

SPEED CONTROL AND DRIVER FOR 2-PHASE BRUSHLESS MOTOR

DESCRIPTION

The M51781SP is a semiconductor integrated circuit developed for use in controlling 2-phase DC brushless motor. Both control and driver systems are contained in a single chip. It employs hall elements for position detection and consists of an FG amplifier, F-V converter, sample and hold circuit, constituting a complete circuit of F-serve motor driver system in a single chip.

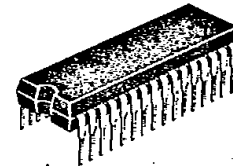
FEATURES

- Includes both control system and driver system in a single chip
- Drives all waves of 2-phase motors
- High output current
- Including FG amplifier, hysteresis comparator, F-V converter, sample and hold circuit
- Gain adjustment of control amplifier of the final stage of servo system possible
- Internal reference voltage generator
- Built-in output current limiter circuit
- Including forward/reverse direction control pins
- Start/stop control pins provided

APPLICATION

FDD, etc.

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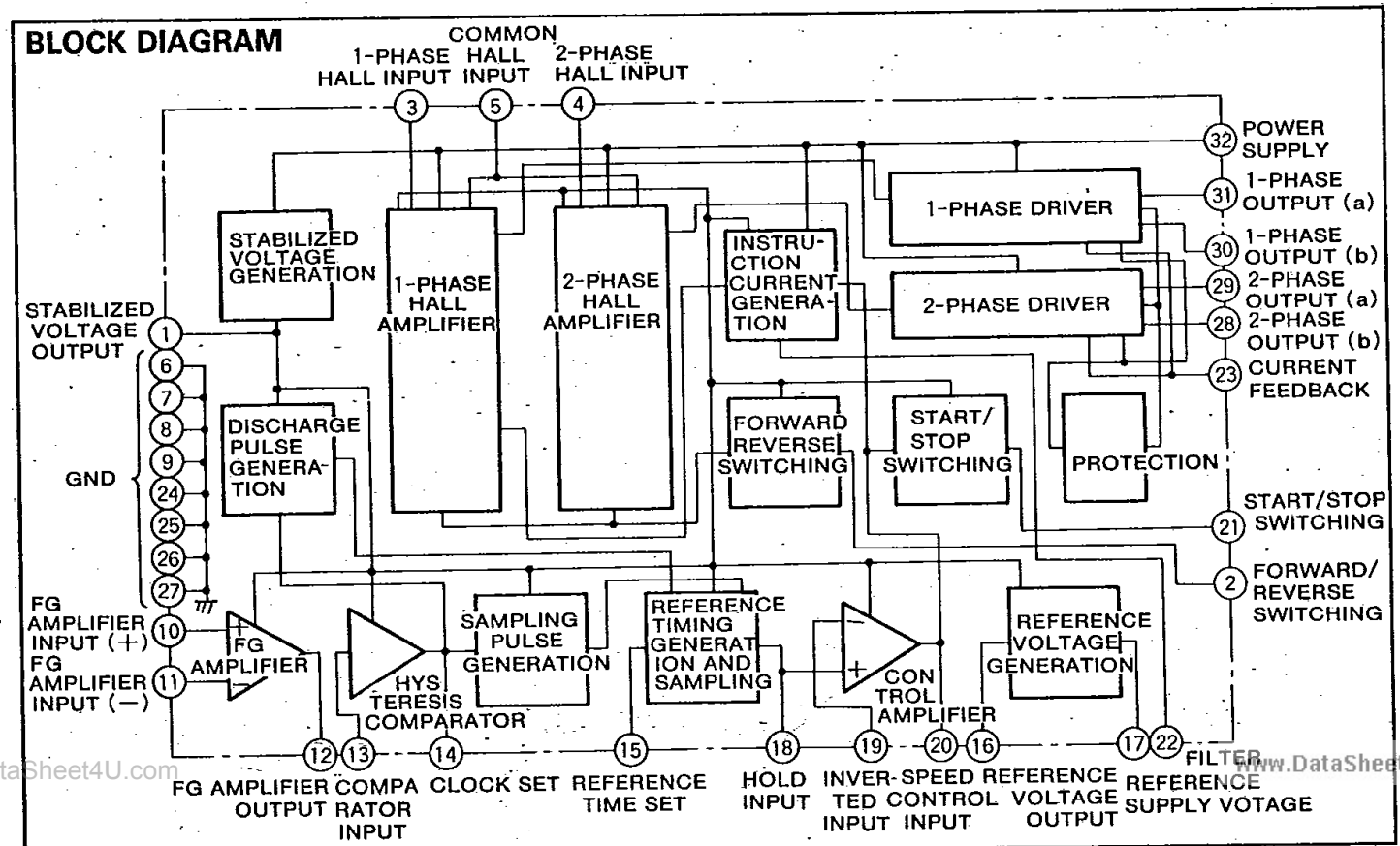


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RECOMMENDED OPERATING CONDITIONS

Supply voltage range 7.2V~18V
Rated supply voltage12V

32-pin molded plastic DIP shrink



ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$, unless otherwise noted)

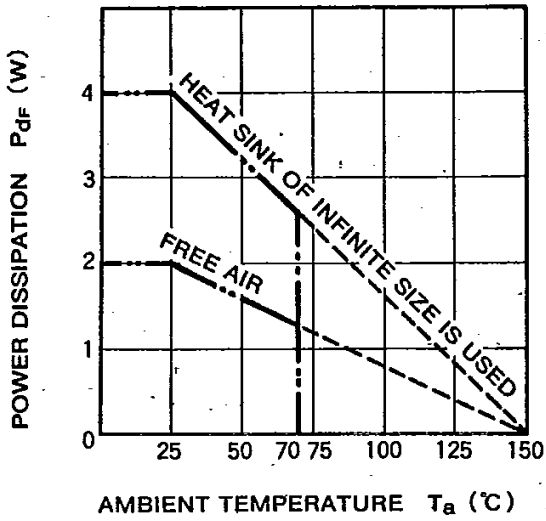
Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		18	V
I_{Lmax}	Charge current		1.2	A/PHASE
I_L	Output current		0.4	A/PHASE
I_{stb}	Pin ① output current		20	mA
$I_{OL⑩}$	Pin ⑩ source current	When discharge of time constant capacitor is finished	10	mA
$I_{OL⑮}$	Pin ⑮ source current	When discharge of time constant capacitor is finished	10	mA
V_H	Applied voltages between pins ③-⑤ and pins ④-⑤		5	V_{P-P}
$V_{⑩-⑮}$	Applied current between pin ⑩ and pin ⑮		± 0.7	V
$V_{H(C)}$	Hall input common phase voltage	Between pins ③-⑤ and pins ④-⑤	$1 \sim V_{stb} - 1$	V
P_{df}	Power dissipation	Heat sink of infinite size is used	4	W
T_{opr}	Operating temperature		$-20 \sim +70$	$^\circ\text{C}$
T_{stg}	Storage temperature		$-40 \sim +125$	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$, $V_{CC}=12\text{V}$, unless otherwise noted)

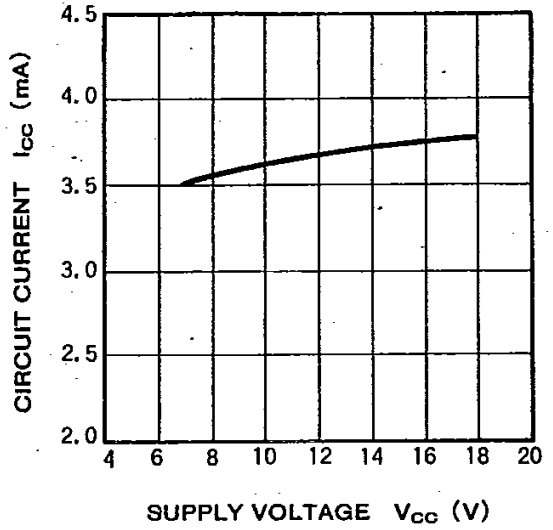
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$I_{CC(1)}$	Circuit current (1)		2.2	3.5	5.5	mA
$I_{CC(2)}$	Circuit current (2)	$V_{CC}=18\text{V}$	2.4	3.9	6.6	mA
$V_{stb(1)}$	Stabilized output voltage (1)		5.4	5.8	6.2	V
$V_{stb(2)}$	Stabilized output voltage (2)	270Ω between V_{stb} and GND	5.2	5.8	6.2	V
V_{ref}	Output voltage of reference voltage		2.72	2.90	3.02	V
$I_{⑩}$	Pin ⑩ input current	$V_{CC}=V_{stb}=5.8\text{V}$, $V_{⑩}=0\text{V}$		0.5	3.0	μA
$I_{⑮}$	Pin ⑮ input current	$V_{CC}=V_{stb}=5.8\text{V}$, $V_{⑮}=0\text{V}$		30	180	nA
$V_{OL⑩}$	Pin ⑩ low level voltage	$V_{CC}=V_{stb}=5.8\text{V}$, $10\text{k}\Omega$ between V_{stb} and pin ⑩		80	120	mV
$V_{OL⑮}$	Pin ⑮ low level voltage	$V_{CC}=V_{stb}=5.8\text{V}$, $10\text{k}\Omega$ between V_{stb} and pin ⑮		50	90	mV
$V_{TH(1)}$	Clock threshold voltage (1)	$V_{CC}=V_{stb}=5.8\text{V}$	1.83	1.95	2.05	V
$V_{TH(2)}$	Clock threshold voltage (2)	$V_{CC}=V_{stb}=5.8\text{V}$	2.75	2.90	3.05	V
$V_{TH(3)}$	Clock threshold voltage (3)	$V_{CC}=V_{stb}=5.8\text{V}$	3.12	3.28	3.44	V
$V_{TH(4)}$	Clock threshold voltage (4)	$V_{CC}=V_{stb}=5.8\text{V}$	4.10	4.32	4.54	V
$V_{OL⑳}$	Pin ⑳ low level voltage	$V_{CC}=V_{stb}=5.8\text{V}$, $5.1\text{k}\Omega$ between V_{stb} and pin ⑳		0.75	1.00	V
$V_{offset⑮-⑩}$	Offset voltage between pin ⑮ and pin ⑩	$V_{CC}=V_{stb}=5.8\text{V}$			± 10	mV
$V_{offset⑩-⑮}$	Offset voltage between pin ⑩ and pin ⑮	$V_{CC}=V_{stb}=5.8\text{V}$			± 10	mV
$I_{Ba(max)}$	Maximum bias current of a output	Measured at pin ㉓	9	13		mA
$I_{Bb(max)}$	Maximum bias current of b output	Measured at pin ㉓	9	13		mA
$K_{IB(max)}$	Maximum current bias ratio	Calculated by $I_{Ba(max)}/I_{Bb(max)}$	0.9	1.0	1.1	A/A
$V_{sat(U)}$	Output saturation voltage (upper)	$I_O=0.8\text{A}$, applicable to pins ㉓~㉑		1.5	2.2	V
$V_{sat(D)}$	Output saturation voltage (lower)	$I_O=0.8\text{A}$, applicable to pins ㉓~㉑		1.0	1.5	V

TYPICAL CHARACTERISTICS

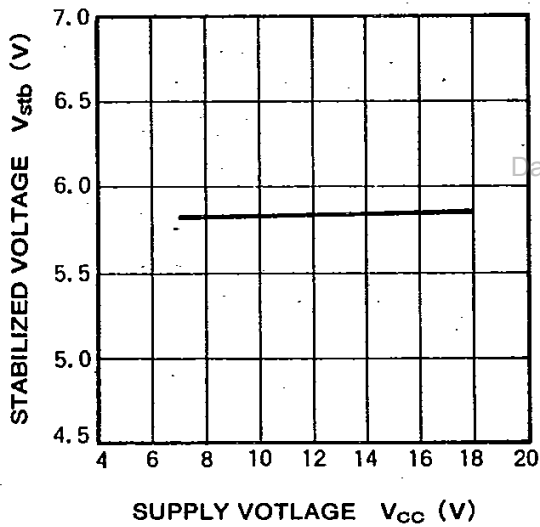
THERMAL DERATING (MAXIMUM RATING)



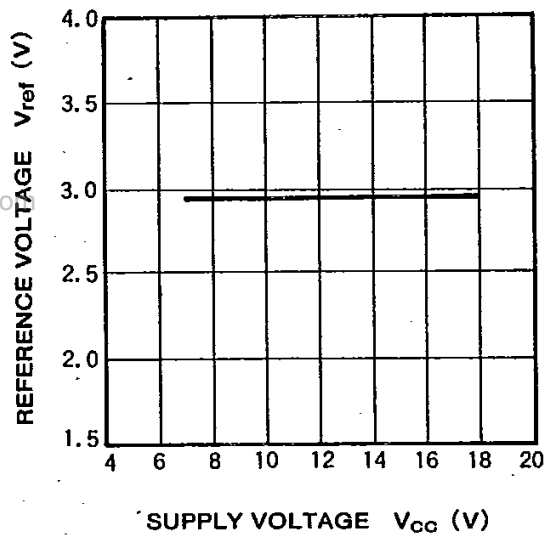
CIRCUIT CURRENT VS. SUPPLY VOLTAGE



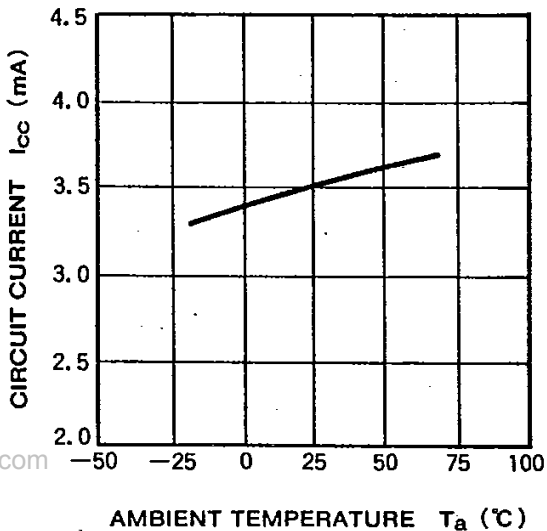
STABILIZED VOLTAGE VS. SUPPLY VOLTAGE



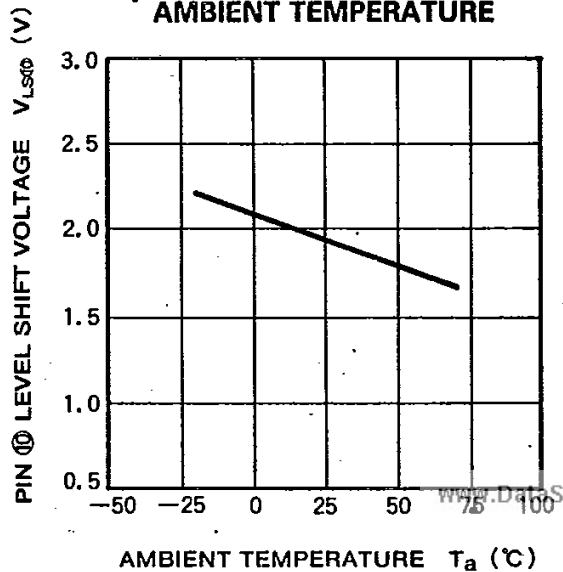
REFERENCE VOLTAGE VS. SUPPLY VOLTAGE



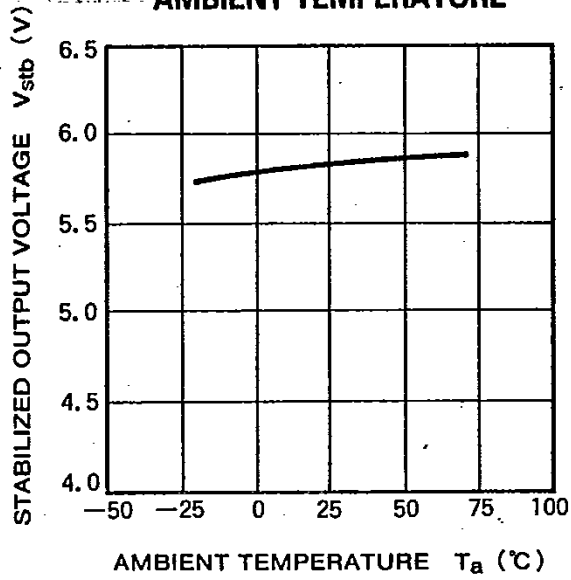
CIRCUIT CURRENT VS. AMBIENT TEMPERATURE



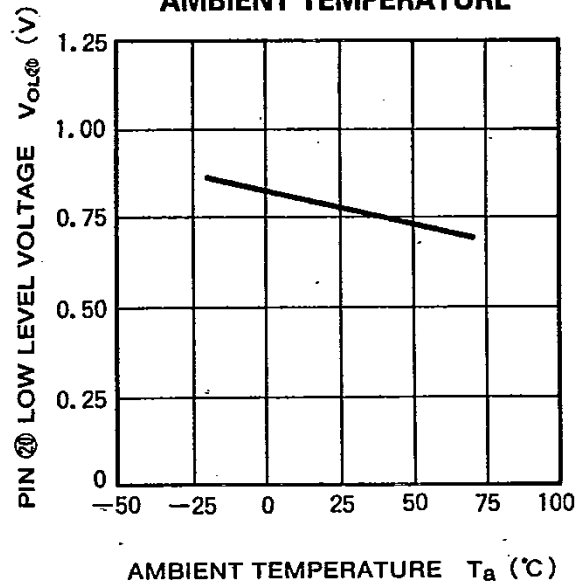
PIN ⑩ LEVEL SHIFT VOLTAGE VS. AMBIENT TEMPERATURE



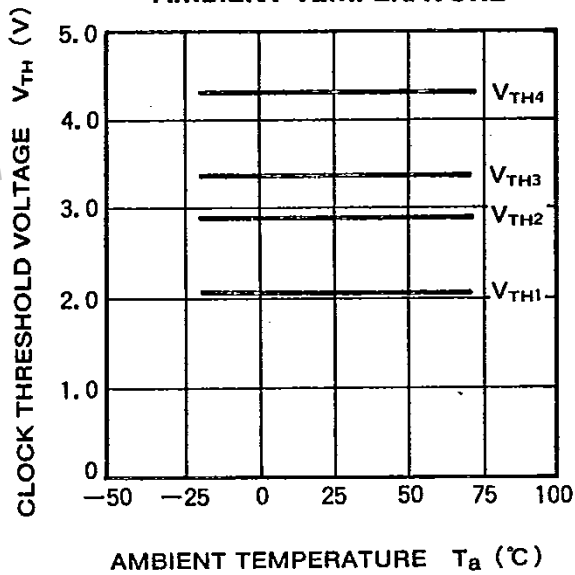
STABILIZED OUTPUT VOLTAGE VS. AMBIENT TEMPERATURE



PIN ⑩ LOW LEVEL VOLTAGE VS. AMBIENT TEMPERATURE



CLOCK THRESHOLD VOLTAGE VS. AMBIENT TEMPERATURE



REFERENCE VOLTAGE VS. AMBIENT TEMPERATURE

