M5270L

LOW SATURATION OUTPUT TYPE CURRENT DRIVER

DESCRIPTION

M5270L is dual Darlington current driver (semiconductor integrated circuit) which consists of NPN transistors with clamp diode and it can be driven directly from 5V-type microcomputers or logic ICs.

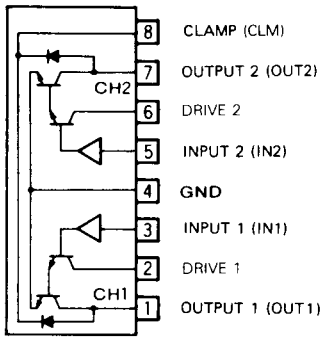
Low saturation output can be obtained by separating the output stage transistor's collector from the drive stage transistors.

FEATURES

- High voltage resistance . . . . . $BV_{CEO} \geqq 80V$
- High input voltage resistance . . . . . $V_I \geqq 20V$
- Large current drive . . . . . $I_{C(max)} = 3.0A^*$
- Low saturation output . . . . . 0.3V (typ) (I_C = 0.7A)
- Contains a clamp diode.
- Operates by the "H" level input.
- Wide operating temperature range . . . Ta = −40~+85°C

* PW = 10 ms, duty cycle ≦ 10%

PIN CONFIGURATION (TOP VIEW)



Outline 8P5

APPLICATION

Motor drives for various relays or portable printers, digit drives for display elements such as LEDs and lamps, or power amplifiers

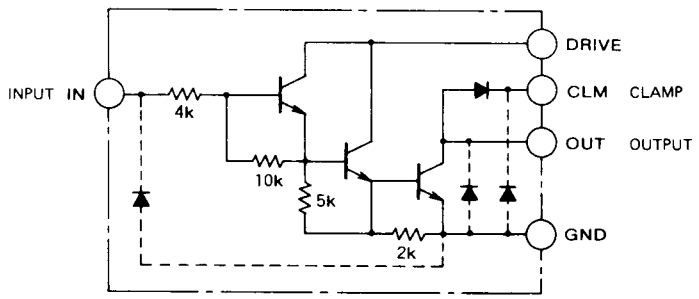
FUNCTION

Unlike the existing common-collector-type transistor arrays, M5270L realizes 0.3V of low saturation output voltage (typ, I_C = 0.7A) by separating the drive stage collector from the output stage collector. Therefore, the power dissipation which is determined by the product of the load current and the saturation output voltage can be greatly decreased.

The maximum output current is 3.0A and up to 80V can be applied as the output voltage.

CIRCUIT DIAGRAM

HIGH ACTIVE



CLM, GND are common to channels 1 and 2.
The diode indicated by dashed lines are already contained in the IC structure, therefore, it is not necessary to attach it externally.

* Output – Function

Input	Output
L	H(OFF)
H	L(ON)

UNIT: Ω

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ABSOLUTE MAXIMUM RATINGS (Ta=25℃, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_D	Drive stage applied voltage		80	V
V_{CEO}	Output voltage	When the output is "H"	80	V
V_I	Input voltage		20	V
I_C	Output current	Current per circuit when the output is "L"	3.0*	A
V_R	Clamp diode reverse voltage		80	V
I_F	Clamp diode forward current		3.0	A
Pd	Power dissipation	Ta=25℃	1.2(1.7)**	W
Topr	Operating temperature		−40 ~ +85	℃
Tstg	Storage temperature		−55 ~ +150	℃

* : PW=10ms, duty cycle ≦ 10%

** : 400mm² of copper film is added

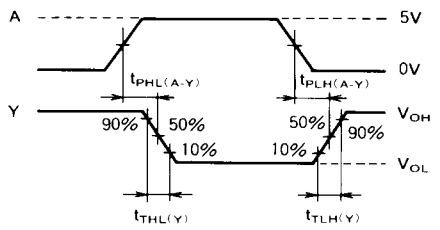
RECOMMENDED OPERATING CONDITIONS (Ta=25℃, unless otherwise noted)

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
V_D	Drive stage applied voltage		4	5	70	V
V_{CE}	Output applied voltage		0		70	V
I_C	Output current	Current per current	0	0.7	2.0	A
V_R	Clamp diode reverse voltage		0		70	V
I_F	Clamp diode forward current		0		2.0	A
Pd	Operating temperature		0		1.0	W

ELECTRICAL CHARACTERISTICS (Ta=25℃, value/circuit unless otherwise noted)

Symbol	Parameter	Test conditions		Limits			Unit
				Min	Typ	Max	
$V_{(BR)CEO}$	Output breakdown voltage	I_{CEO} = 100μA					V
$V_{CE(sat)}$	Saturation output voltage	V_D = 4V, V_I = 3.5V	I_C = 1.8A, R_D = 30Ω		0.8	1.5	V
			I_C = 1.0A, R_D = 50Ω		0.4	0.8	
			I_C = 0.7A, R_D = 100Ω		0.3	0.6	
I_I	Input current	V_I = 4V				1.0	mA
		V_I = 0.5V				0.1	
$I_{O(leak)}$	Output lead current	V_{CE} = 80V				100	μA
I_R	Clamp diode leak current	V_R = 80V				50	μA
V_R	Clamp diode reverse voltage	I_R = 100μA		80			V
V_F	Clamp diode forward voltage	I_F = 2.0A				3.0	V
V_{IH}	"H" input voltage	I_C = 2.0A		3.5			V
V_{IL}	"L" input voltage	$I_{O(leak)}$ = 50μA				1.0	V

TIMING DIAGRAM



TYPICAL SPEED (Example)

$t_{PHL(A-Y)}$	$t_{PLH(A-Y)}$	$t_{THL(Y)}$	$t_{TLH(Y)}$
400ns	3.2μs	15ns	30ns

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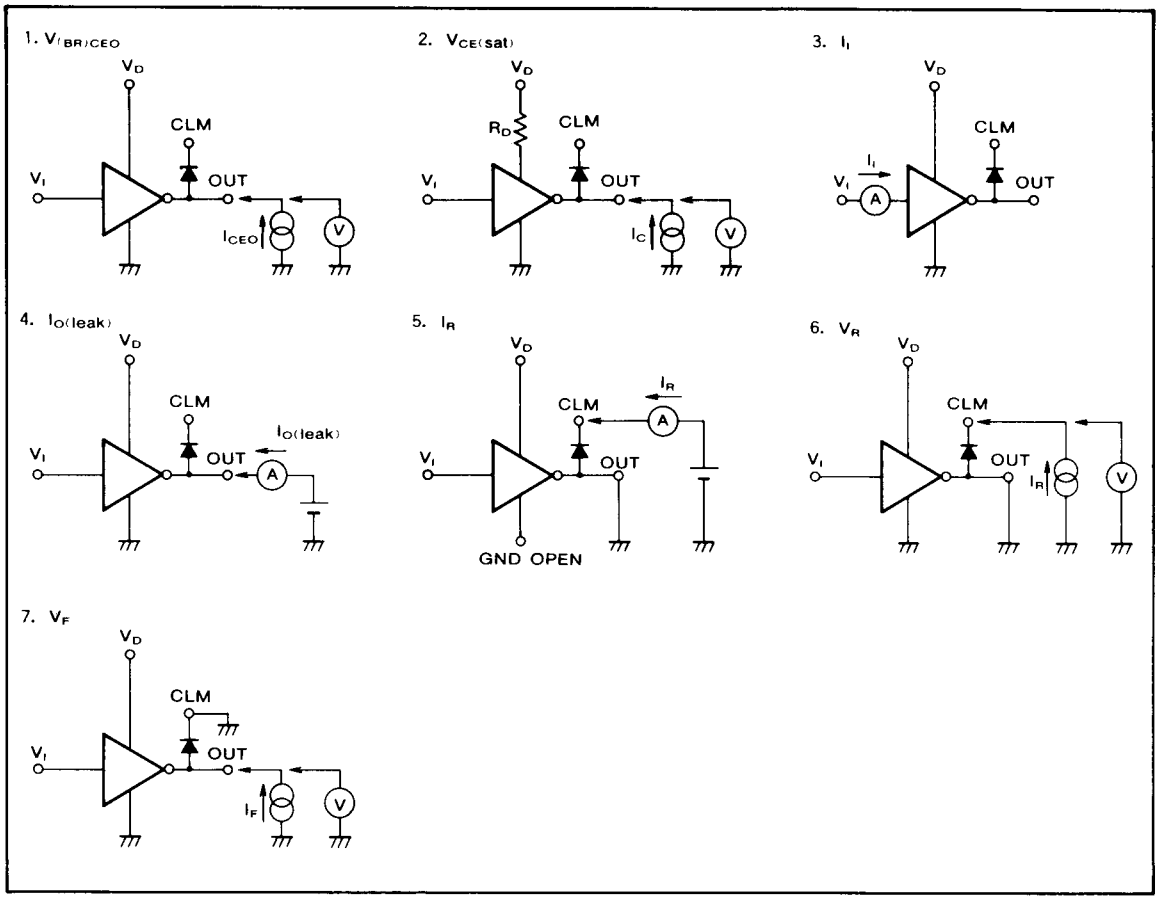
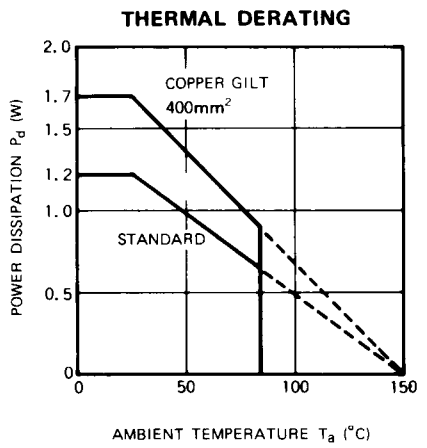
TEST CIRCUITS

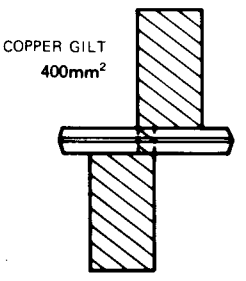


TYPICAL CHARACTERISTICS

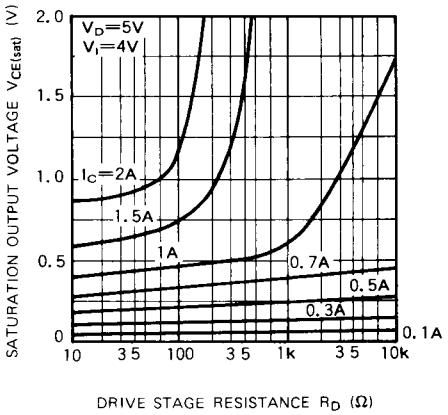


SAMPLE PCB LAYOUT

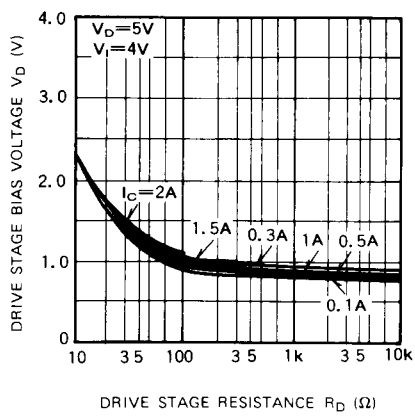
When you design a layout of a PCB, you have to consider the thermal derating. To improve the heat radiation of an IC, add a 400 mm^2 of copper film at the base of the GND pin. This will improve the thermal derating characteristics.



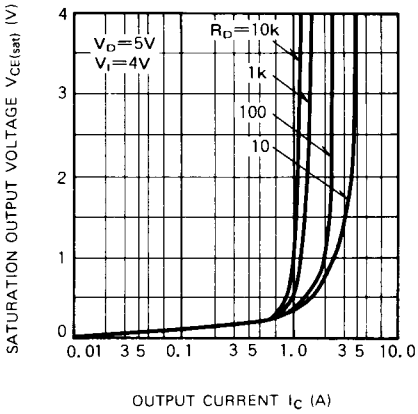
SATURATION OUTPUT VOLTAGE VS. DRIVE STAGE RESISTANCE



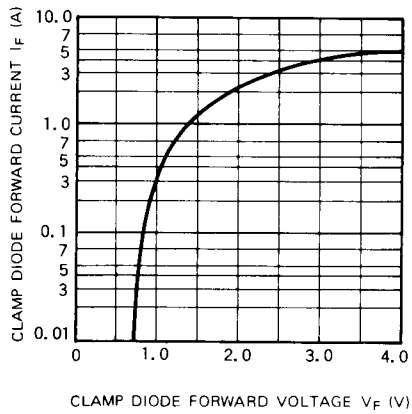
DRIVE STAGE VIAS VOLTAGE VS. DRIVE STAGE RESISTANCE



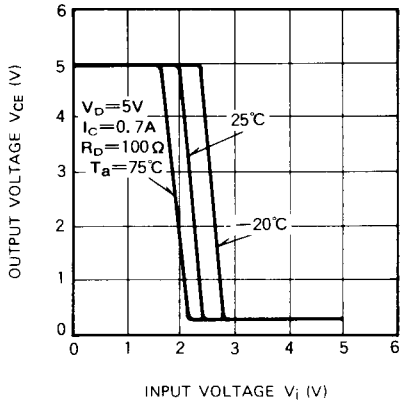
SATURATION OUTPUT VOLTAGE VS. OUTPUT CURRENT



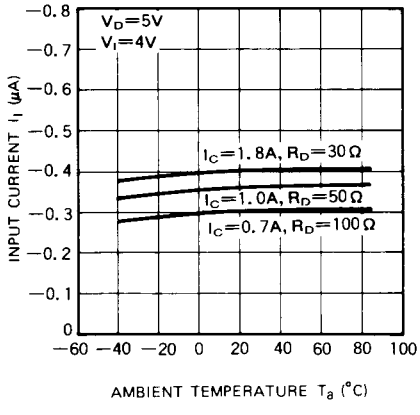
CLAMP DIODE FORWARD CURRENT VS. CLAMP DIODE FORWARD VOLTAGE



OUTPUT VOLTAGE VS. INPUT VOLTAGE



INPUT CURRENT VS. AMBIENT TEMPERATURE



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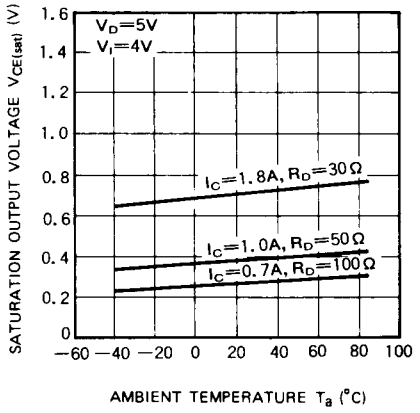
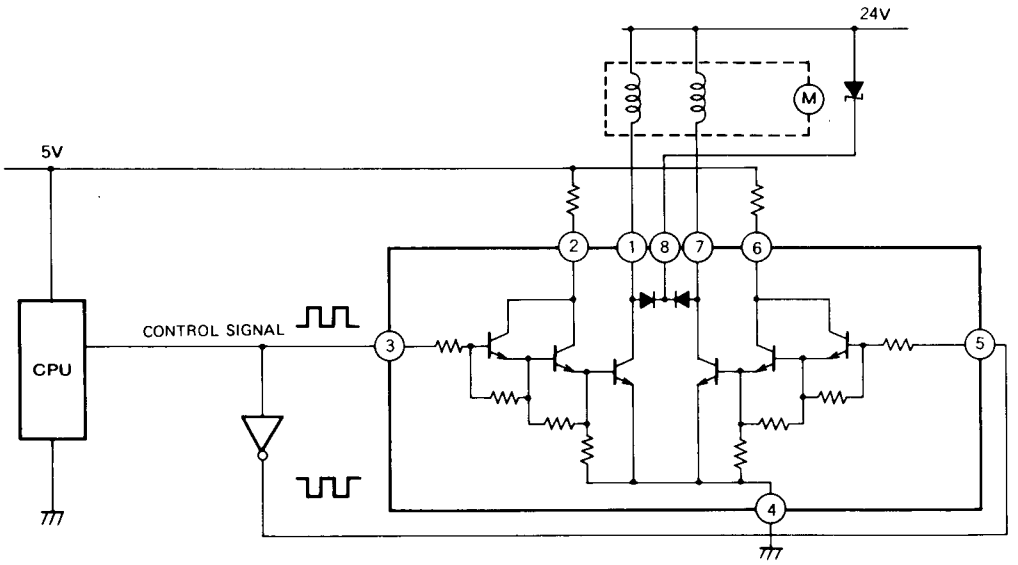
SATURATION OUTPUT VOLTAGE VS. AMBIENT TEMPERATURE



APPLICATION CIRCUIT (Stepping motor drive for a printer)



V_{CC}, DRIVE, CLAMP, AND GND ARE THE SAME FOR BOTH CIRCUITS.