

power transistor components (PTC)

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publication reference to product category

Product Description	Publication Reference Number	Product Description	Publication Reference Number	
High Voltage NPN Darlington Transistors	PTC 6000/6001/6002/6003-2.1	High Voltage NPN Transistors	PTC 401/402-2.1	
	PTC 6022/6023-2.1		PTC 403/409-2.1	
	PTC 6060/6061/6062/6063-2.1		PTC 410/411-2.1	
	PTC 6072/6073-2.1		PTC 413/423-2.1	
	PTC 7000/03-2.1		PTC 424/425-2.1	
	PTC 9000/9001/9002-2.1		PTC 430/431-2.1	
	PTC 10000/01-2.1		2N6674/2N6675-2.1	
	PTC 10002/03-2.1		2N6676/2N6677/2N6678-2.1	
	PTC 10004/05-2.1		Fast Recovery Power Rectifiers	PTC 862/864/866-2.1
	PTC 10006/07-2.1			PTC 872/874/876-2.1
	PTC 10008/09-2.1	PTC 920/921/922/923-2.1		
	PTC 10015/16-2.1	Power Modules	PTC 940/3-2.1	
	PTC 10020/21-2.1		PTC 950/3-2.1	
PTC 10022/23-2.1	PTC 2000/01-2.1			
			PTC 2010/11-2.1	
			PTC 2051/52-2.1	
			PTC 2200/2201-2.1	
			PTC 2400/01-2.1	

Separate copies of the individual product Technical Publications are available. Please order by referenced Publication number(s) from Allen-Bradley Publication Services Department.



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POWER TRANSISTOR COMPONENTS

Microelectronic Products
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800 W. Carson Street / Torrance, California 90502 / (213) 320-1190 / Telex No. 664276

Milwaukee, Wisconsin 53204

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Series PTC 6000, PTC 6001, PTC 6002, PTC 6003

Fast-Switching High Power Darlington Transistors

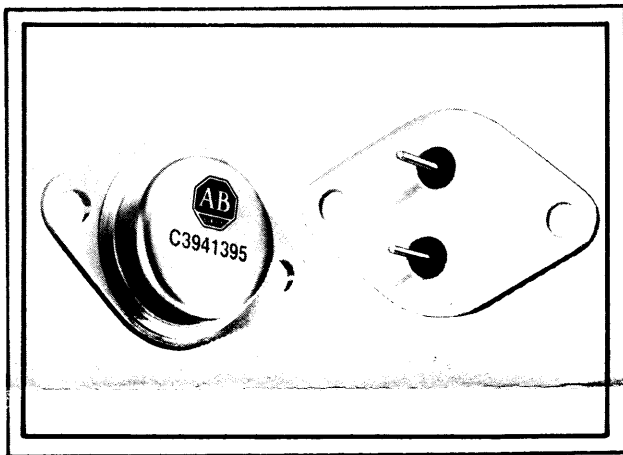
15 Amperes • 500 Volts

FEATURES

- High Voltage Rating – 500 Volts Sustaining
- Fast-Switching Capabilities/Fast Turn-Off Time
- Glass Passivated Die to Provide Excellent High Temperature Stability
- Thermally Stable Structure for Reliability in Power Cycling
- Overload Short Circuit Rating

APPLICATIONS

- High Voltage Switching Power Supplies
- Inverters/Regulators
- Deflection Circuits
- Pulse-Width-Modulated (PWM) System Control Circuitry



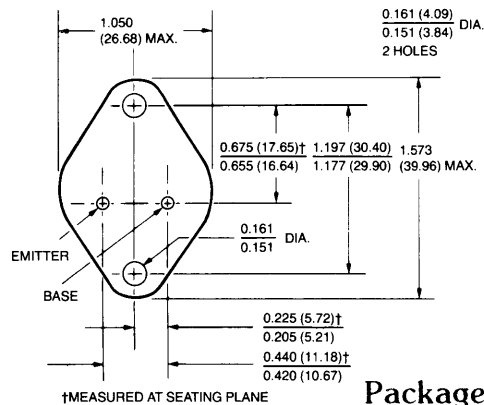
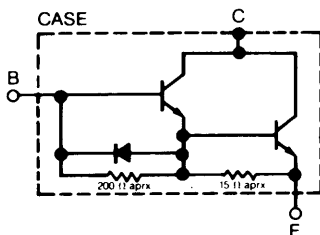
SPECIFICATIONS

General

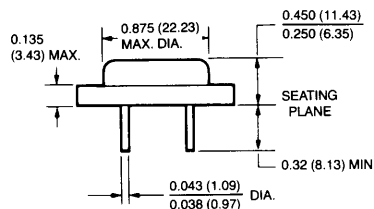
Featuring a unique process of manufacturing, Powerlithic series PTC 6000 Darlington provide a combination of fast-switching, high-power capabilities, including high safe operating areas (SOA) and are ideally suited for application in switching power supplies, regulators, inverters and off-line systems.

The triple diffused, high temperature glass passivated mesa device exhibits improved secondary breakdown characteristics. An excellent voltage range enables the unit to meet unusually demanding requirements in fast-switching circuitry. An internal diode provides rapid device turn-off.

Electrical



Package outline JEDEC TO-3



Basic dimensions in inches.

Dimensions shown in PARENTHESES are in millimeters.

SERIES PTC 6000/6001/6002/6003

Fast-Switching, High Power Darlingtontons

Absolute maximum ratings

Description	PTC 6000	PTC 6001	PTC 6002	PTC 6003	Unit	Conditions
V _{CBO} Collector-Base Voltage	350	400	450	550	V	
V _{CEO} Collector-Emitter Voltage	350	400	450	550	V	
I _C Collector Current – Continuous	15				A	
I _C Collector Current – Peak	30				A	
I _B Base Current – Continuous	4				A	
I _B Base Current – Peak	6				A	
P _D Maximum Power Dissipation	125				W	T _C = 25°C
T _J , T _{stg} Junction Operating and Storage Temperature Range	-65 to +150				°C	
Lead Temperature	300				°C	Measured 0.0625 ± 0.0312 in. (1.588 ± 0.794 mm) from case for 10 sec.

Electrical characteristics at T_C = 25°C (unless otherwise specified)

Description	Type	Min.	Typ.	Max.	Unit	Conditions
V _{CEO(sus)} Collector-Emitter Sustaining Voltage	PTC 6000	300			V	I _C = 2A, L = 2mH.
	PTC 6001	350			V	
	PTC 6002	400			V	
	PTC 6003	500			V	
I _{CEO} Collector Cut-off Current	All		0.1	1.0	mA	At rated collector voltage
I _{EBO} Emitter Cut-off Current	All		200	300	mA	V _{EB} = 4V.
FBSOA Forward Bias Safe Operating Area	All					
h _{FE} DC Current Gain 1	All		40	160		I _C = 5A, V _{CE} = 5V
			30	120		I _C = 10A, V _{CE} = 5V
			20	60		I _C = 15A, V _{CE} = 5V
V _{CE(SAT)} Collector-Emitter Saturation Voltage 1	All		1.8	2.0	V	I _C = 10A, I _B = 500mA
			1.2	1.5	V	I _C = 10A, I _B = 1A
			1.8	2.0	V	I _C = 15A, I _B = 1.5A
V _{BE(SAT)} Base-Emitter Saturation Voltage 1	All		2.2	2.5	V	I _C = 10A, I _B = 1A
			2.4	3.0	V	I _C = 15A, I _B = 1.5A
(h _{fe}) Small Signal Current Gain	All	8				I _C = 500mA, V _{CE} = 10V, f = 1MHz

Switching characteristics resistive load

Description	Type	Min.	Typ.	Max.	Unit	Conditions
t _r Rise Time	All			0.4	μs	V _{CC} = 150V; I _C = 10A I _{B1} = 1.0A I _{B2} = 1.0A PW ≥ 25μs
t _s Storage Time	All		2.0	2.5	μs	
t _f Fall Time	All		0.8	1.0	μs	

Thermal and mechanical characteristics

Description	Type	Typ.	Unit	Conditions
R _{θJC} Thermal Resistance Junction-to-Case	All	1.0	°C/W	
Approximate Weight	All	0.5	oz	
Darlington Circuit	All	14	gm	

1 PULSE TEST: PW = 300 μs, DUTY CYCLE ≤ 2%

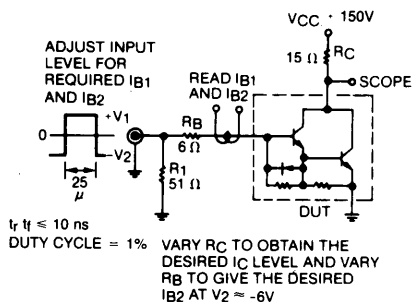


Figure 1 – Switching Circuit

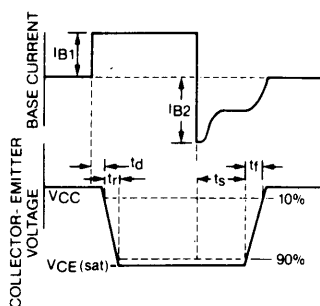


Figure 1a – Switching Waveform

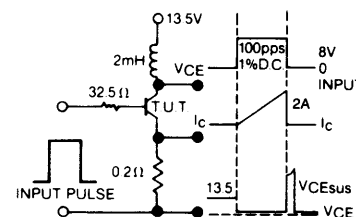
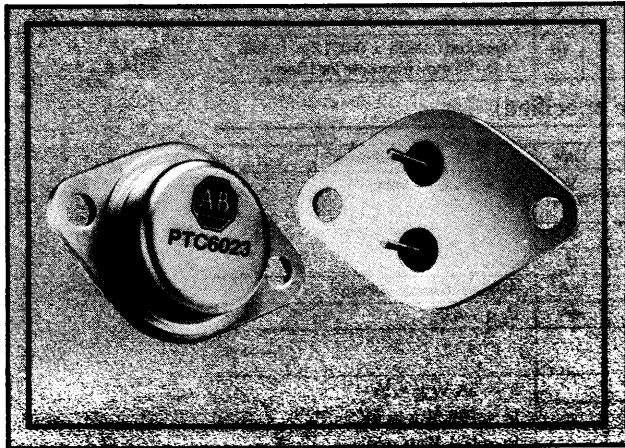


Figure 2 – Sustaining Voltage Test Circuit



Series PTC 6022, PTC 6023 NPN Silicon Power Darlington Transistors

40 Amperes • 600 Volts



FEATURES

- High Voltage Rating — 600 Volts
- Overload Short Circuit Rating
- Glass Passivated Die to Provide Excellent High Temperature Stability
- No Parasitic Diode on Output Transistor

APPLICATIONS

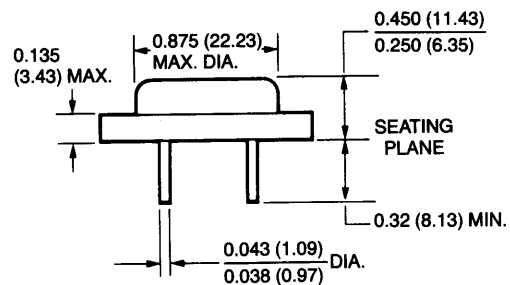
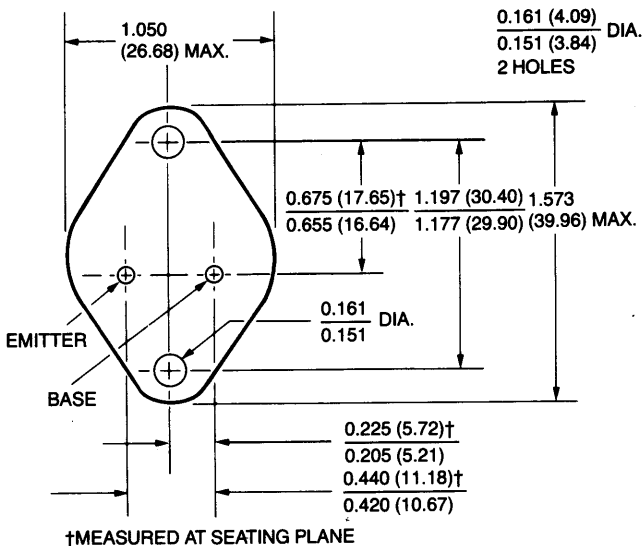
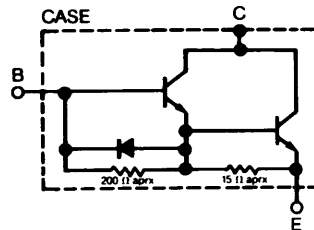
- High Voltage Switching Power Supplies
- Inverters/Regulators
- Deflection Circuits
- Pulse-Width-Modulated (PWM) System Control Circuitry

SPECIFICATIONS

General

The PTC 6022 and PTC 6023, Powerlithic series of silicon NPN darlington transistors are designed for high voltage, high speed, high power switching applications. These high voltage darlington transistors are ideally suited for applications in switching power supplies, pulse-width-modulated regulators and inverter or converter circuits operating off 240 volt lines.

Electrical



Basic dimensions in inches.

Dimensions shown in PARENTHESSES are in millimeters.

Package outline JEDEC TO-3

SERIES PTC 6022/6023

Fast-Switching, High Voltage Power Darlington Transistors

Absolute maximum ratings

Description	6022	6023	Unit	Conditions
V _{CB0}	500	600	Volts	
V _{CEO}	500	600	Volts	
I _C		30	A	
I _C		50	A	
I _B		5	A	
I _B		10	A	
P _D		125	W	T _C = 25°C
T _j , T _{stg}		-65 to + 150	°C	
		300	°C	Measured 0.625 ± 0.312 in. from case for 10 sec.

Electrical characteristics at 25°C (unless otherwise specified)

Description	Type	Min.	Typ.	Max.	Unit	Conditions
V _{CEO(sus)}	PTC 6022	350			V	I _C = 2A, L = 2mH. See Figure 2
	PTC 6023	400			V	
I _{CEO}	All			0.5	mA	At rated collector voltage
I _{EBO}	All			300	mA	V _{EB} = 4 V.
FBSOA	All					
h _{FE}	All	50		750		I _C = 10A, V _{CE} = 5.0V.
V _{CE(SAT)}	All			2.0	V	I _C = 20A, I _B = 1.0A
V _{BE(SAT)}	All			2.5	V	I _C = 20A, I _B = 1.0A

Switching characteristics resistive load

Description	Type	Min.	Typ.	Max.	Unit	Conditions
t _d	All			0.04	μs	See Figure 1 I _C = 20 Amps V _{BE} = -6.0V. V _{CC} = 300 Volts I _{B1} = I _{B2} = 1.0A PW = 25 μ sec.
t _r	All			0.4	μs	
t _{stg}	All			6.5	μs	
t _f	All			1.0	μs	

Thermal and mechanical characteristics

Description	Type	Min.	Typ.	Max.	Unit	Conditions
R _{θJC}	All		1.0		°C/W	
Approximate Weight	All		.5		oz	
			14.0		gm	
Darlington Circuit	All					

■ PULSE TEST: PW = 300 μs, DUTY CYCLE ≤ 2%

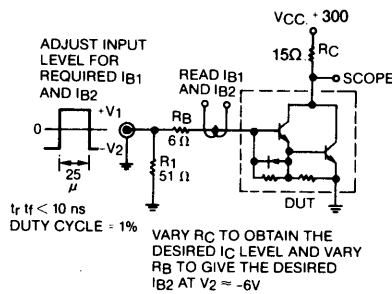


Figure 1 - Switching Circuit

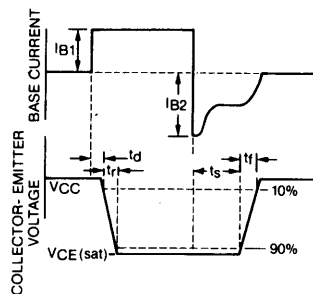


Figure 1a - Switching Waveform

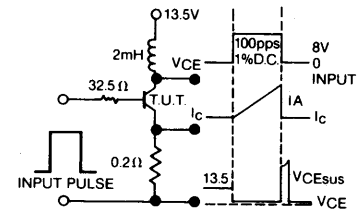


Figure 2 - Sustaining Voltage Test Circuit



Series PTC 6060, PTC 6061, PTC 6062, PTC 6063

Fast-Switching High Power Darlington Transistors

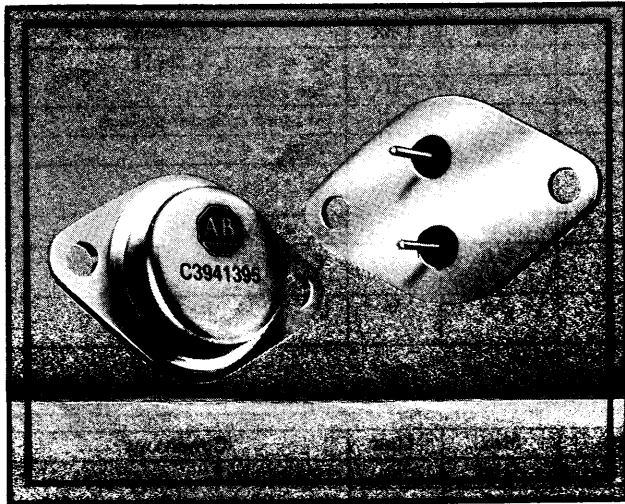
20 Amperes • 500 Volts

FEATURES

- High Voltage Rating – 500 Volts Sustaining
- Fast-Switching Capabilities/Fast Turn-Off Time
- Glass Passivated Die to Provide Excellent High Temperature Stability
- Thermally Stable Structure for Reliability in Power Cycling
- Overload Short Circuit Rating

APPLICATIONS

- High Voltage Switching Power Supplies
- Inverters/Regulators
- Deflection Circuits
- Pulse-Width-Modulated (PWM) System Control Circuitry



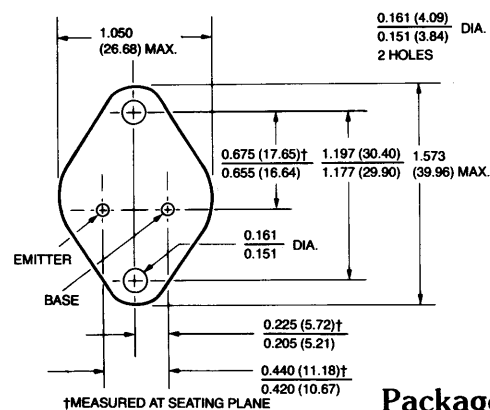
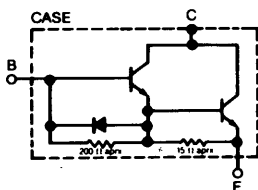
SPECIFICATIONS

General

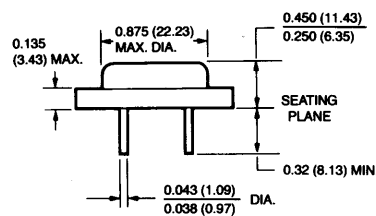
Featuring a unique process of manufacturing Powerlithic series PTC6060 Darlington transistors provide a combination of fast-switching, high-power capabilities, including high safe operating areas (SOA) and are suited for application in switching power supplies, regulators, inverters and line operated systems.

The triple diffused, high temperature glass passivated mesa device exhibits improved secondary breakdown characteristics. An excellent voltage range enables the unit to meet unusually demanding requirements in fast-switching circuitry. An internal diode provides rapid device turn-off.

Electrical



Package outline JEDEC TO-3



Basic dimensions in inches.

Dimensions shown in PARENTHESES are in millimeters.

SERIES PTC 6060/6061/6062/6063

Fast-Switching, High Power Darlingtons

Absolute maximum ratings

Description	PTC 6060	PTC 6061	PTC 6062	PTC 6063	Unit	Conditions
V _{CB0} Collector-Base Voltage	350	400	450	550	V	
V _{CE0} Collector-Emitter Voltage	350	400	450	550	V	
I _C Collector Current – Continuous	20				A	
I _C Collector Current – Peak	40				A	
I _B Base Current – Continuous	4				A	
I _B Base Current – Peak	6				A	
P _D Maximum Power Dissipation	125				W	T _C = 25°C
T _j , T _{stg} Junction Operating and Storage Temperature Range	- 65 to + 150				°C	
Lead Temperature	300				°C	Measured 0.0625 ± 0.0312 in. (1.588 ± 0.794 mm) from case for 10 sec.

Electrical characteristics at T_C = 25°C (unless otherwise specified)

Description	Type	Min.	Typ.	Max.	Unit	Conditions
V _{CE0(sus)} Collector Emitter Sustaining Voltage	PTC 6060	300			V	I _C = 2A, L = 2mH
	PTC 6061	350			V	
	PTC 6062	400			V	
	PTC 6063	500			V	
I _{CEO} Collector Cut-off Current	All			1.0	mA	At rated collector voltage
I _{EBO} Emitter Cut-off Current	All			300	mA	V _{EB} = 4V
FBSOA Forward Bias Safe Operating Area	All					
h _{FE} DC Current Gain	All	30		120		I _C = 10A, V _{CE} = 5V
		20		80		I _C = 15A, V _{CE} = 5V
		15		60		I _C = 20A, V _{CE} = 5V
V _{CE(SAT)} Collector-Emitter Saturation Voltage	All			1.4	V	I _C = 10A, I _B = 2A
				1.5	V	I _C = 10A, I _B = 1A
				2.0	V	I _C = 20A, I _B = 2A
V _{BE(SAT)} Base-Emitter Saturation Voltage	All			2.5	V	I _C = 10A, I _B = 1A
				3.0	V	I _C = 20A, I _B = 2A
(h _{fe}) Small Signal Current Gain	All	8				I _C = 500mA, V _{CE} = 10V, f = 1MHz

Switching characteristics resistive load

Description	Type	Min.	Typ.	Max.	Unit	Conditions
t _r Rise Time	All			0.4	S	V _{CC} = 150V; I _C = 10A
t _s Storage Time	All		2.0	2.5	μS	I _{B1} = 1.0A I _{B2} = 1.0A
t _f Fall Time	All		0.8	1.0	μS	PW ≥ 25μS

Thermal and mechanical characteristics

Description	Type	Typ.	Unit	Conditions
R _{θJC} Thermal Resistance Junction-to-Case	All	1.0	°C/W	
Approximate Weight	All	1.0	oz	
		28	gm	
Darlington Circuit	All			

■ PULSE TEST: PW = 300μs, DUTY CYCLE ≤ 2%

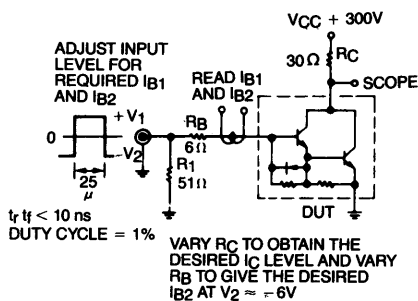


Figure 1 — Switching Circuit

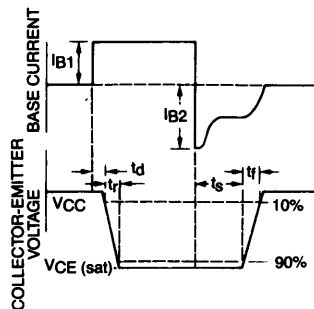


Figure 1a — Switching Waveform

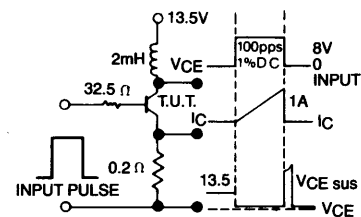


Figure 2 — Sustaining Voltage Test Circuit



Series PTC 6072, PTC 6073

NPN Silicon Power Darlington Power Diode Module

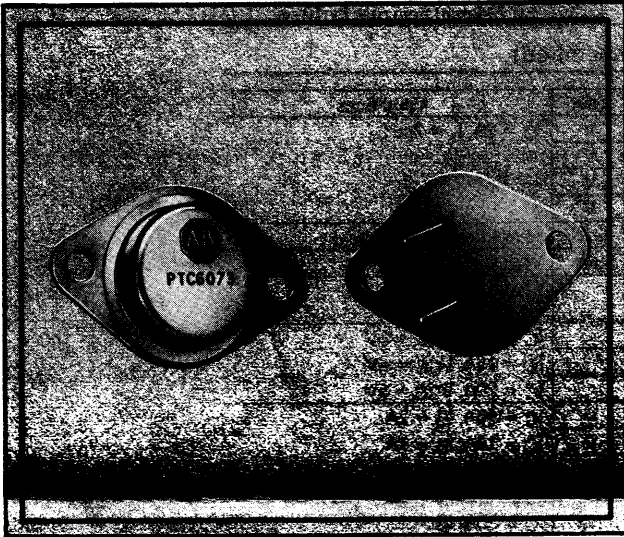
40 Amperes • 400 Volts

FEATURES

- High Voltage Rating — 600 Volts
- Overload Short Circuit Rating
- Glass Passivated Die to Provide Excellent High Temperature Stability
- Discrete Diode Connected Across The Output Terminals
- Fast Switching of High Power

APPLICATIONS

- High Current Switching Power Supplies
- Inverters/Regulators
- ~~Pulse Width Modulated~~ (PWM) System Control Circuitry

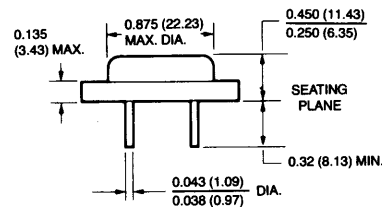
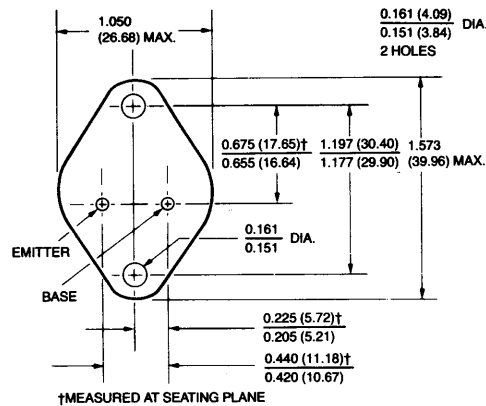
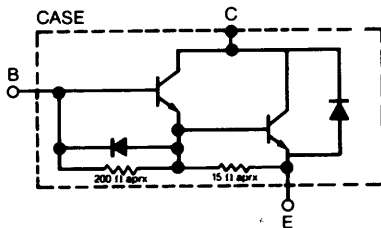


SPECIFICATIONS

General

The PTC 6072 and PTC 6073 Powerlithic series of silicon Power Darlington modules are designed for high voltage, high power switching applications. These modules have a discrete diode connected between the collector and emitter of the darlington output transistor. This 40 Ampere fast switching diode can be used as an inverse parallel diode in inverter applications. These modules are ideally suited for applications in switching power supplies, pulse-width-modulated regulators and inverter or converter applications operating off 240 volts.

Electrical



Basic dimensions in inches.

Dimensions shown in PARENTHESES are in millimeters.

Package outline JEDEC TO-3

SERIES PTC 6072/6073

Fast-Switching, High Voltage Power Darlington Power Diode Module

Absolute maximum ratings

Description	6072	6073	Unit	Conditions
V _{CB0} Collector-Base Voltage	500	600	Volts	
V _{CEO} Collector-Emitter Voltage	500	600	Volts	
I _C Collector Current Continuous		40	A	
I _C Collector Current Peak		50	A	
I _B Base Current Continuous		5	A	
I _B Base Current Peak		10	A	
P _D Maximum Power Dissipation		125	W	T _C = 25°C
T _j , T _{stg} Junction Operating and Storage Temperature Range		-65 to +150	°C	
Lead Temperature		300	°C	Measured 0.625 ± 0.312 in. from case for 10 sec.

Electrical characteristics at 25°C (unless otherwise specified)

Description	Type	Min.	Typ.	Max.	Unit	Conditions
V _{CEO(sus)} Collector Emitter Sustaining Voltage	PTC 6072	350			V	I _C = 2A, L = 2mH.
	PTC 6073	400			V	See Figure 2
I _{CEO} Collector Cut-off Current	All			500	mA	At rated collector voltage
I _{EBO} Emitter Cut-off Current	All			300	mA	V _{EB} = 4 V.
FBSOA Forward Bias Safe Operating Area	All					
h _{FE} DC Current Gain	All	50		250		I _C = 10A, V _{CE} = 5.0V.
V _{CE(SAT)} Collector-Emitter Saturation Voltage	All			2.0	V	I _C = 20A, I _B = 1.0A
V _{BE(SAT)} Base-Emitter Saturation Voltage	All			2.5	V	I _C = 20A, I _B = 1.0A

Switching characteristics resistive load

Description	Type	Min.	Typ.	Max.	Unit	Conditions
t _d Delay Time	All			0.04	μs	See Figure 1
t _r Rise Time	All			0.4	μs	I _C = 20 Amps V _{BE} = -6.0V.
t _{stg} Storage Time	All		5.0	6.5	μs	V _{CC} = 300 Volts
t _f Fall Time	All		0.8	1.0	μs	I _{B1} = I _{B2} = 1.0A PW = 25 μ sec.

Thermal and mechanical characteristics

Description	Type	Min.	Typ.	Max.	Unit	Conditions
R _{θJC} Thermal Resistance Junction to Case	All		1.0		°C/W	
Approximate Weight	All		.5		oz	
			14.0		gm	
Darlington Circuit	All					

Inverse parallel diode characteristics

Description	Type	Min.	Typ.	Max.	Unit	Conditions
V _F Forward Voltage	All		1.0	1.5	V	I _C = 40A
t _{rr} Reverse Recovery Time	All			500	ns	I _F = 20A di/dt = 50A/μs
V _{RRR}	PTC 6072	500			V	
	PTC 6073	600			V	

■ PULSE TEST: PW = 300 μs, DUTY CYCLE ≤ 2%

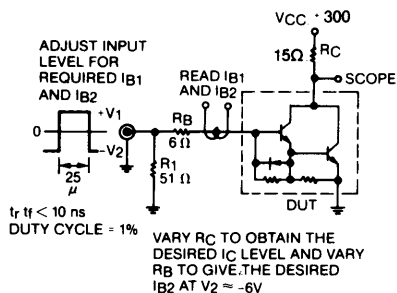


Figure 1 – Switching Circuit

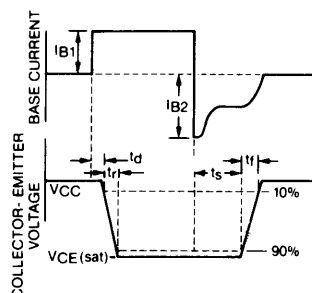


Figure 1a – Switching Waveform

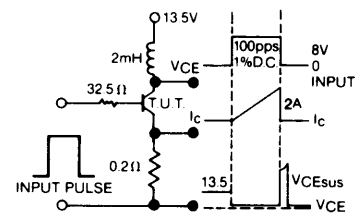


Figure 2 – Sustaining Voltage Test Circuit