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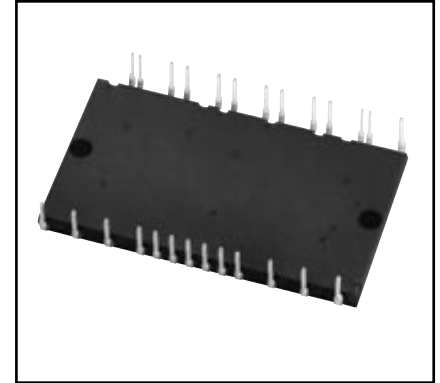
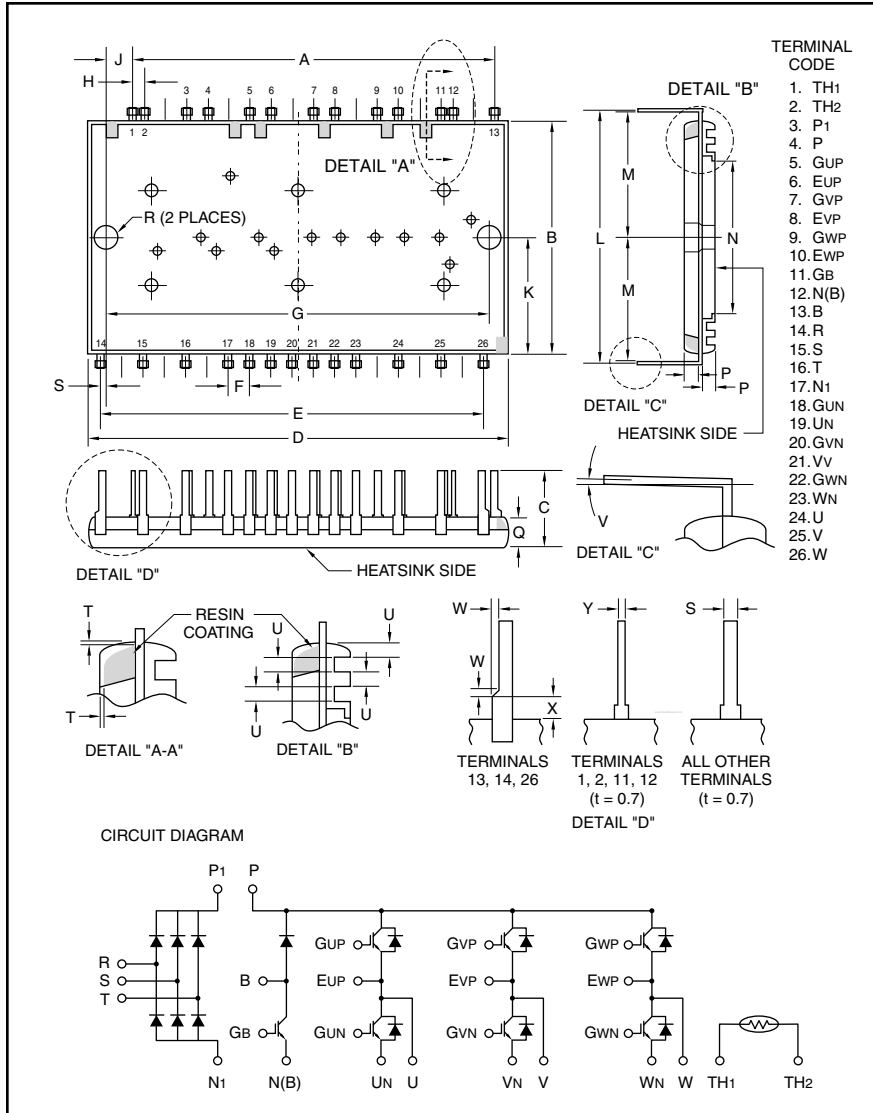


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DIP-CIB

3Ø Converter + 3Ø Inverter + Brake
15 Amperes/1200 Volts



Description:

DIP-CIBs are low profile, thermally efficient, transfer mold modules. Each module consists of a three-phase diode converter section, a three-phase inverter section and a brake circuit. Open emitters allow the designer to sense the current in each phase leg for accurate and low cost current sensing. A thermistor is included in the package for sensing the base-plate temperature. 5th Generation CSTBT chips yield low loss. The module is completely Pb-Free and hence RoHS compliant.

Features:

- Compact Package
- Only 5.7mm Thick
- One Package for Entire Family
- Thermistor
- Open Emitters

Applications:

- AC Motor Control
- Servo Motors
- Robotics
- HVAC Inverters

Ordering Information:

CP15TD1-24A is a 1200 Volt, 15 Ampere DIP-CIB module.

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	2.68±0.01	68.0±0.3
B	1.73±0.02	44.0±0.5
C	0.58±0.004	14.7±0.1
D	3.1±0.02	79.0±0.5
E	2.83	72.0
F	0.16±0.01	4.0±0.3
G	2.83±0.01	72.0±0.3
H	0.07	2.0
J	0.2±0.008	5.0±0.2
K	0.87	22.0
L	1.91±0.023	48.6±0.6
M	0.94±0.02	23.9±0.5

Dimensions	Inches	Millimeters
N	1.14	29.0
P	0.098	2.5
Q	0.22±0.02	5.7±0.5
R	0.18±0.008Dia.	4.5±0.2 Dia.
S	0.04±0.008	1.0±0.2
T	0 Min.	0 Min.
U	0.04	1.1
V	0-5°	0-5°
W	0.02 Max.	0.5 Max.
X	0.06±0.02	1.6±0.5
Y	0.023±0.008	0.6±0.2



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

CP15TD1-24A

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Absolute Maximum Ratings, $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	CP15TD1-24A	Units
Junction Temperature	T_j	-20 to 125	$^\circ\text{C}$
Storage Temperature	T_{stg}	-20 to 125	$^\circ\text{C}$
Mounting Torque, M4 Mounting Screws	—	13	in-lb
Module Weight Typical	—	52	Grams
Isolation Voltage (60Hz, Sinusoidal, AC 1 Min., Applied Between Pins and Heatsink)	V_{ISO}	2500	Volts

Inverter Part

Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current* (DC, $T_C = 100^\circ\text{C}$)	I_C	15	Amperes
Peak Collector Current** (Pulse)	I_{CM}	30	Amperes
Maximum Collector Dissipation ($T_C = 25^\circ\text{C}$)	P_C	113	Watts
Emitter Current* (DC, $T_C = 64^\circ\text{C}$)	I_E^{***}	15	Amperes
Peak Emitter Current** (Pulse)	I_{EM}^{***}	30	Amperes

Brake Part

Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current* (DC, $T_C = 100^\circ\text{C}$)	I_C	10	Amperes
Peak Collector Current** (Pulse)	I_{CM}	20	Amperes
Maximum Collector Dissipation ($T_C = 25^\circ\text{C}$, $T_j < 150^\circ\text{C}$)	P_C	104	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	V_{RRM}	1200	Volts
Forward Current (Clamp Diode Part, $T_j < 150^\circ\text{C}$)	I_{FM}	10	Amperes

Converter Part

Repetitive Peak Reverse Voltage	V_{RRM}	1600	Volts
Recommended AC Input Voltage	E_a	440	Volts
DC Output Current (Three-phase Rectifying Circuit)	I_O	15	Amperes
Surge Forward Current (1/2 Cycle at 60 Hz, Peak Value, Non-repetitive)	I_{FSM}	245	Amperes
I^2t for Fusing (Value for 1 Cycle of Surge Current)	I^2t	252	A^2s

* T_C is measured just underneath the power chip.

**Pulse width and repetition rate should be such that the device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.

*** I_E , V_{EC} , t_{rr} , and Q_{rr} represent characteristics of the anti-paralleled emitter-to-collector free-wheel diode (FWDI).

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Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Inverter Part						
Collector-Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1.0	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 1.5mA, V_{CE} = 10V$	6.5	7.5	8.5	Volts
Gate-Emitter Cutoff Current	I_{GES}	$V_{GE} = 20V, V_{CE} = 0V$	—	—	1.0	μA
Collector-Emitter	$V_{CE(sat)}$	$I_C = 15A, V_{GE} = 15V, T_j = 25^\circ C$	—	1.8	2.5	Volts
Saturation Voltage*		$I_C = 15A, V_{GE} = 15V, T_j = 125^\circ C$	—	2.0	—	Volts
Input Capacitance	C_{ies}		—	—	3.24	nF
Output Capacitance	C_{oes}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	—	—	0.3	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.06	nF
Total Gate Charge	Q_G	$V_{CC} = 600V, I_C = 15A, V_{GE} = 15V$	—	100	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	100	ns
Turn-on Rise Time	t_r	$V_{CC} = 600V, I_C = 15A,$	—	—	75	ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GE} = \pm 15V, R_G = 22\Omega,$	—	—	300	ns
Turn-off Fall Time	t_f	$T_j = 25^\circ C,$	—	—	400	ns
Reverse Recovery Time**	t_{rr}	Inductive Load	—	200	—	ns
Reverse Recovery Charge**	Q_{rr}		—	0.35	—	μC
Emitter-Collector Voltage**	V_{EC}	$I_E = 15A, V_{GE} = 0V$	—	2.7	3.5	Volts
External Gate Resistance	R_g	—	22	—	220	Ω
Brake Part						
Collector-Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1.0	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 1.0mA, V_{CE} = 10V$	6.5	7.5	8.5	Volts
Gate-Emitter Cutoff Current	I_{GES}	$V_{GE} = 20V, V_{CE} = 0V$	—	—	1.0	μA
Collector-Emitter	$V_{CE(sat)}$	$I_C = 10A, V_{GE} = 15V, T_j = 25^\circ C$	—	1.8	2.5	Volts
Saturation Voltage*		$I_C = 10A, V_{GE} = 15V, T_j = 125^\circ C$	—	2.0	—	Volts
Input Capacitance	C_{ies}		—	—	2.04	nF
Output Capacitance	C_{oes}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	—	—	0.16	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.04	nF
Total Gate Charge	Q_G	$V_{CC} = 600V, I_C = 10A, V_{GE} = 15V$	—	67	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	100	ns
Turn-on Rise Time	t_r	$V_{CC} = 600V, I_C = 10A,$	—	—	75	ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GE} = \pm 15V, R_G = 33\Omega,$	—	—	300	ns
Turn-off Fall Time	t_f	$T_j = 25^\circ C,$	—	—	400	ns
Reverse Recovery Time	t_{rr}	Inductive Load	—	200	—	ns
Reverse Recovery Charge	Q_{rr}		—	0.3	—	μC
Forward Voltage Drop	V_{FM}	$I_F = 10A, \text{Clamp Diode Part}$	—	2.7	3.5	Volts
External Gate Resistance	R_g	—	33	—	330	Ω

*Pulse width and repetition rate should be such as to cause negligible temperature rise.

** T_C is measured just underneath the power chip.



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Electrical Characteristics, $T_j = 25\text{ °C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Converter Part						
Repetitive Reverse Current	I_{RRM}	$V_R = V_{RRM}, T_j = 125\text{ °C}$	—	—	1.0	mA
Forward Voltage Drop	V_{FM}	$I_F = 15\text{ A}$	—	1.1	1.4	Volts

Thermal and Mechanical Characteristics, $T_j = 25\text{ °C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Common Rating						
Contact Thermal Resistance	$R_{th(c-f)}$	Case-to-Fin, Thermal Grease Applied	—	0.047	—	°C/W

Inverter Part

Thermal Resistance, Junction to Case	$R_{th(j-c)Q}$	IGBT Part, Per 1/6 Module	—	—	1.2	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	FWDi Part, Per 1/6 Module	—	—	1.7	°C/W

Brake Part

Thermal Resistance, Junction to Case	$R_{th(j-c)Q}$	IGBT Part	—	—	1.2	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	FWDi Part	—	—	1.7	°C/W

Converter Part

Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per 1/6 Module	—	—	1.3	°C/W
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NTC Thermistor Part

Resistance	R_{th}	$T_C = 25\text{ °C}$	9.5	10.0	10.5	$\text{k}\Omega$
B Constant*	$B(25/100)$	Resistance at $25\text{ °C}, 100\text{ °C}$	—	3450	—	K

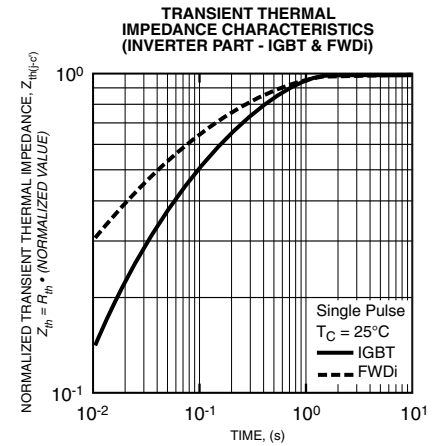
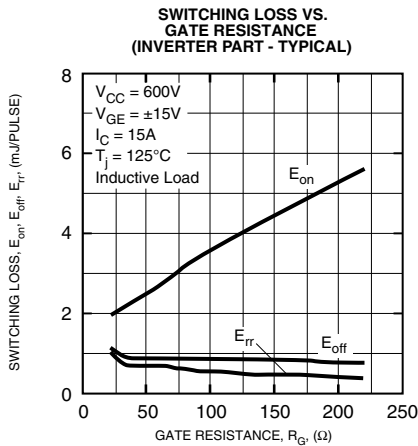
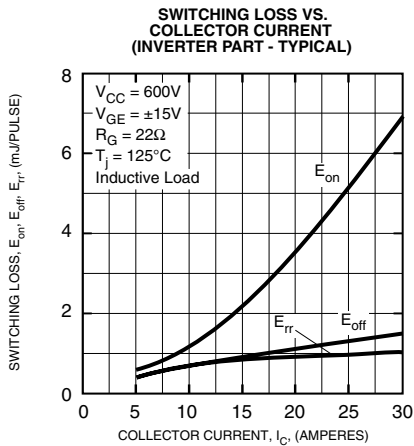
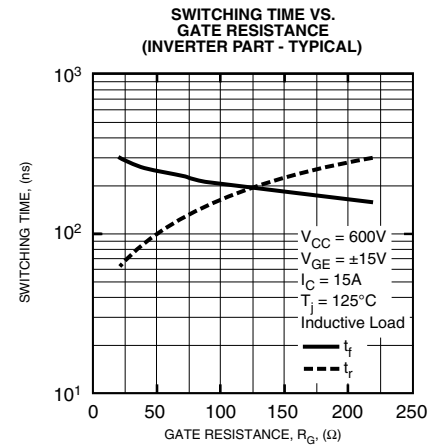
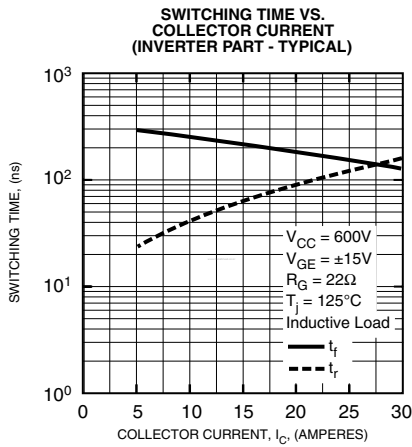
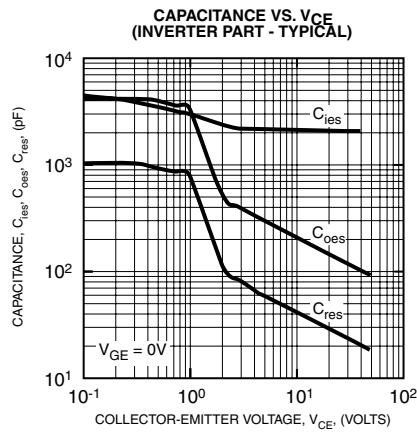
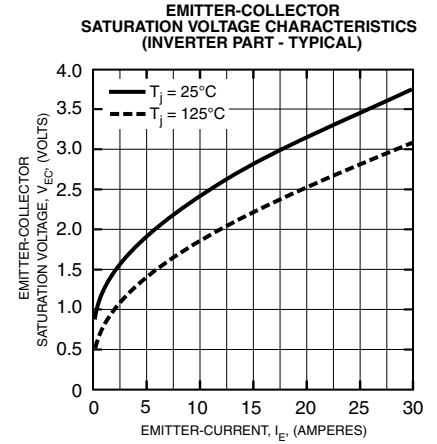
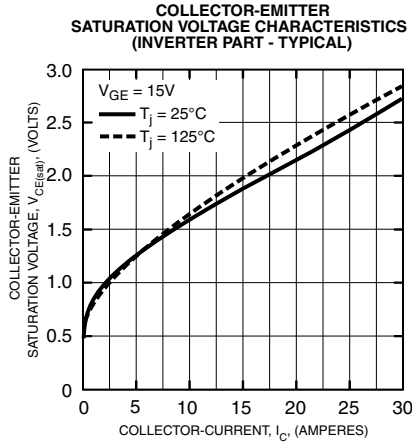
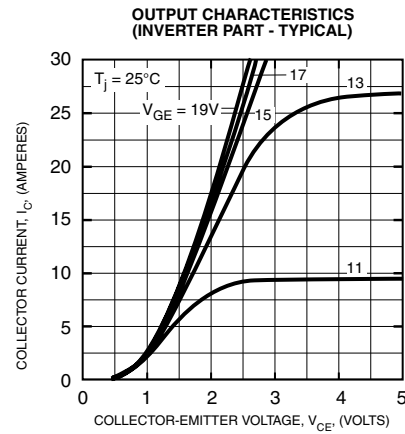
* $B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$ where R_1 is the resistance at $T_1(K)$, R_2 is the resistance at $T_2(K)$.

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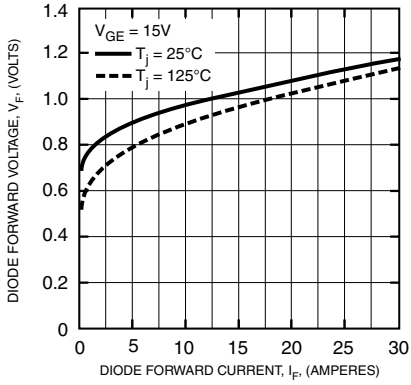
CP15TD1-24A

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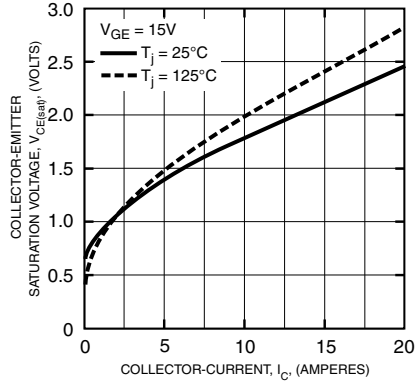
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DIODE FORWARD VOLTAGE CHARACTERISTICS (CONVERTER PART - TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (BRAKE PART - TYPICAL)



EMITTER-COLLECTOR SATURATION VOLTAGE CHARACTERISTICS (BRAKE PART - TYPICAL)

