

M54561P

7-UNIT 300mA SOURCE TYPE DARLINGTON TRANSISTOR ARRAY WITH CLAMP DIODE

DESCRIPTION

M54561P is seven-circuit output-sourcing Darlington transistor arrays. The circuits are made of PNP and NPN transistors. Both the semiconductor integrated circuits perform high-current driving with extremely low input-current supply.

FEATURES

- High breakdown voltage ($BV_{CEO} \geq 40V$)
- High-current driving ($I_o(max) = -300mA$)
- With output clamping diodes
- Active "L" input
- Wide operating temperature range ($T_a = -20$ to $+75^\circ C$)

APPLICATION

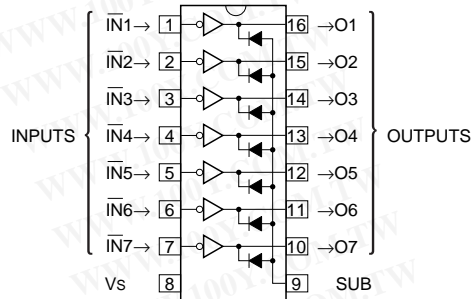
Drives of relays, printers, LEDs, fluorescent display tubes and lamps, and interfaces between MOS-bipolar logic systems and relays, solenoids, or small motors

FUNCTION

The M54561P have seven circuits of current-sourcing outputs. Darlington transistor, which are made of PNP transistor and NPN transistor. Resistance of $20k\Omega$ is connected between PNP transistor base and input pin. PNP transistor emitters and NPN transistor collector is connected V_s (pin 8), and spike killer clamping diode is provided between each output pins.

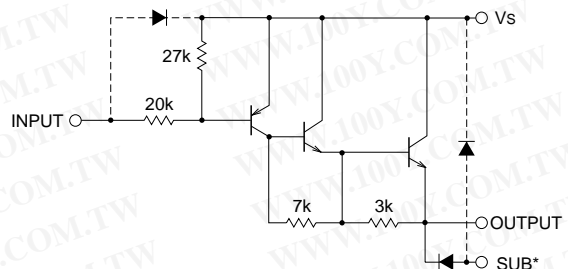
Output current is 300mA maximum and supply voltage V_s is 40V maximum operate Active "L" input.

PIN CONFIGURATION (TOP VIEW)



Outline 16P4

CIRCUIT SCHEMATIC



* SUB must be the lowest voltage in a circuit.

The seven circuits share the V_s and SUB.

The diodes shown by broken line are parasite diodes and must not be used.

Unit : Ω

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ABSOLUTE MAXIMUM RATINGS (Unless otherwise noted, $T_a = -20 \sim +75^\circ C$)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CEO}	Collector-emitter voltage	Output, L	$-0.5 \sim V_s$	V
V_s	Supply voltage		40	V
V_i	Input voltage		$-0.5 \sim V_s$	V
I_o	Output current	Current per circuit output, H	-300	mA
I_F	Clamping diode forward current		-300	mA
V_R	Clamping diode reverse voltage		40	V
P_d	Power dissipation	$T_a = 25^\circ C$, when mounted on board	1.47	W
T_{opr}	Operating temperature		$-20 \sim +75$	$^\circ C$
T_{stg}	Storage temperature		$-55 \sim +125$	$^\circ C$

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RECOMMENDED OPERATING CONDITIONS (Unless otherwise noted, $T_a = -20 \sim +75^\circ\text{C}$)

Symbol	Parameter	Limits			Unit	
		min	typ	max		
Vs	Supply voltage	0	—	40	V	
Io	Output current per channel	Percent duty cycle less than 10%	0	—	-300	mA
		Percent duty cycle less than 50%	0	—	-100	
VIH	"H" input voltage	Vs-0.2	—	Vs+0.3	V	
VIL	"L" input voltage	0	—	Vs-3	V	

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ELECTRICAL CHARACTERISTICS (Unless otherwise noted, $T_a = -20 \sim +75^\circ\text{C}$)

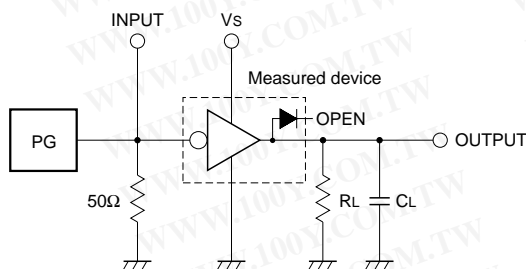
Symbol	Parameter	Test conditions	Limits			Unit
			min	typ*	max	
IS (leak)	Supply leak current	Vs = 40V	—	—	100	μA
VCE (sat)	Collector-emitter saturation voltage	VI = Vs-3V, Io = -300mA	—	1.65	2.4	V
		VI = Vs-3V, Io = -100mA	—	1.45	2.0	
Ii	Input current	VI = Vs-3.5V,	—	-150	-250	μA
VF	Clamping diode forward voltage	IF = -300mA	—	-1.6	-2.4	V
IR	Clamping diode reverse current	VR = 40V	—	—	100	μA
hFE	DC amplification factor	VCE = 4V, Io = -300mA, Ta = 25°C	1000	8000	—	—

* : The typical values are those measured under ambient temperature (T_a) of 25°C. There is no guarantee that these values are obtained under any conditions.

SWITCHING CHARACTERISTICS (Unless otherwise noted, $T_a = 25^\circ\text{C}$)

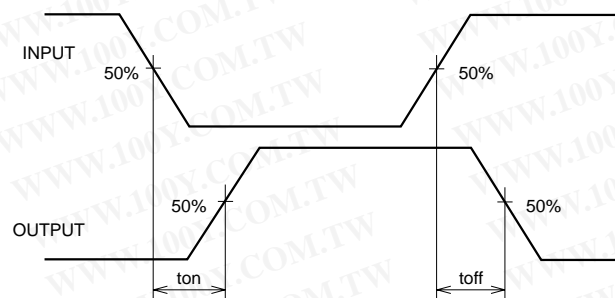
Symbol	Parameter	Test conditions	Limits			Unit
			min	typ	max	
ton	Turn-on time	CL = 15pF (note 1)	—	200	—	ns
toff	Turn-off time		—	2500	—	ns

NOTE 1 TEST CIRCUIT



- (1) Pulse generator (PG) characteristics : PRR = 1kHz, $t_w = 10\mu\text{s}$, $t_r = 6\text{ns}$, $t_f = 6\text{ns}$, $Z_o = 50\Omega$, $V_{in} = 7$ to 10.3V
- (2) Input-output conditions : $R_L = 40\Omega$, $V_s = 10\text{V}$
- (3) Electrostatic capacity CL includes floating capacitance at connections and input capacitance at probes

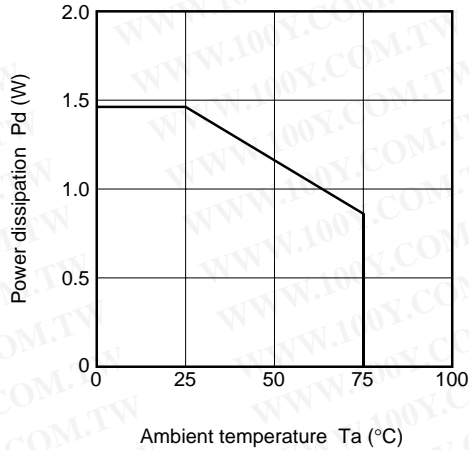
TIMING DIAGRAM



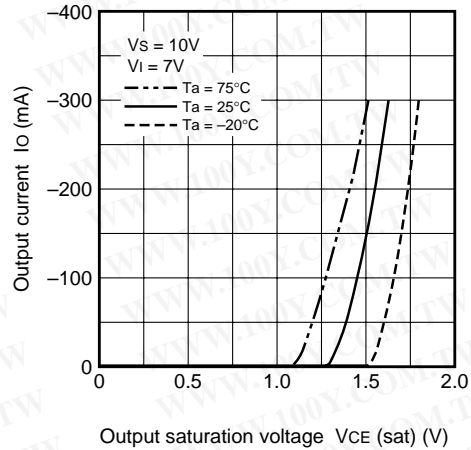
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TYPICAL CHARACTERISTICS

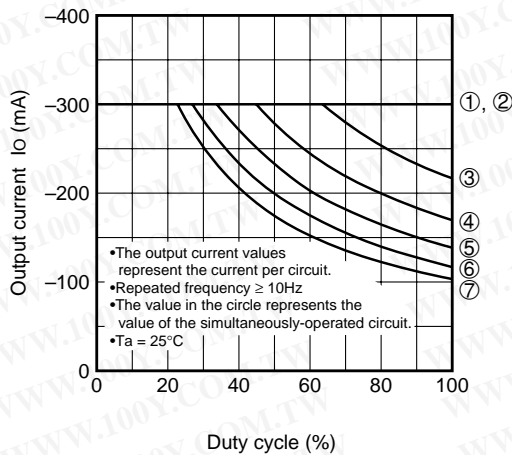
Thermal Derating Factor Characteristics



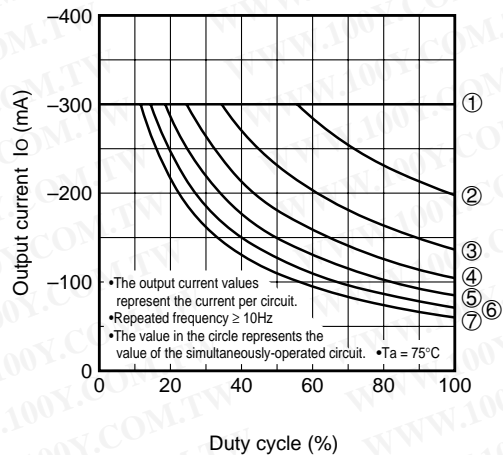
Output Saturation Voltage Output Current Characteristics



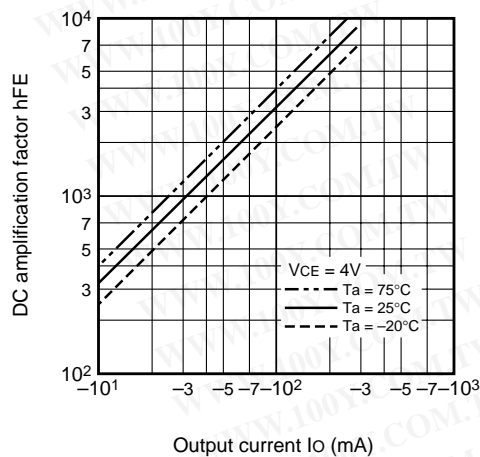
Duty-Cycle-Output Current Characteristics



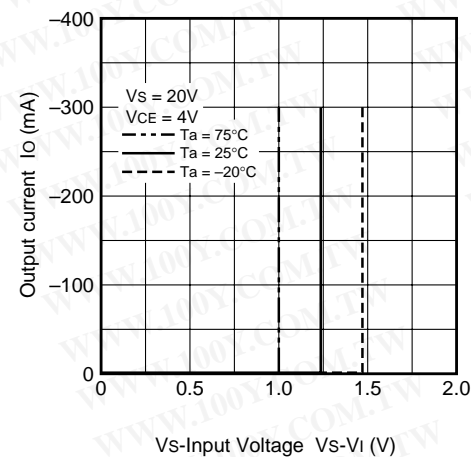
Duty-Cycle-Output Current Characteristics



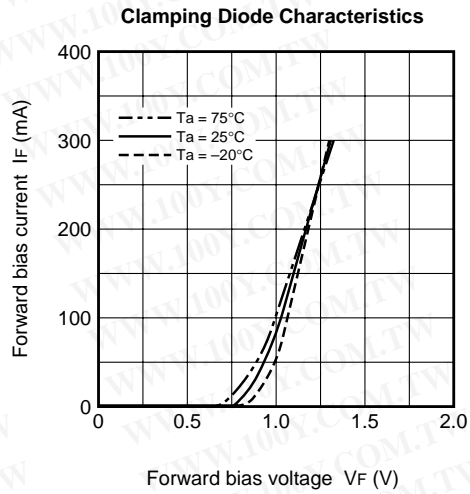
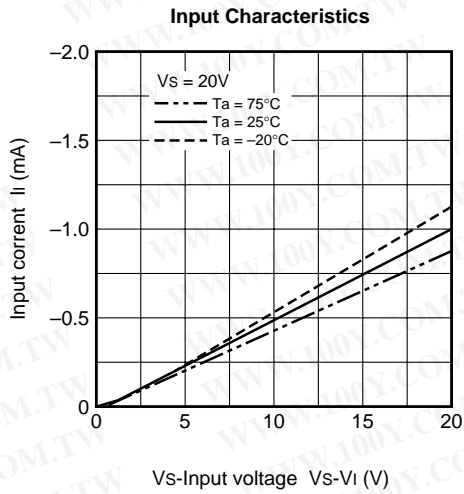
DC Amplification Factor output Current Characteristics



Grounded Emitter Transfer Characteristics



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