# M5269L

## LOW SATURATION OUTPUT TYPE CURRENT DRIVER

## DESCRIPTION

M5269L is dual Darlington current driver (semiconductor integrated circuit) which consists of PNP and 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 . . . . . $I_{C(max)} = 2.0A^*$
- Low saturation output . . . . . 0.3V (typ) ($I_C = 0.7A$)
- Contains a clamp diode.
- Operates by the "L" level input.
- Wide operating temperature range . . $T_a = -40°C \sim +85°C$

* PW = 10 ms, duty cycle $\leqq$ 10%

## APPLICATION

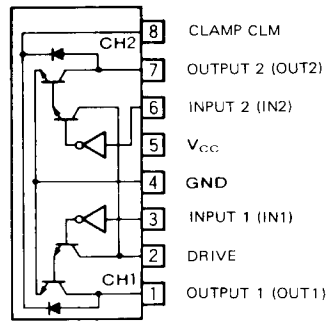
Motor drives for various relays or portable printers, digit drives for display elements such as LEDs and lamps, or power amplifiers

## FUNCTION

Unlike the existing common-collector-type transistor arrays, M5269L 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.

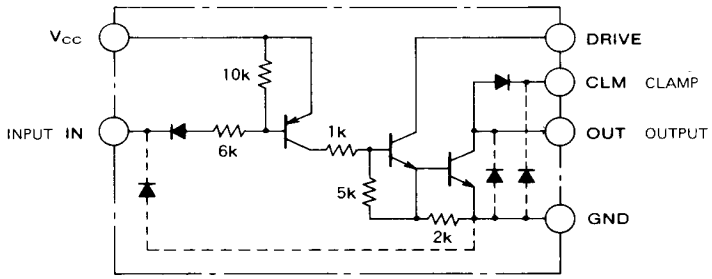
The maximum output current is 3.0A and up to 80V can be applied as the output voltage.

## PIN CONFIGURATION (TOP VIEW)




Outline 8P5

## CIRCUIT DIAGRAM




DRIVE, CLM, $V_{CC}$, and 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.

LOW ACTIVE

* Output – Function

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

UNIT: Ω



MITSUBISHI ELECTRIC

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

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | | 20 | V |
| $V_D$ | Drive stage applied voltage | | 80 | V |
| $V_{CED}$ | Output voltage | When the output is "H" | 80 | V |
| $V_I$ | Input voltage | $V_{CC}$ = 5V | 30 | 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.

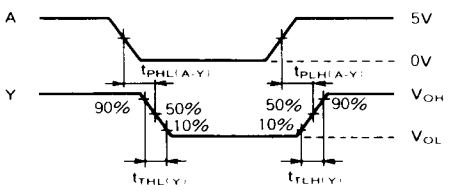
## RECOMMENDED OPERATING CONDITIONS (Ta = 25℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{CC}$ | Supply voltage | | 4 | 5 | 6 | V |
| $V_D$ | Drive stage applied voltage | | 4 | 5 | 70 | V |
| $V_{CE}$ | Output applied voltage | | 0 | | 70 | V |
| $I_C$ | Output current | Current per circuit | 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 specified)

| Symbol | Parameter | Test conditions | | Limits | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $V_{(BR)CEO}$ | Output breakdown voltage | $I_{CEO}$ = 100μA | | 80 | | | V |
| $I_{CCH}$ | Output "H" supply voltage | $V_{CC}$ = 6V, $V_I$ = $V_{CC}$ | | | | 10 | μA |
| $I_{CCL}$ | Output "L" supply voltage | $V_{CC}$ = 6V, $V_I$ = 0.5V | | | | 10 | mA |
| $V_{CE(sat)}$ | Saturation output voltage | $V_{CC}$ = 4V, $V_D$ = 4V, $V_I$ = 0.5V | $I_C$ = 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 | $V_I$ = $V_{CC}$ − 0.5V | | | | −0.1 | mA |
| | | $V_I$ = $V_{CC}$ − 6V | | | | −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 | $I_{O(leak)}$ = 50μA | | $V_{CC}$−1.0 | | | V |
| $V_{iL}$ | "L" input voltage | $I_C$ = 2.0A | | | | $V_{CC}$−3.5 | V |

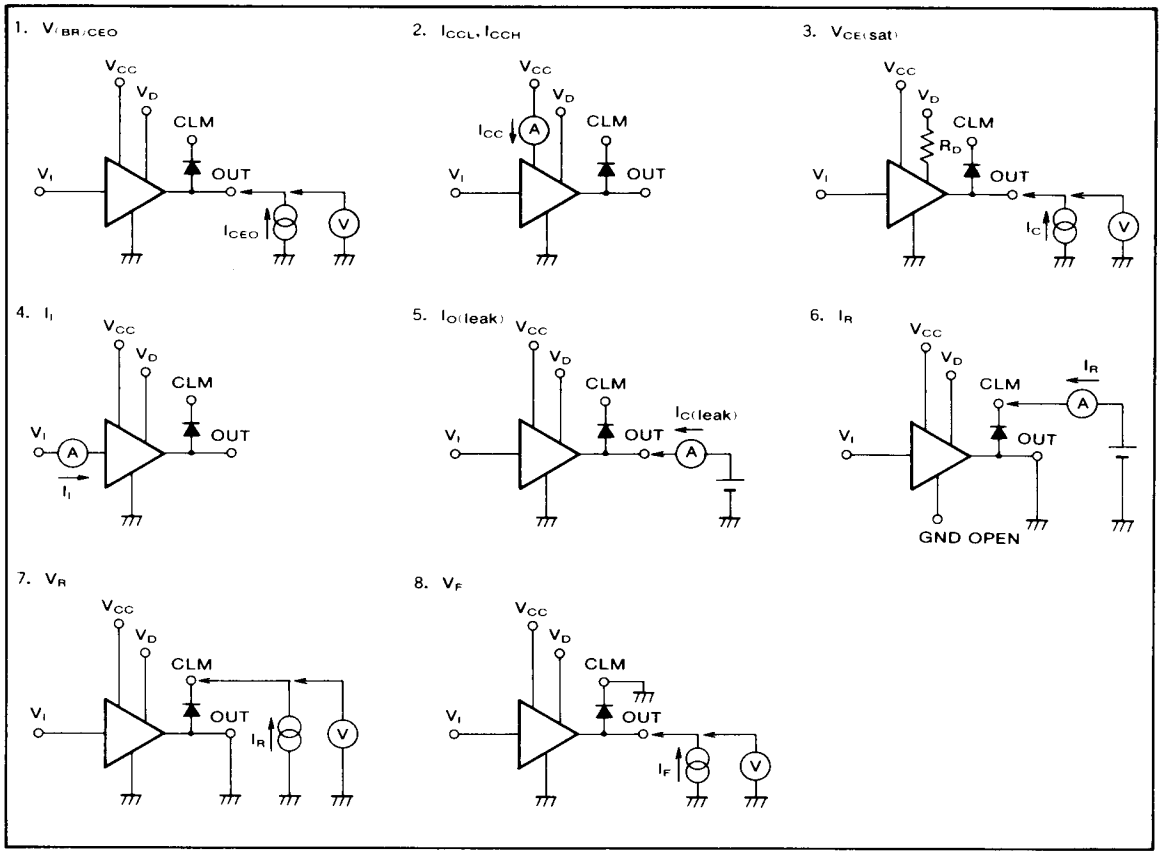
## TIMING DIAGRAM



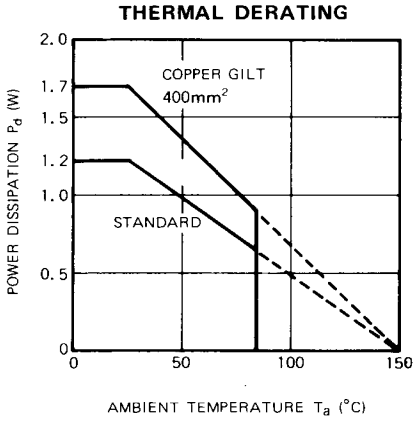

## TYPICAL SPEED (Example)

| $t_{PHL(A-Y)}$ | $t_{PLH(A-Y)}$ | $t_{THL(Y)}$ | $t_{TLH(Y)}$ |
|---|---|---|---|
| 500ns | 11μs | 130ns | 20ns |

## TEST CIRCUITS

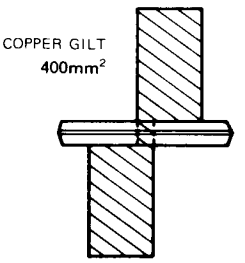



## TYPICAL CHARACTERISTICS



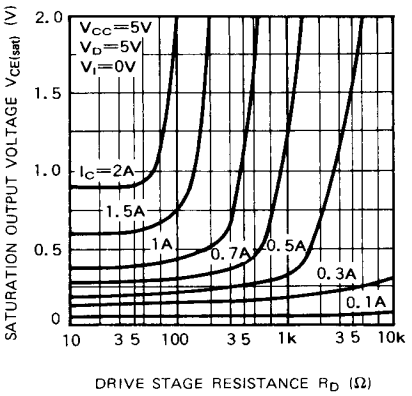

## SAMPLE PCB LAYOUT

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.

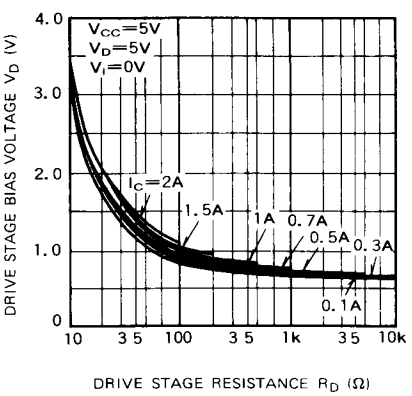


## LOW SATURATION OUTPUT TYPE CURRENT DRIVER

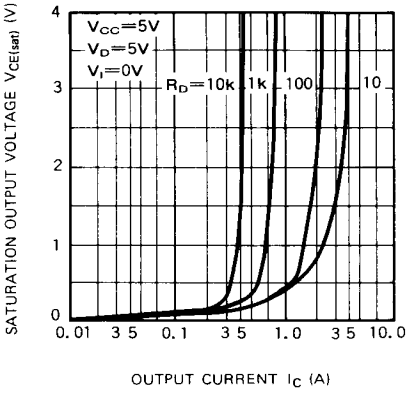
### SATURATION OUTPUT VOLTAGE VS. DRIVE STAGE RESISTANCE



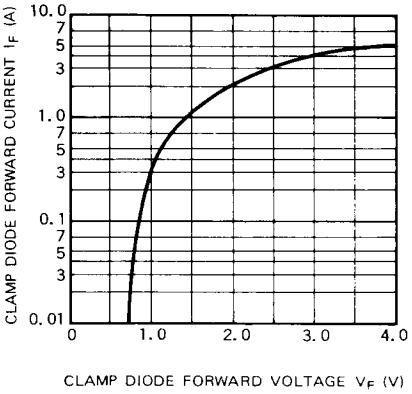

### DRIVE STAGE VIAS VOLTAGE VS. DRIVE STAGE RESISTANCE



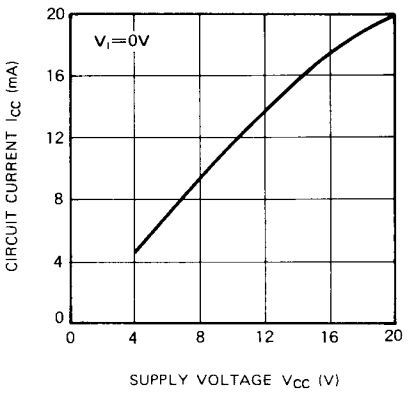

### SATURATION OUTPUT VOLTAGE VS. OUTPUT CURRENT



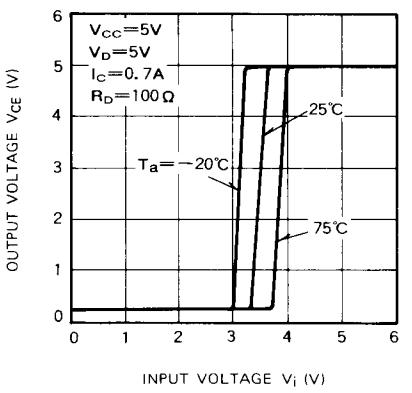

### CLAMP DIODE FORWARD CURRENT VS. CLAMP DIODE FORWARD VOLTAGE



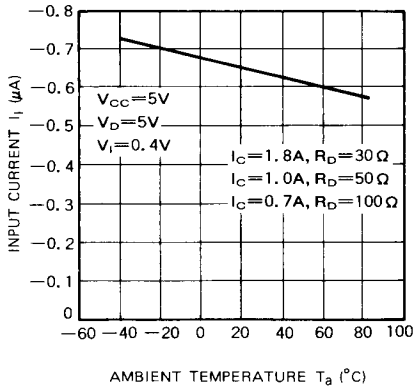

### CIRCUIT CURRENT VS. SUPPLY VOLTAGE



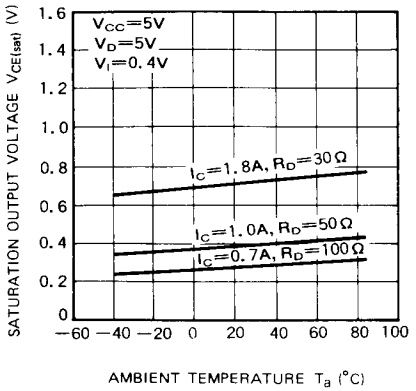

### OUTPUT VOLTAGE VS. INPUT VOLTAGE



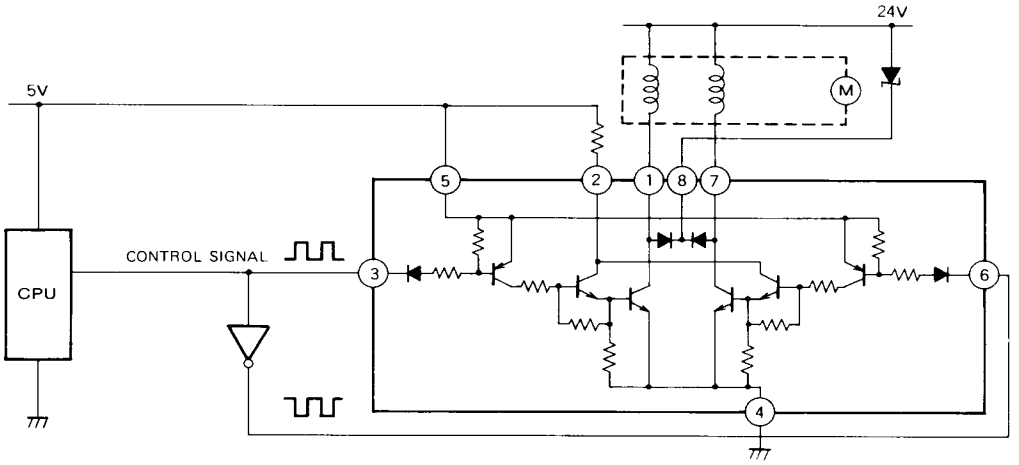
INPUT CURRENT VS.
AMBIENT TEMPERATURE




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.