



6NNPP03

Power MOSFET

30V COMPLEMENTARY ENHANCEMENT MODE MOSFET H-BRIDGE (N-CHANNEL/P-CHANNEL)

■ DESCRIPTION

The UTC **6NNPP03** 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 **6NNPP03** is universally applied in DC-AC Inverters and DC Motor control.

■ FEATURES

* N-CHANNEL

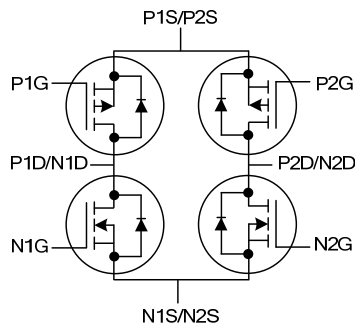
- $R_{DS(ON)} \leq 28\text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=5.8\text{A}$
- $R_{DS(ON)} \leq 33\text{ m}\Omega$ @ $V_{GS}=4.5\text{V}$, $I_D=5.0\text{A}$
- $R_{DS(ON)} \leq 52\text{ m}\Omega$ @ $V_{GS}=2.5\text{V}$, $I_D=4.0\text{A}$

* P-CHANNEL

- $R_{DS(ON)} \leq 50\text{ m}\Omega$ @ $V_{GS}=-10\text{V}$, $I_D=-4.2\text{A}$
- $R_{DS(ON)} \leq 65\text{ m}\Omega$ @ $V_{GS}=-4.5\text{V}$, $I_D=-4.0\text{A}$
- $R_{DS(ON)} \leq 120\text{ m}\Omega$ @ $V_{GS}=-2.5\text{V}$, $I_D=-1.0\text{A}$

* High switching speed

■ SYMBOL

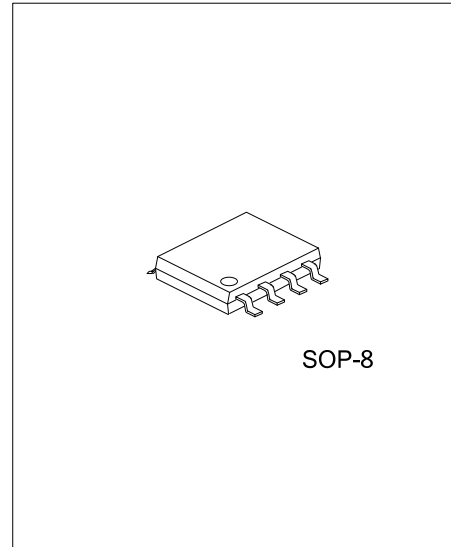


■ ORDERING INFORMATION

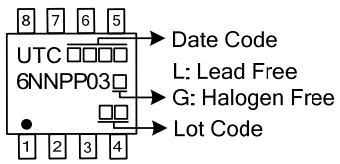
Ordering Number		Package	Packing
Lead Free	Halogen Free		
6NNPP03L-S08-R	6NNPP03G-S08-R	SOP-8	Tape Reel

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

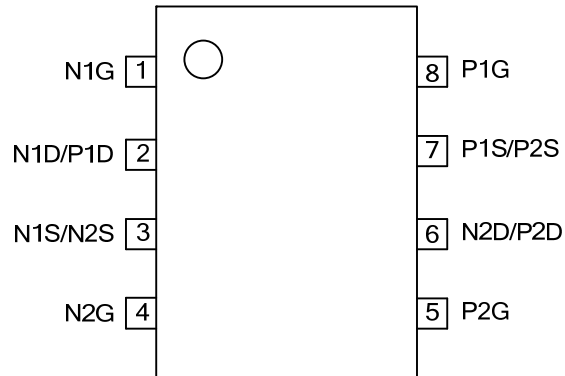
<p>6NNPP03G-S08-R</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



PIN CONFIGURATION



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

PARAMETER		SYMBOL	RATINGS		UNIT
			N-CHANNEL	P-CHANNEL	
Drain-Source Voltage		V_{DSS}	30	-30	V
Gate-Source Voltage		V_{GSS}	± 12	± 12	V
Drain Current	Continuous (Note 3)	I_D	6.0	6.0	A
	Pulsed (Note 4)	I_{DM}	24	24	A
Power Dissipation	$T_A=25^\circ\text{C}$ (Note 2)	P_D	0.87		W
	Derating		6.94		mW/ $^\circ\text{C}$
Junction Temperature		T_J	-55 ~ +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. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions with the heat-sink split into two equal areas (one for each drain connection); the device is measured when operating in a steady-state condition with one active die.
3. except the device is measured at $t \leq 10$ sec.
4. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$. The pulse current is limited by the maximum junction temperature.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	144	$^\circ\text{C}/\text{W}$

Note: For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions with the heat-sink split into two equal areas (one for each drain connection); the device is measured when operating in a steady-state condition with one active die.

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

N-CHANNEL

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	30			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=30\text{V}$, $V_{GS}=0\text{V}$			0.5	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 12\text{V}$, $V_{DS}=0\text{V}$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.6		1.4	V
Static Drain-Source On-State Resistance (Note 1)	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=5.8\text{A}$		21	28	m Ω
		$V_{GS}=4.5\text{V}$, $I_D=5.0\text{A}$		30	33	m Ω
		$V_{GS}=2.5\text{V}$, $I_D=4.0\text{A}$		43.3	52	m Ω
DYNAMIC PARAMETERS						
Input Capacitance (Note 3)	C_{ISS}	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1.0\text{MHz}$		1010		pF
Output Capacitance (Note 3)	C_{OSS}			200		pF
Reverse Transfer Capacitance (Note 3)	C_{RSS}			120		pF
GATE CHARGE						
Total Gate Charge (Note 3)	Q_G	$V_{DS}=24\text{V}$, $V_{GS}=10\text{V}$, $I_D=4.0\text{A}$, $I_G=1.0\text{mA}$		30.8		nC
Gate to Source Charge (Note 3)	Q_{GS}			3.6		nC
Gate to Drain Charge (Note 3)	Q_{GD}			4.0		nC
SWITCHING PARAMETERS						
Turn-ON Delay Time (Note 2, 3)	$t_{D(ON)}$	$V_{DD}=15\text{V}$, $V_{GS}=10\text{V}$, $I_D=6.0\text{A}$, $R_G=25\Omega$		10.4		ns
Rise Time (Note 2, 3)	t_R			4.2		ns
Turn-OFF Delay Time (Note 2, 3)	$t_{D(OFF)}$			114		ns
Fall-Time (Note 2, 3)	t_F			48.6		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current (Note 2, 3)	I_S				6	A
Maximum Body-Diode Pulsed Current (Note 2, 3)	I_{SM}				24	A
Drain-Source Diode Forward Voltage(Note 1)	V_{SD}	$I_S=1.0\text{A}$, $V_{GS}=0\text{V}$			1.4	V

■ ELECTRICAL CHARACTERISTICS(Cont.)

P-CHANNEL

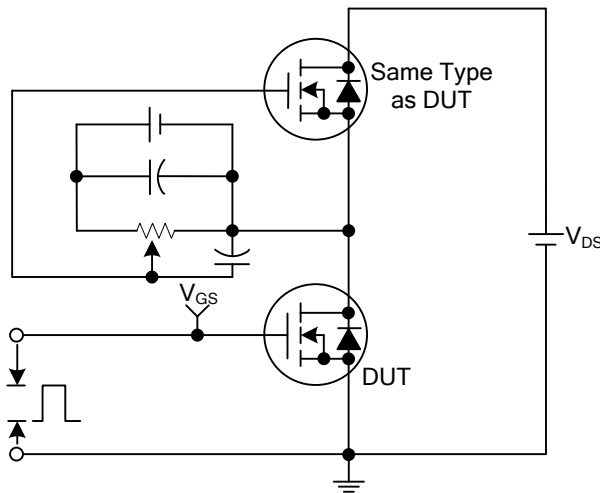
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D=-250\mu A, V_{GS}=0V$	-30			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$			-0.5	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.6		-1.3	V
Static Drain-Source On-State Resistance (Note 1)	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-4.2A$		42	50	m Ω
		$V_{GS}=-4.5V, I_D=-4.0A$		53	65	m Ω
		$V_{GS}=-2.5V, I_D=-1.0A$		90	120	m Ω
DYNAMIC PARAMETERS (Note 3)						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=-15V,$ $f=1.0MHz$		920		pF
Output Capacitance	C_{OSS}			230		pF
Reverse Transfer Capacitance	C_{RSS}			110		pF
Gate Charge						
Total Gate Charge (Note 3)	Q_G	$V_{DS}=-24V, V_{GS}=-10V,$ $I_D=-4.0A, I_G=-1.0mA$		24.8		nC
Gate to Source Charge (Note 3)	Q_{GS}			4.4		nC
Gate to Drain Charge (Note 3)	Q_{GD}			2.8		nC
SWITCHING PARAMETERS						
Turn-ON Delay Time (Note 2, 3)	$t_{D(ON)}$	$V_{DD}=-15V, V_{GS}=-10V$ $I_D=-6.0A, R_G=25\Omega$		9.4		ns
Rise Time (Note 2, 3)	t_R			40		ns
Turn-OFF Delay Time (Note 2, 3)	$t_{D(OFF)}$			110		ns
Fall-Time (Note 2, 3)	t_F			46.4		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current (Note 1, 3)	I_S				6.0	A
Maximum Body-Diode Pulsed Current (Note 2, 3)	I_{SM}				24	A
Drain-Source Diode Forward Voltage(Note 1)	V_{SD}	$I_S=-1.0A, V_{GS}=0V$			1.4	V

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

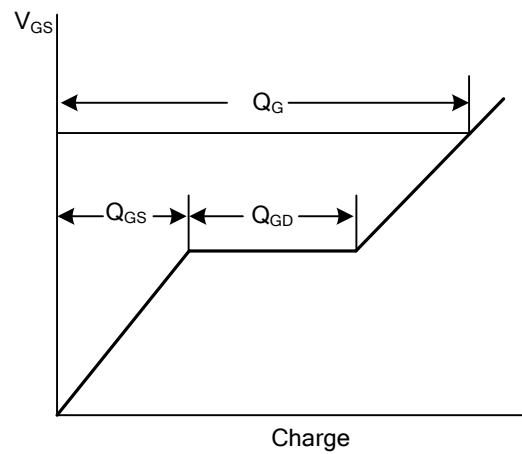
2. Switching characteristics are independent of operating junction temperature.

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

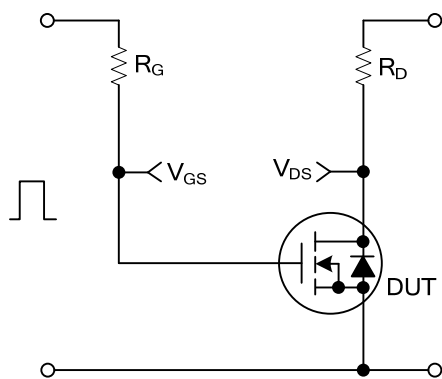
■ TEST CIRCUITS AND WAVEFORMS



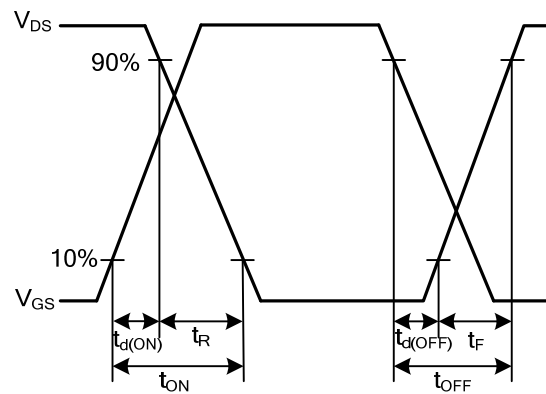
Gate Charge Test Circuit



Gate Charge Waveforms



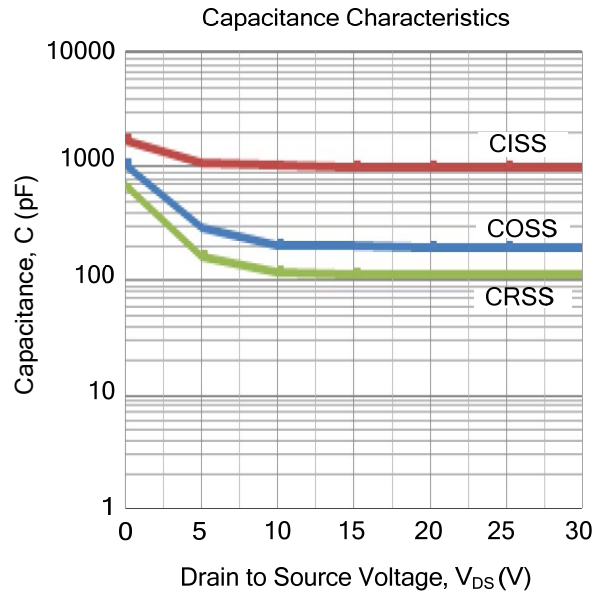
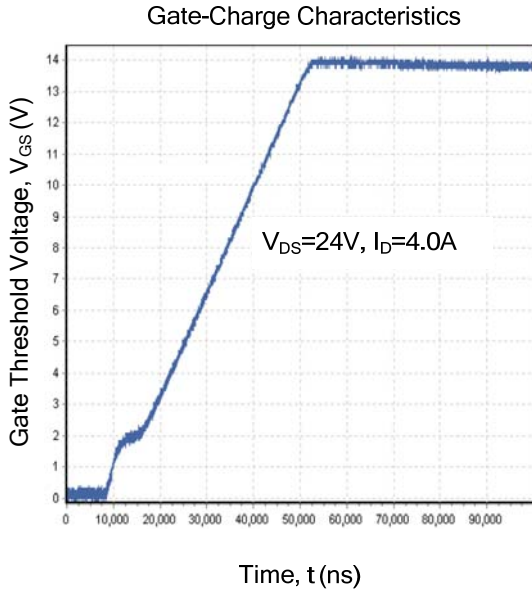
Resistive Switching Test Circuit



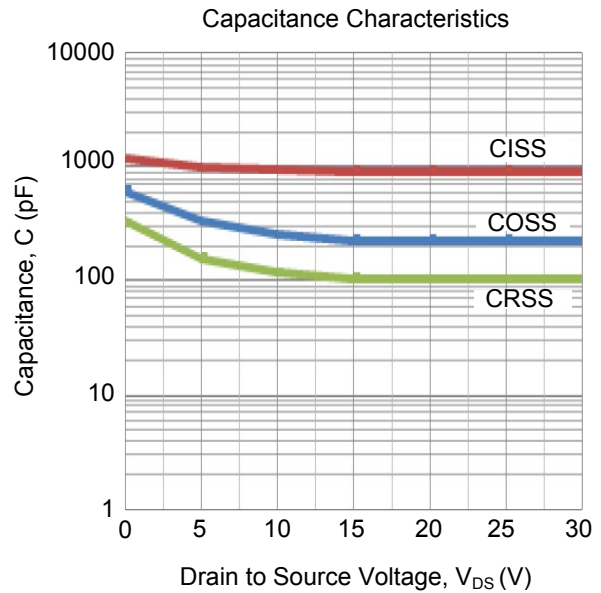
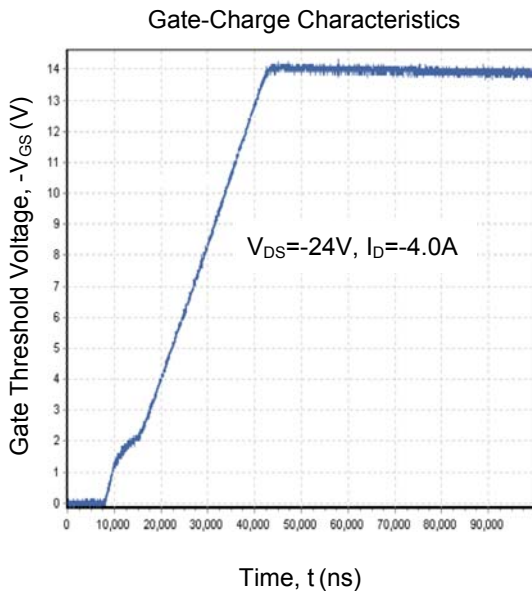
Resistive Switching Waveforms

■ TYPICAL CHARACTERISTICS

N-CHANNEL



P-CHANNEL



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