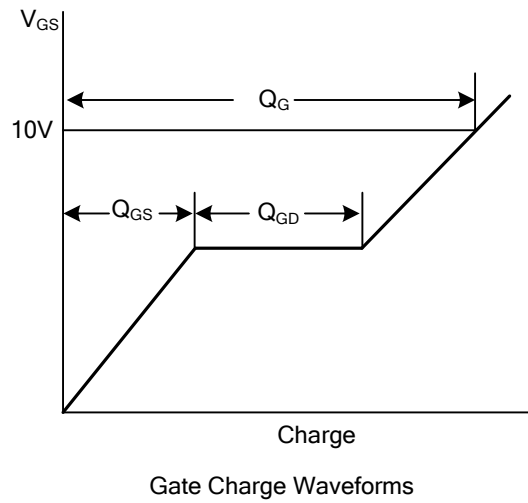
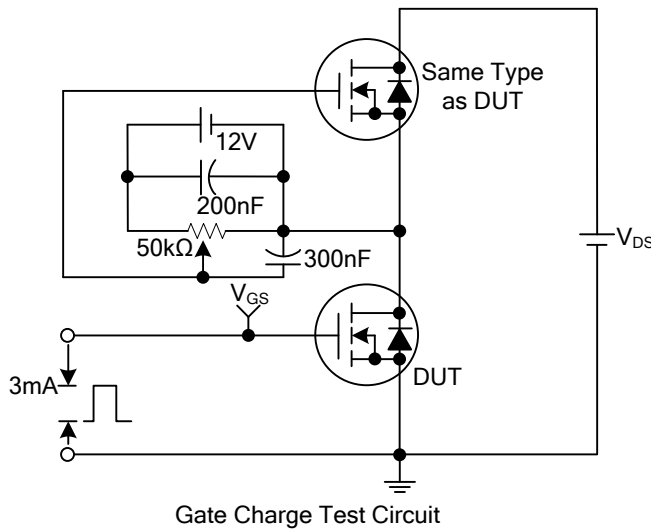
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|--------------|---|-----|------|-------|---------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$ | -60 | | | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=-60\text{V}$, $V_{GS}=0\text{V}$ | | | -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) | $R_{DS(ON)}$ | $V_{GS}=-10\text{V}$, $I_D=-2\text{A}$ | | | 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} | $V_{GS}=0\text{V}$, $V_{DS}=-25\text{V}$, $f=1.0\text{MHz}$ | | 550 | | pF |
| Output Capacitance (Note 3) | C_{OSS} | | | 65 | | pF |
| Reverse Transfer Capacitance (Note 3) | C_{RSS} | | | 35 | | pF |
| SWITCHING PARAMETERS | | | | | | |
| Turn-ON Delay Time (Note 2, 3) | $t_{D(ON)}$ | $V_{DD}=-30\text{V}$, $I_D=-1\text{A}$, $R_G=6\Omega$, $V_{GS}=-10\text{V}$ | | 35 | | ns |
| Rise Time (Note 2, 3) | t_R | | | 32 | | ns |
| Turn-OFF Delay Time (Note 2, 3) | $t_{D(OFF)}$ | | | 165 | | ns |
| Fall-Time (Note 2, 3) | t_F | | | 50 | | ns |
| Total Gate Charge (Note 3) | Q_G | $V_{GS}=-10\text{V}$, $V_{DS}=-30\text{V}$, $I_D=-0.9\text{A}$ | | 21 | | nC |
| Gate to Source Charge (Note 3) | Q_{GS} | | | 3 | | nC |
| Gate to Drain Charge (Note 3) | Q_{GD} | | | 3 | | nC |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | |
| Maximum Body-Diode Continuous Current | I_S | $T_A=25^\circ\text{C}$ (Note 2) | | | -1.9 | 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} | $I_S=-2\text{A}$, $V_{GS}=0\text{V}$ | | -0.9 | -1.1 | V |

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

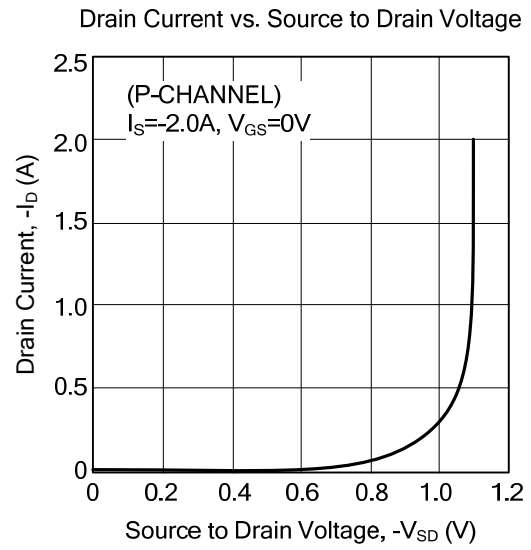
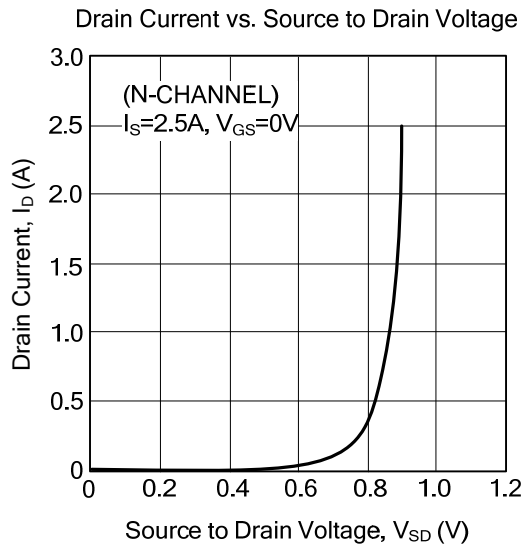
2. Switching characteristics are independent of operating junction temperature.

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

■ TEST CIRCUITS AND WAVEFORMS



■ TYPICAL CHARACTERISTICS



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