LOW SATURATION OUTPUT TYPE CURRENT DRIVER

DESCRIPTION

M5265P is quad Darlington current driver (semiconductor integrated circuit) which consists of PNP and NPN transistors with clamp diode and it can be driven directly by very small input current.

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

CHARACTERISTICS

- 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 . . . . 0.25V (typ) ($I_C = 0.3A$)
- 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, M5265P realizes 0.25V of low saturation output voltage (typ, I_C = 0.3A) 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 2.0A and up to 80V can be applied as the output voltage.

PIN CONFIGURATION (TOP VIEW)

OUT1 1	16 CLM2
DRIVE1 2	15 OUT4
IN1 3	14 IN4
GND1 4	13 Vcc2
Vcc1 5	12 GND2
IN2 6	11 IN3
OUT2 7	10 DRIVE2
CLM1 8	9 OUT3

CH1, CH2, CH3, CH4
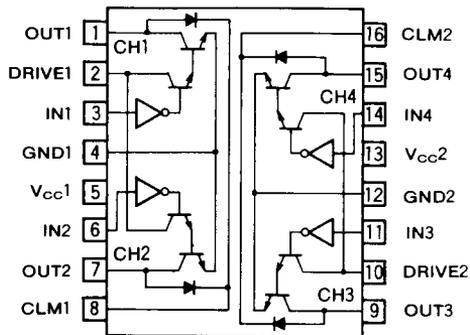
Outline 16P4

CIRCUIT DIAGRAM

LOW ACTIVE

6k, 10k, 1k, 5k, 2k

Vcc, INPUT IN, DRIVE, CLM (CLAMP), OUT (OUTPUT), GND

DRIVE, CLM, V_CC, and GND are common to channels 1–2 and 3–4.
The diode indicated by dashed lines are already contained in the IC structure, therefore, it is not necessary to attach it externally.

Unit. Ω
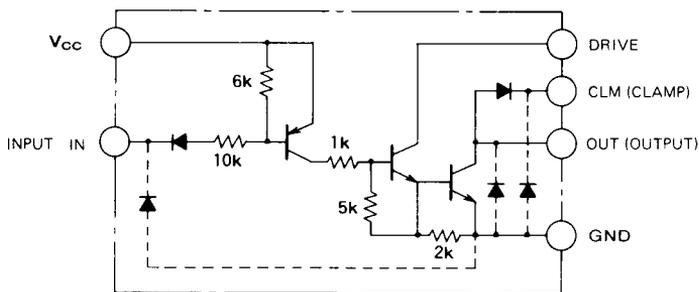
* OUTPUT – FUNCTION

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

MITSUBISHI ELECTRIC

LOW SATURATION OUTPUT TYPE CURRENT DRIVER

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

| Symbol	Parameter	Conditions	Rating	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"	2.0*	A
V_R	Clamp diode reverse voltage		80	V
I_F	Clamp diode forward current		2.0	A
P_d	Power dissipation	Ta = 25℃	2.0(2.5)**	W
T_{opr}	Operating temperature		−40 ~ +85	℃
T_{stg}	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	Condition	Min	Typ	Max	Unit
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	0.3	1.25	A
V_R	Clamp diode reverse voltage		0		70	V
I_F	Clamp diode foward current		0		1.25	A
P_d	Operating temperature		0		1.0	W

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

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
$V_{(BR)CEO}$	Output breakdown voltage	$I_{CEO} = 100\mu A$		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	$V_{CC} = 4V$ $V_D = 4V$ $V_I = 0.5V$	$I_C = 1.25A, R_D = 50\Omega$		1.0	1.8	V
			$I_C = 0.7A, R_D = 100\Omega$		0.55	1.0	
			$I_C = 0.3A, R_D = 260\Omega$		0.25	0.5	
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	$I_R = 100\mu A$		80			V
V_F	Clamp diode forward voltage	$I_F = 1.25A$				2.5	V
V_{IH}	"H" input voltage	$I_{O(leak)} = 50\mu A$		$V_{CC}-1.0$			V
V_{IL}	"L" input voltage	$I_C = 1.25A$				$V_{CC}-3.5$	V

TIMING DIAGRAM
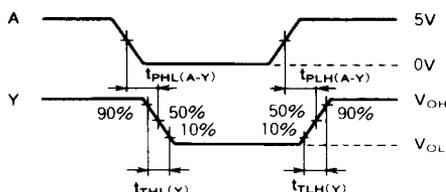
TYPICAL SPEED (Example)

$t_{PHL(A-Y)}$	$t_{PLH(A-Y)}$	$t_{THL(Y)}$	$t_{TLH(Y)}$
140ns	8.0μs	100ns	650ns

LOW SATURATION OUTPUT TYPE CURRENT DRIVER

TEST CIRCUITS

1. $V_{(BR)CEO}$

2. I_{CCL}, I_{CCH}

3. $V_{CE(sat)}$

4. I_I

5. $I_{o(leak)}$

6. I_R

7. V_R

8. V_F

TYPICAL CHARACTERISTICS

POWER DISSIPATION P_d (W)

COPPER GILT 400mm^2

STANDARD

AMBIENT TEMPERATURE T_a (°C)
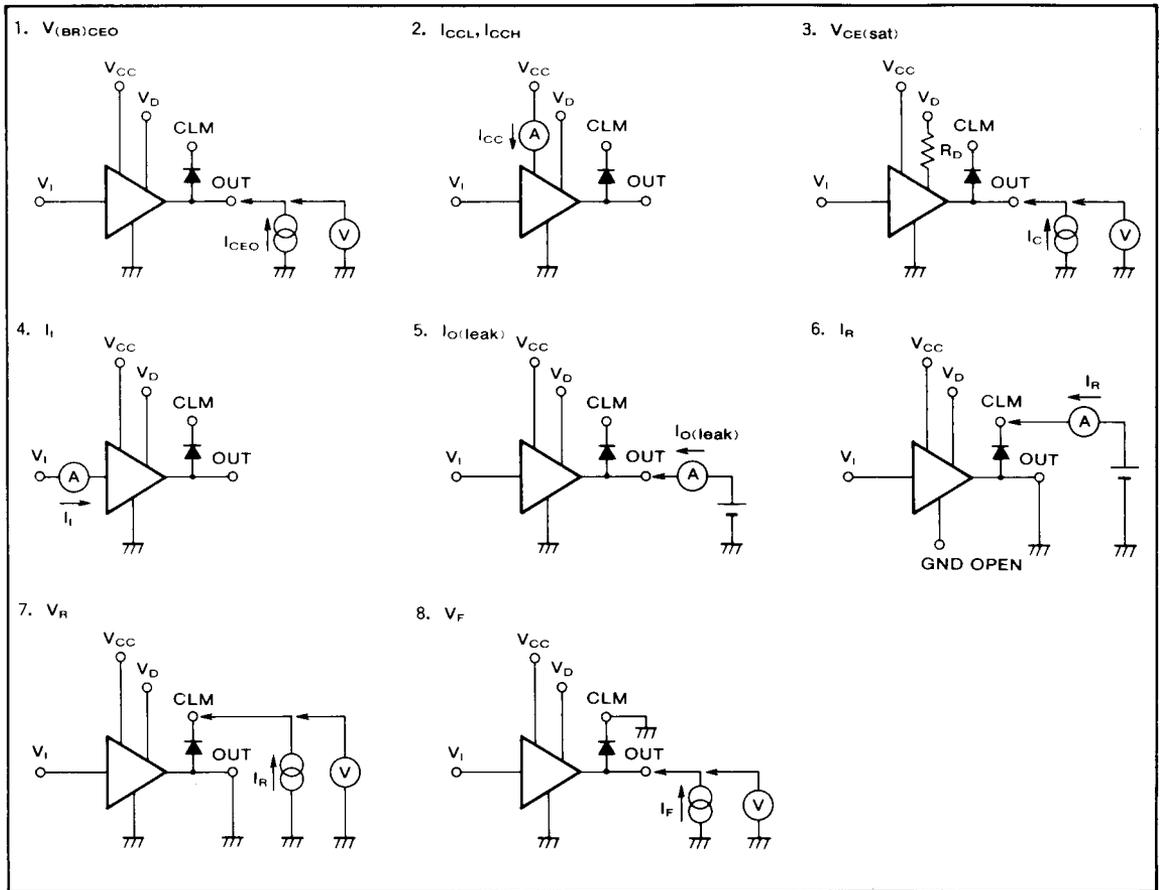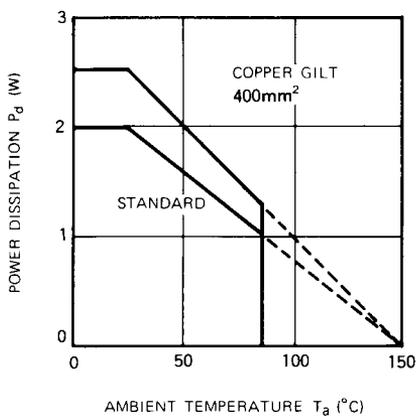
SAMPLE PCB LAYOUT

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.

COPPER GILT

COPPER GILT 400mm^2

COPPER GILT

MITSUBISHI ELECTRIC
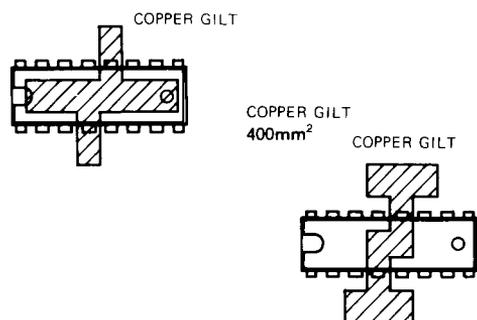
LOW SATURATION OUTPUT TYPE CURRENT DRIVER

SATURATION OUTPUT VOLTAGE VS. DRIVE STAGE RESISTANCE
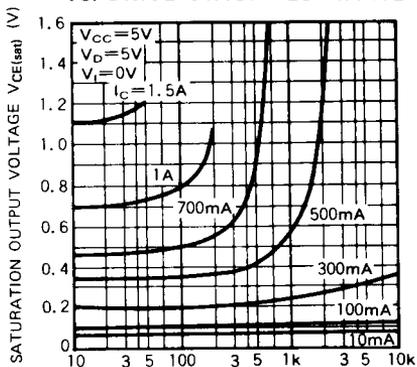
DRIVE STAGE VIAS VOLTAGE VS. DRIVE STAGE RESISTANCE
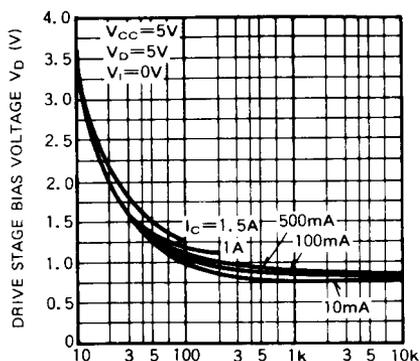
SATURATION OUTPUT VOLTAGE VS. OUTPUT CURRENT
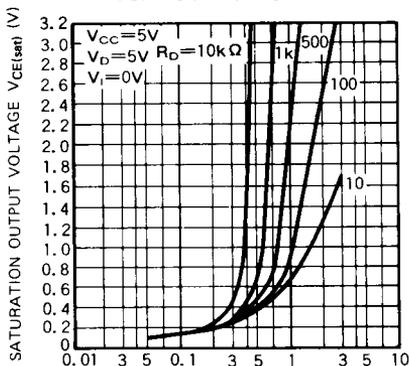
CLAMP DIODE FORWARD CURRENT VS. CLAMP DIODE FORWARD VOLTAGE
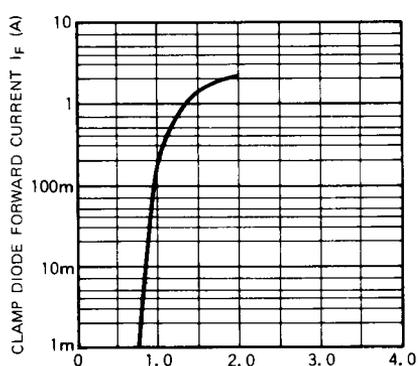
CIRCUIT CURRENT VS. SUPPLY VOLTAGE
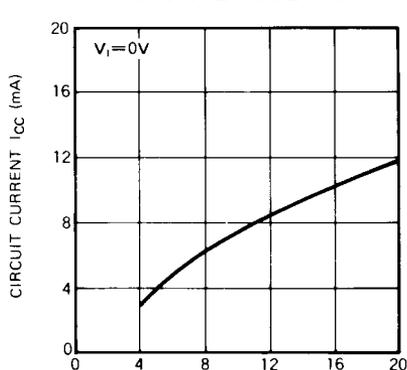
OUTPUT VOLTAGE VS. INPUT VOLTAGE

LOW SATURATION OUTPUT TYPE CURRENT DRIVER

INPUT CURRENT VS. AMBIENT TEMPERATURE

INPUT CURRENT I_I (μA)

AMBIENT TEMPERATURE T_a (°C)

SATURATION OUTPUT VOLTAGE VS. AMBIENT TEMPERATURE

SATURATION OUTPUT VOLTAGE $V_{CE(sat)}$ (V)

$V_{CC}=5V$
$V_D=5V$
$V_I=0V$

$I_C=2A, R_D=20\,\Omega$

$I_C=0.7A, R_D=100\,\Omega$

$I_C=0.3A, R_D=260\,\Omega$

AMBIENT TEMPERATURE T_a (°C)
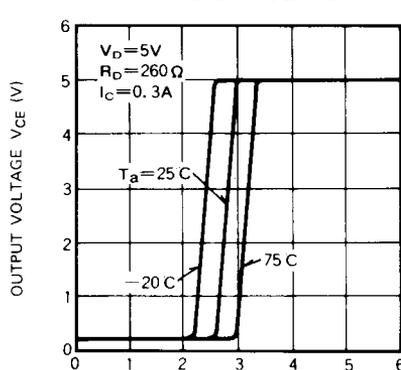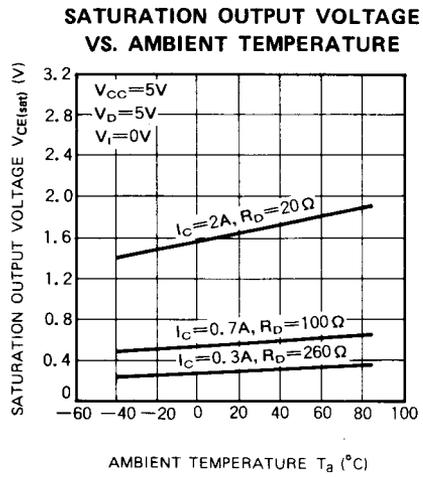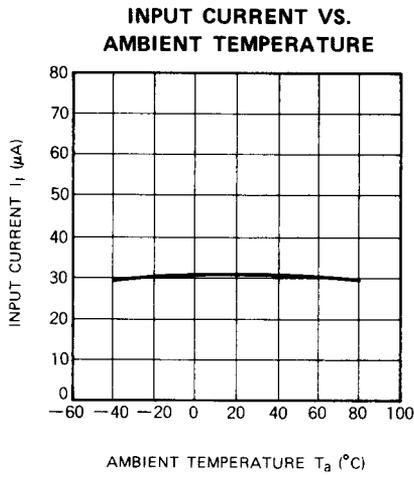
APPLICATION CIRCUIT (Stepping motor drive for a printer)

24V

5V

CONTROL SIGNAL

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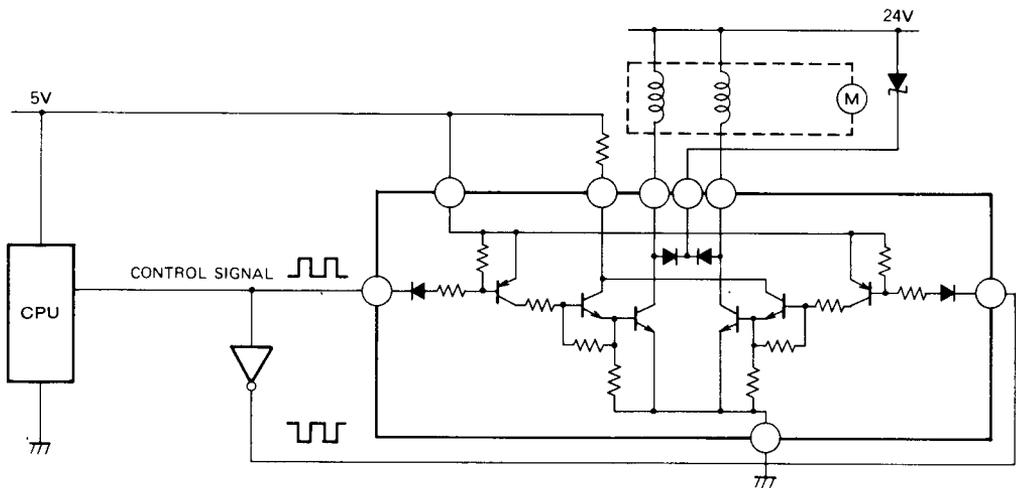
V_{CC}, DRIVE, CLAMP, AND GND ARE THE SAME FOR BOTH CIRCUITS.

MITSUBISHI ELECTRIC