TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TD62003PA,TD62003APA,TD62004PA,TD62004APA

#### 7CH DARLINGTON SINK DRIVER

The TD62003PA / APA Series are high-voltage, high-current darlington drivers comprised of seven NPN darlington pairs. All units feature integral clamp diodes for switching inductuve loads. Applications include relay, hammer, lamp and display (LED) drivers.

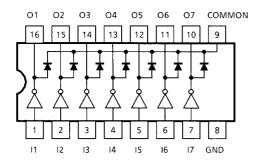
#### **FEATURES**

- Output current (single output) 500 mA (Max.)
- High sustaining voltage output 35 V (Min.) (TD62003PA series)
  V (Min.) (TD62003APA series)
- Output clamp diodes
- Inputs compatible with various types of logic. TD62003PA, APA  $R_{IN} = 2.7 \text{ k}\Omega$  TD62004PA, APA  $R_{IN} = 10.5 \text{ k}\Omega$
- Package DIP-16 pin

# DIP16-P-300-2.54A

Weight: 1.11g (Typ.)

## **PIN CONNECTION (TOP VIEW)**

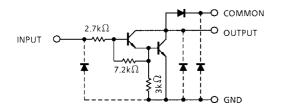


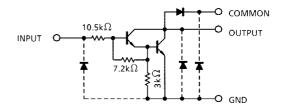


#### **SCHEMATICS (EACH DRIVER)**

#### TD62003PA / APA

#### **TD62004PA / APA**





Note: The input and output parasitic diodes cannot be used as clamp diodes.

## **MAXIMUM RATINGS (Ta = 25°C)**

CHARACTERISTIC		SYMBOL	RATING	UNIT	
Output Sustaining Voltage	PA	Vo= (0110)	-0.5~35	V	
	APA	V <sub>CE</sub> (SUS)	-0.5~50		
Output Current	Output Current		500	mA / ch	
Input Voltage		V <sub>IN</sub>	-0.5~30	V	
Clamp Diode Reverse Voltage	PA	V <sub>R</sub>	35	٧	
	APA	VR	50		
Clamp Diode Forward Current		I <sub>F</sub>	500	mA	
Power Dissipation		PD	1.47	W	
Operating Temperature	PA	т	-30~75	°C	
	APA	- T <sub>opr</sub>	-40~85		
Storage Temperature		T <sub>stg</sub>	-55~150	°C	

#### RECOMMENDED OPERATING CONDITIONS

(Ta = -40~85°C for Type-APA and Ta = -30~75°C for Type-PA)

CHARACTERISTIC		SYMBOL	CONDITION		MIN	TYP.	MAX	UNIT
Output Sustaining	PA	V (2) (2)			0	_	35	V
Voltage	APA	V <sub>CE</sub> (SUS)			0	_	50	v
Output Current	PA		T <sub>pw</sub> = 25 ms 7 Circuits	Duty = 10%	0	_	370	- mA / ch
		lour		Duty = 50%	0	_	140	
	APA	lout		Duty = 10%	0	_	400	
	AFA			Duty = 50%	0	_	170	
·		V <sub>IN</sub>			0	_	24	٧
Input Voltage	TD62003	\/	I <sub>OUT</sub> = 400 mA, h <sub>FE</sub> = 800		2.8	_	24	- V
	TD62004	V <sub>IN</sub> (ON)			6.2	_	24	
	TD62003	.,			0	_	0.7	V
	TD62004	VIN (OFF)			0	_	1.0	V
Clamp Diode Reverse Voltage	PA				_	_	35	V
	APA	- V <sub>R</sub>			_	_	50	V
Clamp Diode Forward Current		I <sub>F</sub>			_	_	350	mA
Power Dissipation		$P_{D}$	Ta = 85°C		_	_	0.52	W

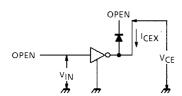


# **ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

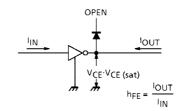
CHARACTER	CHARACTERISTIC SYMBOL CIR- CUIT TEST CONDITION		CONDITION	MIN	TYP.	MAX	UNIT		
Output Leakage Current	APA	- I <sub>CEX</sub>		V <sub>CE</sub> = 50 V,	CE = 50 V, Ta = 25°C — — —		50		
			1	V <sub>CE</sub> = 50 V, Ta = 85°C		_	_	100	μА
	PA		'	V <sub>CE</sub> = 35 V, Ta = 25°C		_	_	50	
	FA			V <sub>CE</sub> = 35 V, Ta = 75°C		_	_	100	
Collector=Emitter Saturation Voltage		V <sub>CE (sat)</sub>	2	I <sub>OUT</sub> = 350 mA, I <sub>IN</sub> = 500 μA		_	1.3	1.6	٧
				I <sub>OUT</sub> = 200 mA, I <sub>IN</sub> = 350 μA		_	1.1	1.3	
				I <sub>OUT</sub> = 100 mA, I <sub>IN</sub> = 250 μA		_	0.9	1.1	
DC Current Transfer Ra	tio	h <sub>FE</sub>	2	V <sub>CE</sub> = 2 V, I <sub>OUT</sub> = 350 mA		1000	_	_	
	TD62003	1	3	V <sub>IN</sub> = 2.4 V, I <sub>OUT</sub> = 350 mA		_	0.4	0.7	mA
Input Current	TD62004	I <sub>IN</sub> (ON)	3	V <sub>IN</sub> = 9.5 V, I <sub>OUT</sub> = 350 mA		_	0.8	1.3	
(Output On)	PA	lu.,	4	I <sub>OUT</sub> = 500 μA, Ta = 75°C		50	65	_	μА
	APA	IN (OFF)	4	I <sub>OUT</sub> = 500 μA, Ta = 85°C		50	65	_	
	TD62003	Vin (ON)			I <sub>OUT</sub> = 350 mA	_	<b>—</b> 2.6	2.6	
Input Voltage (Output On)			5	V <sub>CE</sub> = 2 V	I <sub>OUT</sub> = 200 mA	_	_	2.0	V
	TD62004			h <sub>FE</sub> = 800	I <sub>OUT</sub> = 350 mA	_	_	4.7	
	1002004				I <sub>OUT</sub> = 200 mA	_	_	4.4	
	APA	- I <sub>R</sub>		V <sub>R</sub> = 50 V, Ta = 25°C		_	_	50	- μΑ
Clamp Diode Reverse			6	V <sub>R</sub> = 50 V, Ta = 85°C		_	_	100	
Current	PA			V <sub>R</sub> = 35 V, Ta = 25°C		_	_	50	
				V <sub>R</sub> = 35 V, Ta = 75°C		_	_	100	
Clamp Diode Forward V	oltage	V <sub>F</sub>	7	I <sub>F</sub> = 350 mA		_	_	2.0	V
Input Capacitance	apacitance C <sub>IN</sub> —			_	15	_	pF		
Turn-On Delay	PA			$V_{OUT}$ = 35 V, $R_{L}$ = 85 $\Omega$ $C_{L}$ = 15 pF		_	0.1	_	
	APA	t <sub>ON</sub> 8		V <sub>OUT</sub> = 50 V, R <sub>L</sub> = 125 Ω C <sub>L</sub> = 15 pF		_	0.1	_	
Turn-Off Delay	PA			$V_{OUT}$ = 35 V, $R_{L}$ = 85 $\Omega$ $C_{L}$ = 15 pF		_	0.2	_	- µs
	APA	t <sub>OFF</sub> 8		V <sub>OUT</sub> = 50 \ C <sub>L</sub> = 15 pF	V, R <sub>L</sub> = 125 Ω	_	0.2	_	

## **TEST CIRCUIT**

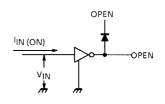
## 1. I<sub>CEX</sub>



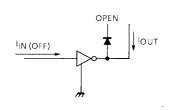
## 2. VCE (sat), hFE



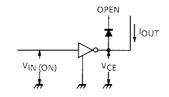
## 3. I<sub>IN (ON)</sub>



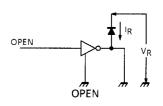
## 4. I<sub>IN (OFF)</sub>



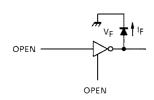
## 5. V<sub>IN (ON)</sub>



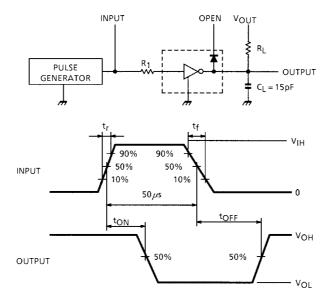
## 6. I<sub>R</sub>



## 7. V<sub>F</sub>



### 8. ton, toff



Note 1: Pulse Width 50 µs, Duty Cycle 10%

Output Impedance 50  $\Omega$ ,  $t_f \le 5$ ns,  $t_f \le 10$ ns

Note 2: See below

#### INPUT CONDITION

TYPE NUMBER	R <sub>I</sub>	V <sub>IH</sub>
TD620003PA / APA	0	3 V
TD620004 / APA	0	8 V

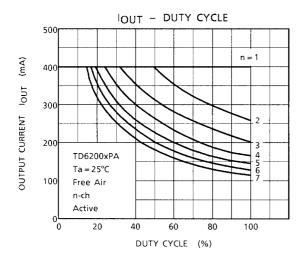
Note 3: C<sub>L</sub> includes probe and jig capacitance

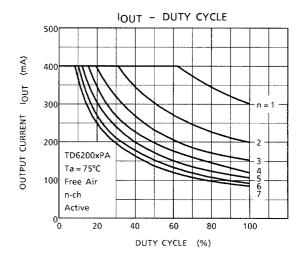
#### **PRECAUTIONS for USING**

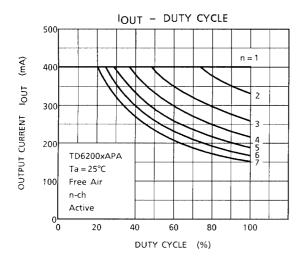
This IC does not include built-in protection circuits for excess current or overvoltage.

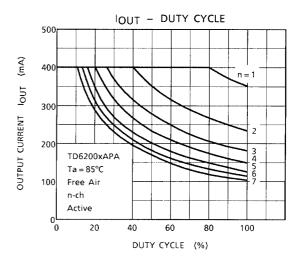
If this IC is subjected to excess current or overvoltage, it may be destroyed.

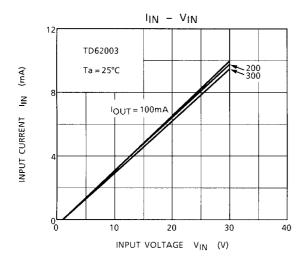
Hence, the utmost care must be taken when systems which incorporate this IC are designed. Utmost care is necessary in the design of the output line, COMMON and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

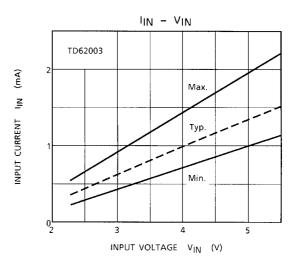


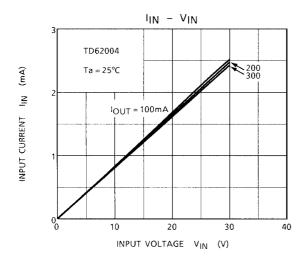


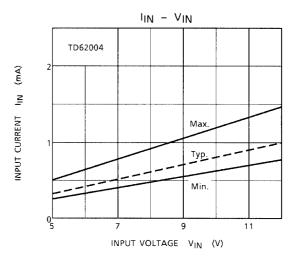


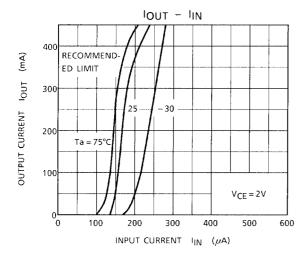


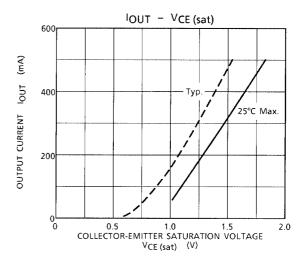


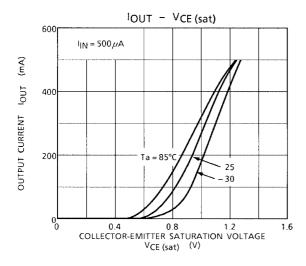


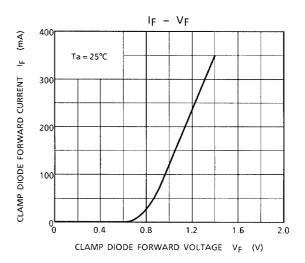


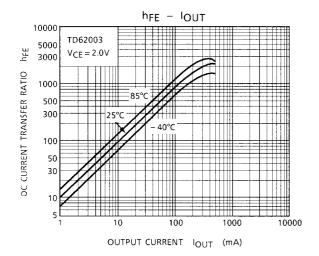


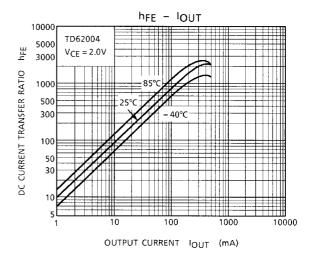


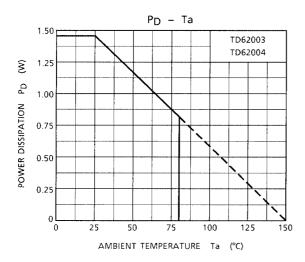




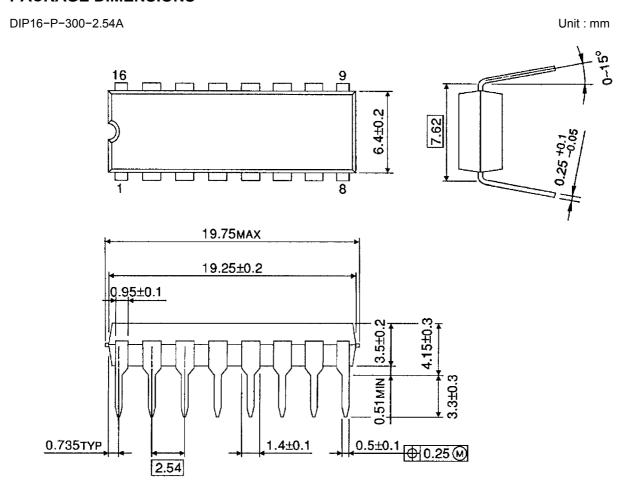








#### **PACKAGE DIMENSIONS**



Weight: 1.11 g (Typ.)

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000707EBA

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