

TOSHIBA POWER TRANSISTOR MODULE SILICON NPN & PNP EPITAXIAL TYPE (DARLINGTON POWER TRANSISTOR 6 IN 1)

MP6301

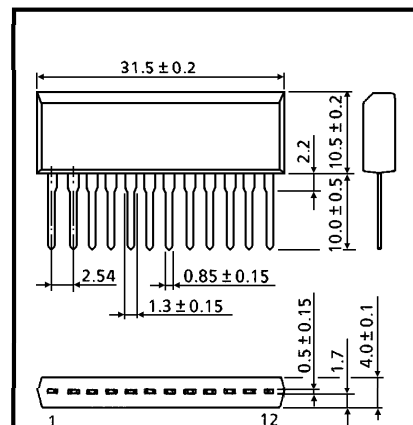
HIGH POWER SWITCHING APPLICATIONS.

3-PHASE MOTOR DRIVE AND BIPOLAR DRIVE OF PULSE MOTOR.

INDUSTRIAL APPLICATIONS

Unit in mm

- Small Package by Full Molding (SIP 12 Pin)
- High Collector Power Dissipation (6 Devices Operation)
: $P_T = 4.4W$ ($T_a = 25^\circ C$)
- High Collector Current : $I_C(DC) = \pm 3A$ (Max.)
- High DC Current Gain : $h_{FE} = 2000$ (Min.)
($V_{CE} = \pm 2V, I_C = \pm 1A$)



1, 11, 12 EMITTER
2, 4, 5, 7, 8, 10 BASE
3, 6, 9 COLLECTOR

JEDEC	—
EIAJ	—
TOSHIBA	2-32C1

Weight : 3.9g

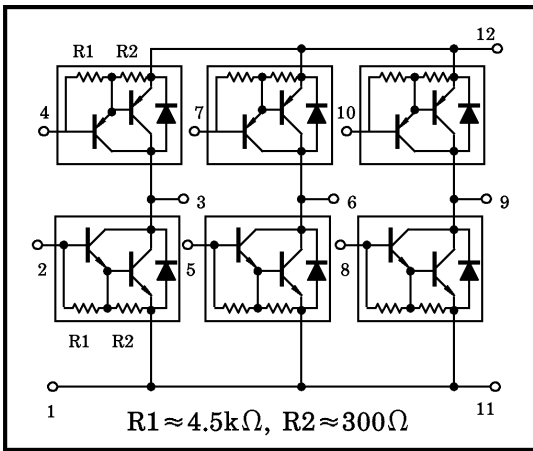
MAXIMUM RATINGS ($T_a = 25^\circ C$)

CHARACTERISTIC	SYMBOL	RATING		UNIT
		NPN	PNP	
Collector-Base Voltage	V_{CBO}	100	-100	V
Collector-Emitter Voltage	V_{CEO}	80	-80	V
Emitter-Base Voltage	V_{EBO}	8	-8	V
Collector Current	DC	I_C	3	A
	Pulse	I_{CP}	5	
Continuous Base Current	I_B	0.5	-0.5	A
Collector Power Dissipation (1 Device Operation)	P_C	2.0		W
Collector Power Dissipation (6 Devices Operation)	P_T	4.4		W
Junction Temperature	T_j	150		$^\circ C$
Storage Temperature Range	T_{stg}	-55~150		$^\circ C$

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ARRAY CONFIGURATION



THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance of Junction to Ambient (6 Devices Operation, $T_a = 25^\circ\text{C}$)	$\Sigma R_{th(j-a)}$	28.4	$^\circ\text{C} / \text{W}$
Maximum Lead Temperature for Soldering Purposes (3.2mm from Case for 10s)	T_L	260	$^\circ\text{C}$

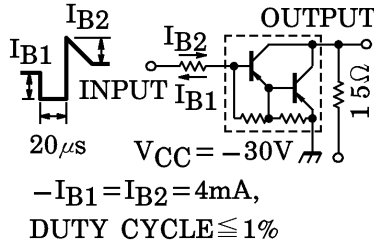
ELECTRICAL CHARACTERISTICS (Ta = 25°C) (NPN TRANSISTOR)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		ICBO	V _{CB} = 100V, I _E = 0	—	—	20	μA
Collector Cut-off Current		ICEO	V _{CE} = 80V, I _B = 0	—	—	20	μA
Emitter Cut-off Current		IEBO	V _{EB} = 8V, I _C = 0	0.8	—	4.0	mA
Collector-Base Breakdown Voltage		V _{(BR)CBO}	I _C = 1mA, I _E = 0	100	—	—	V
Collector-Emitter Breakdown Voltage		V _{(BR)CEO}	I _C = 10mA, I _B = 0	80	—	—	V
DC Current Gain		h _{FE} (1)	V _{CE} = 2V, I _C = 1A	2000	—	—	
		h _{FE} (2)	V _{CE} = 2V, I _C = 2A	1000	—	—	
Saturation Voltage	Collector-Emitter	V _{CE(sat)}	I _C = 2A, I _B = 4mA	—	—	1.8	V
	Base-Emitter	V _{BE(sat)}	I _C = 2mA, I _B = 4mA	—	—	2.3	
Transition Frequency		f _T	V _{CE} = 2V, I _C = 0.5A	—	100	—	MHz
Collector Output Capacitance		C _{ob}	V _{CB} = 10V, I _E = 0, f = 1MHz	—	20	—	pF
Switching Time	Turn-on Time	t _{on}		—	0.4	—	μs
	Storage Time	t _{stg}		—	3.0	—	
	Fall Time	t _f		I _{B1} = -I _{B2} = 4mA DUTY CYCLE ≤ 1%	—	0.6	

EMITTER-COLLECTOR DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Current	I _{FM}	—	—	—	3	A
Surge Current	I _{FSM}	t = 1s, 1 shot	—	—	5	A
Forward Voltage	V _F	I _F = 1A, I _B = 0	—	—	2.0	V
Reverse Recovery Time	t _{rr}	I _F = 3A, V _{BE} = -3V,	—	1	—	μs
Reverse Recovery Charge	Q _{rr}	dI _F / dt = -50A / μs	—	5	—	μC

ELECTRICAL CHARACTERISTICS (Ta = 25°C) (PNP TRANSISTOR)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		ICBO	V _{CB} = -100V, I _E = 0	—	—	-20	μA
Collector Cut-off Current		ICEO	V _{CE} = -80V, I _B = 0	—	—	-20	μA
Emitter Cut-off Current		IEBO	V _{EB} = -8V, I _C = 0	-0.8	—	-4.0	mA
Collector-Base Breakdown Voltage		V _{(BR)CBO}	I _C = -1mA, I _E = 0	-100	—	—	V
Collector-Emitter Breakdown Voltage		V _{(BR)CEO}	I _C = -10mA, I _B = 0	-80	—	—	V
DC Current Gain		h _{FE} (1)	V _{CE} = -2V, I _C = -1A	2000	—	—	
		h _{FE} (2)	V _{CE} = -2V, I _C = -2A	1000	—	—	
Saturation Voltage	Collector-Emitter	V _{CE(sat)}	I _C = -2A, I _B = -4mA	—	—	-1.8	V
	Base-Emitter	V _{BE(sat)}	I _C = -2A, I _B = -4mA	—	—	-2.3	
Transition Frequency		f _T	V _{CE} = -2V, I _C = -0.5A	—	50	—	MHz
Collector Output Capacitance		C _{ob}	V _{CB} = -10V, I _E = 0, f = 1MHz	—	30	—	pF
Switching Time	Turn-on Time	t _{on}	 <p> $-I_{B1} = I_{B2} = 4\text{mA}$, DUTY CYCLE $\leq 1\%$ </p>	—	0.4	—	μs
	Storage Time	t _{stg}		—	1.8	—	
	Fall Time	t _f		—	—	0.4	

EMITTER-COLLECTOR DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Current	I _{FM}	—	—	—	3	A
Surge Current	I _{FSM}	t = 1s, 1 shot	—	—	5	A
Forward Voltage	V _F	I _F = 1A, I _B = 0	—	—	2.0	V
Reverse Recovery Time	t _{rr}	I _F = 3A, V _{BE} = 3V,	—	500	—	μs
Reverse Recovery Charge	Q _{rr}	dI _F / dt = -50A / μs	—	2.7	—	μC