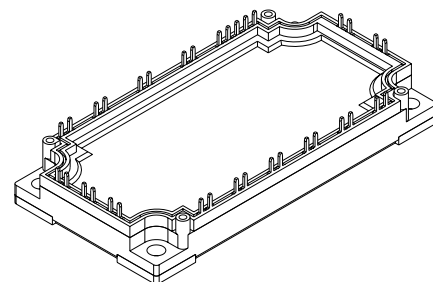
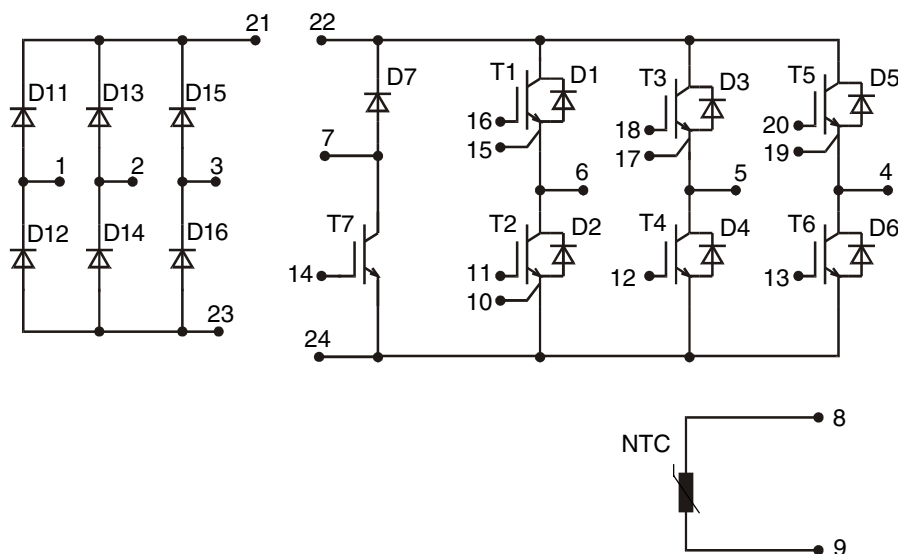


## Converter - Brake - Inverter Module (CBI3)



| Three Phase Rectifier      | Brake Chopper                 | Three Phase Inverter          |
|----------------------------|-------------------------------|-------------------------------|
| $V_{RRM} = 1600 \text{ V}$ | $V_{CES} = 1200 \text{ V}$    | $V_{CES} = 1200 \text{ V}$    |
| $I_{FAVM} = 42 \text{ A}$  | $I_{C25} = 35 \text{ A}$      | $I_{C25} = 50 \text{ A}$      |
| $I_{FSM} = 300 \text{ A}$  | $V_{CE(sat)} = 2.3 \text{ V}$ | $V_{CE(sat)} = 2.5 \text{ V}$ |

### Input Rectifier D11 - D16

| Symbol     | Conditions                                                               | Maximum Ratings |   |
|------------|--------------------------------------------------------------------------|-----------------|---|
| $V_{RRM}$  |                                                                          | 1600            | V |
| $I_{FAV}$  | $T_C = 80^\circ\text{C}$ ; sine $180^\circ$                              | 30              | A |
| $I_{DAVM}$ | $T_C = 80^\circ\text{C}$ ; rectangular; $d = 1/3$ ; bridge               | 80              | A |
| $I_{FSM}$  | $T_{VJ} = 25^\circ\text{C}$ ; $t = 10 \text{ ms}$ ; sine $50 \text{ Hz}$ | 300             | A |
| $P_{tot}$  | $T_C = 25^\circ\text{C}$                                                 | 100             | W |

| Symbol     | Conditions                                                                         | Characteristic Values<br>( $T_{VJ} = 25^\circ\text{C}$ , unless otherwise specified) |            |                  |
|------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------|------------------|
|            |                                                                                    | min.                                                                                 | typ.       | max.             |
| $V_F$      | $I_F = 35 \text{ A}$ ; $T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$ |                                                                                      | 1.2<br>1.2 | 1.4<br>V         |
| $I_R$      | $V_R = V_{RRM}$ ; $T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$      |                                                                                      | 0.4        | 0.02<br>mA<br>mA |
| $R_{thJC}$ | (per diode)                                                                        |                                                                                      |            | 1.3 K/W          |

### Application: AC motor drives with

- Input from single or three phase grid
- Three phase synchronous or asynchronous motor
- electric braking operation

### Features

- High level of integration - only one power semiconductor module required for the whole drive
- NPT IGBT technology with low saturation voltage, low switching losses, high RBSOA and short circuit ruggedness
- Epitaxial free wheeling diodes with Hyperfast and soft reverse recovery
- Industry standard package with insulated copper base plate and soldering pins for PCB mounting
- Temperature sense included

**Output Inverter T1 - T6**

| Symbol                                 | Conditions                                                                                                                         | Maximum Ratings                         |               |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------|
| $V_{CES}$                              | $T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$                                                                             | 1200                                    | V             |
| $V_{GES}$                              | Continuous                                                                                                                         | $\pm 20$                                | V             |
| $I_{C25}$                              | $T_C = 25^{\circ}\text{C}$                                                                                                         | 50                                      | A             |
| $I_{C80}$                              | $T_C = 80^{\circ}\text{C}$                                                                                                         | 35                                      | A             |
| <b>RBSOA</b>                           | $V_{GE} = \pm 15\text{ V}$ ; $R_G = 47\ \Omega$ ; $T_{VJ} = 125^{\circ}\text{C}$<br>Clamped inductive load; $L = 100\ \mu\text{H}$ | $I_{CM} = 50$<br>$V_{CEK} \leq V_{CES}$ | A             |
| <b><math>t_{SC}</math><br/>(SCSOA)</b> | $V_{CE} = V_{CES}$ ; $V_{GE} = \pm 15\text{ V}$ ; $R_G = 47\ \Omega$ ; $T_{VJ} = 125^{\circ}\text{C}$<br>non-repetitive            | 10                                      | $\mu\text{s}$ |
| <b><math>P_{tot}</math></b>            | $T_C = 25^{\circ}\text{C}$                                                                                                         | 225                                     | W             |

| Symbol        | Conditions                                                                                                                                                                                    | Characteristic Values<br>( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) |      |          |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------|----------|
|               |                                                                                                                                                                                               | min.                                                                                   | typ. | max.     |
| $V_{CE(sat)}$ | $I_C = 35\text{ A}$ ; $V_{GE} = 15\text{ V}$ ; $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                                                                | 2.5<br>2.9                                                                             |      | 3.1<br>V |
| $V_{GE(th)}$  | $I_C = 1\text{ mA}$ ; $V_{GE} = V_{CE}$                                                                                                                                                       | 4.5                                                                                    |      | 6.5 V    |
| $I_{CES}$     | $V_{CE} = V_{CES}$ ; $V_{GE} = 0\text{ V}$ ; $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                                                                  | 1.0                                                                                    |      | 1.1 mA   |
| $I_{GES}$     | $V_{CE} = 0\text{ V}$ ; $V_{GE} = \pm 20\text{ V}$                                                                                                                                            |                                                                                        |      | 200 nA   |
| $t_{d(on)}$   | $\left. \begin{array}{l} \text{Inductive load, } T_{VJ} = 125^{\circ}\text{C} \\ V_{CE} = 600\text{ V}; I_C = 35\text{ A} \\ V_{GE} = \pm 15\text{ V}; R_G = 47\ \Omega \end{array} \right\}$ | 100                                                                                    |      | ns       |
| $t_r$         |                                                                                                                                                                                               | 70                                                                                     |      | ns       |
| $t_{d(off)}$  |                                                                                                                                                                                               | 500                                                                                    |      | ns       |
| $t_f$         |                                                                                                                                                                                               | 70                                                                                     |      | ns       |
| $E_{on}$      |                                                                                                                                                                                               | 5.3                                                                                    |      | mJ       |
| $E_{off}$     |                                                                                                                                                                                               | 3.9                                                                                    |      | mJ       |
| $C_{ies}$     | $V_{CE} = 25\text{ V}$ ; $V_{GE} = 0\text{ V}$ ; $f = 1\text{ MHz}$                                                                                                                           | 1.65                                                                                   |      | nF       |
| $Q_{Gon}$     | $V_{CE} = 600\text{ V}$ ; $V_{GE} = 15\text{ V}$ ; $I_C = 35\text{ A}$                                                                                                                        | 120                                                                                    |      | nC       |
| $R_{thJC}$    | (per IGBT)                                                                                                                                                                                    |                                                                                        |      | 0.55 K/W |

**Output Inverter D1 - D6**

| Symbol    | Conditions                 | Maximum Ratings |   |
|-----------|----------------------------|-----------------|---|
| $I_{F25}$ | $T_C = 25^{\circ}\text{C}$ | 50              | A |
| $I_{F80}$ | $T_C = 80^{\circ}\text{C}$ | 35              | A |

| Symbol     | Conditions                                                                                                                                                                     | Characteristic Values |      |          |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------|
|            |                                                                                                                                                                                | min.                  | typ. | max.     |
| $V_F$      | $I_F = 35\text{ A}$ ; $V_{GE} = 0\text{ V}$ ; $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                                                  | 2.4<br>1.8            |      | 2.8<br>V |
| $I_{RM}$   | $\left. \begin{array}{l} I_F = 30\text{ A}; di_F/dt = -500\text{ A}/\mu\text{s}; T_{VJ} = 125^{\circ}\text{C} \\ V_R = 600\text{ V}; V_{GE} = 0\text{ V} \end{array} \right\}$ | 27                    |      | A        |
| $t_{rr}$   |                                                                                                                                                                                | 150                   |      | ns       |
| $R_{thJC}$ | (per diode)                                                                                                                                                                    |                       |      | 1.19 K/W |

### Brake Chopper T7

| Symbol                                  | Conditions                                                                                                                         | Maximum Ratings                         |               |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------|
| $V_{CES}$                               | $T_{VJ} = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$                                                                             | 1200                                    | V             |
| $V_{GES}$                               | Continuous                                                                                                                         | $\pm 20$                                | V             |
| $I_{C25}$                               | $T_C = 25^{\circ}\text{C}$                                                                                                         | 35                                      | A             |
| $I_{C80}$                               | $T_C = 80^{\circ}\text{C}$                                                                                                         | 25                                      | A             |
| <b>RBSOA</b>                            | $V_{GE} = \pm 15\text{ V}$ ; $R_G = 82\ \Omega$ ; $T_{VJ} = 125^{\circ}\text{C}$<br>Clamped inductive load; $L = 100\ \mu\text{H}$ | $I_{CM} = 35$<br>$V_{CEK} \leq V_{CES}$ | A             |
| <b>t<sub>SC</sub></b><br><b>(SCSOA)</b> | $V_{CE} = V_{CES}$ ; $V_{GE} = \pm 15\text{ V}$ ; $R_G = 82\ \Omega$ ; $T_{VJ} = 125^{\circ}\text{C}$<br>non-repetitive            | 10                                      | $\mu\text{s}$ |
| <b>P<sub>tot</sub></b>                  | $T_C = 25^{\circ}\text{C}$                                                                                                         | 180                                     | W             |

| Symbol                                                                 | Conditions                                                                                                                                         | Characteristic Values<br>( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) |                                      |                                  |
|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------|----------------------------------|
|                                                                        |                                                                                                                                                    | min.                                                                                   | typ.                                 | max.                             |
| $V_{CE(sat)}$                                                          | $I_C = 20\text{ A}$ ; $V_{GE} = 15\text{ V}$ ; $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                     |                                                                                        | 2.3<br>2.6                           | 3.0<br>V                         |
| $V_{GE(th)}$                                                           | $I_C = 0.6\text{ mA}$ ; $V_{GE} = V_{CE}$                                                                                                          | 4.5                                                                                    |                                      | 6.5 V                            |
| $I_{CES}$                                                              | $V_{CE} = V_{CES}$ ; $V_{GE} = 0\text{ V}$ ; $T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                       |                                                                                        | 0.8                                  | 0.8 mA<br>mA                     |
| $I_{GES}$                                                              | $V_{CE} = 0\text{ V}$ ; $V_{GE} = \pm 20\text{ V}$                                                                                                 |                                                                                        |                                      | 200 nA                           |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$ | Inductive load, $T_{VJ} = 125^{\circ}\text{C}$<br>$V_{CE} = 600\text{ V}$ ; $I_C = 20\text{ A}$<br>$V_{GE} = \pm 15\text{ V}$ ; $R_G = 82\ \Omega$ |                                                                                        | 100<br>75<br>500<br>70<br>3.1<br>2.4 | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |
| $C_{ies}$                                                              |                                                                                                                                                    |                                                                                        | 1                                    | nF                               |
| $Q_{Gon}$                                                              |                                                                                                                                                    |                                                                                        | 70                                   | nC                               |
| $R_{thJC}$                                                             |                                                                                                                                                    |                                                                                        |                                      | 0.7 K/W                          |

### Brake Chopper D7

| Symbol           | Conditions                      | Maximum Ratings |   |  |
|------------------|---------------------------------|-----------------|---|--|
| V <sub>RRM</sub> | T <sub>VJ</sub> = 25°C to 150°C | 1200            | V |  |
| I <sub>F25</sub> | T <sub>C</sub> = 25°C           | 16              | A |  |
| I <sub>F80</sub> | T <sub>C</sub> = 80°C           | 11              | A |  |

| Symbol                             | Conditions                                                                                                  | Characteristic Values |            |               |
|------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------|------------|---------------|
|                                    |                                                                                                             | min.                  | typ.       | max.          |
| V <sub>F</sub>                     | I <sub>F</sub> = 20 A; T <sub>VJ</sub> = 25°C<br>T <sub>VJ</sub> = 125°C                                    |                       | 3.2<br>2.5 | 3.6 V<br>V    |
| I <sub>R</sub>                     | V <sub>R</sub> = V <sub>RRM</sub> ; T <sub>VJ</sub> = 25°C<br>T <sub>VJ</sub> = 125°C                       |                       | 0.07       | 0.06 mA<br>mA |
| I <sub>RM</sub><br>t <sub>rr</sub> | } I <sub>F</sub> = 10 A; di <sub>F</sub> /dt = -400 A/μs; T <sub>VJ</sub> = 125°C<br>V <sub>R</sub> = 600 V |                       | 13<br>110  | A<br>ns       |
| R <sub>thJC</sub>                  |                                                                                                             |                       |            | 3.2           |

## Temperature Sensor NTC

| Symbol                   | Conditions | Characteristic Values |      |         |
|--------------------------|------------|-----------------------|------|---------|
|                          |            | min.                  | typ. | max.    |
| <b>R<sub>25</sub></b>    | T = 25°C   | 4.75                  | 5.0  | 5.25 kΩ |
| <b>B<sub>25/50</sub></b> |            |                       | 3375 | K       |

## Module

| Symbol     | Conditions                                     | Maximum Ratings |    |
|------------|------------------------------------------------|-----------------|----|
| $T_{VJ}$   |                                                | -40...+150      | °C |
| $T_{JM}$   |                                                | 150             | °C |
| $T_{stg}$  |                                                | -40...+125      | °C |
| $V_{ISOL}$ | $I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}$ | 2500            | V~ |
| $M_d$      | Mounting torque (M5)                           | 3 - 6           | Nm |

| Symbol                | Conditions                   | Characteristic Values |      |      |
|-----------------------|------------------------------|-----------------------|------|------|
|                       |                              | min.                  | typ. | max. |
| $R_{\text{pin-chip}}$ |                              |                       | 5    | mΩ   |
| $d_s$                 | Creepage distance on surface | 6                     |      | mm   |
| $d_A$                 | Strike distance in air       | 6                     |      | mm   |
| $R_{\text{thCH}}$     | with heatsink compound       |                       | 0.01 | K/W  |
| <b>Weight</b>         |                              |                       | 300  | g    |

**Dimensions in mm (1 mm = 0.0394")**

