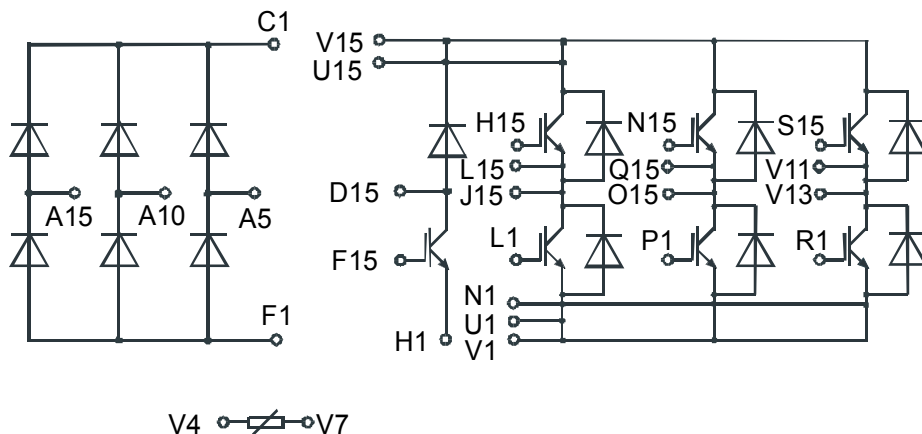


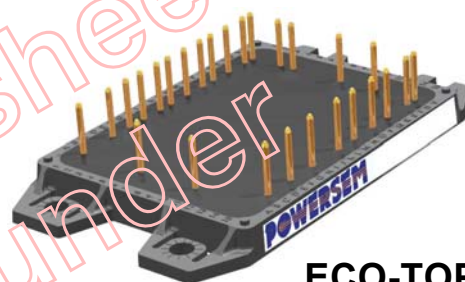
## Converter - Brake - Inverter Module

# PSIPM 50/06

Preliminary Data Sheet



| Three Phase Rectifier      | Brake Chopper                 | Three Phase Inverter          |
|----------------------------|-------------------------------|-------------------------------|
| $V_{RRM} = 1600 \text{ V}$ | $V_{CES} = 600 \text{ V}$     | $V_{CES} = 600 \text{ V}$     |
| $I_{FAVM} = 68 \text{ A}$  | $I_{C25} = 42.5 \text{ A}$    | $I_{C25} = 69 \text{ A}$      |
| $I_{FSM} = 300 \text{ A}$  | $V_{CE(sat)} = 2.4 \text{ V}$ | $V_{CE(sat)} = 2.3 \text{ V}$ |



ECO-TOP™ 1

### Input Rectifiers

| Symbol      | Test Conditions                                               | Maximum Ratings |
|-------------|---------------------------------------------------------------|-----------------|
| $I_{dAV}^*$ | $T_C = 100^\circ\text{C}$ , (per circuit)                     | 68 A            |
| $I_{FSM}$   | $T_{VJ} = 25^\circ\text{C}$ ; $t = 10 \text{ ms}$ ; sin 50 Hz | 300 A           |
| $V_{RRM}$   |                                                               | 1600 V          |

| Symbol     | Test Conditions                                    | Characteristic Value  |
|------------|----------------------------------------------------|-----------------------|
| $I_R$      | $V_R = V_{RRM}$ , $T_{VJ} = T_{VJM}$               | $\leq 3 \text{ mA}$   |
|            | $V_R = V_{RRM}$ , $T_{VJ} = 25^\circ\text{C}$      | $\leq 0.5 \text{ mA}$ |
| $V_F$      | $I_F = 55 \text{ A}$ , $T_{VJ} = 25^\circ\text{C}$ | $\leq 1.46 \text{ V}$ |
| $V_{TO}$   | For power-loss calculations only                   | 0.8 V                 |
| $r_T$      |                                                    | 13 mΩ                 |
| $R_{thJC}$ | per diode; DC                                      | 1.1 K/W               |

### Features

- Package with DCB ceramic base plate
- High level of integration - only one power semiconductor module required for the whole drive
- Planar glass passivated chips
- NPT IGBT technology with low saturation voltage, low switching losses, high RBSOA and short circuit ruggedness
- Epitaxial free wheeling diodes with hipfast and soft reverse recovery
- Temperature sense included
- Leads suitable for PC board soldering
- UL Release applied

### Application: AC motor drives with

- Input from single or three phase grid
- Three phase synchronous or asynchronous motor
- Electric braking operations

**Caution:** These Devices are sensitive to electrostatic discharge. Users should observe proper ESD handling precautions.

### Output Inverter IGBTs

| Symbol                | Conditions                                                                                                                          | Maximum Ratings  |               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------|
| $V_{CES}$             | $T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$                                                                               | 600              | V             |
| $V_{GES}$             |                                                                                                                                     | $\pm 20$         | V             |
| $I_{C25}$             | $T_C = 25^{\circ}\text{C}$                                                                                                          | 69               | A             |
| $I_{C80}$             | $T_C = 80^{\circ}\text{C}$                                                                                                          | 48               | A             |
| $I_{CM}$<br>$V_{CEK}$ | $V_{GE} = \pm 15\text{ V}; R_G = 22\ \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>RBSOA, Clamped inductive load; $L = 100\ \mu\text{H}$ | 100<br>$V_{CES}$ | A             |
| $t_{SC}$<br>(SCSOA)   | $V_{CE} = V_{CES}; V_{GE} = \pm 15\text{ V}; R_G = 22\ \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>non-repetitive                      | 10               | $\mu\text{s}$ |
| $P_{tot}$             | $T_C = 25^{\circ}\text{C}$                                                                                                          | 208              | W             |

| Symbol                                                                 | Conditions                                                                                                                                 | Characteristic Values                                |                       |                      |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------------|----------------------|
|                                                                        |                                                                                                                                            | (T <sub>VJ</sub> = 25°C, unless otherwise specified) |                       |                      |
|                                                                        |                                                                                                                                            | min.                                                 | typ.                  | max.                 |
| $V_{CE(sat)}$                                                          | $I_C = 75\text{ A}; V_{GE} = 15\text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                   |                                                      | 2.3<br>2.8            | 2.8<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>$T_{VJ} = 125^{\circ}\text{C}$                                     |                                                      |                       | 0.8 mA<br>4.4 mA     |
| $I_{GES}$                                                              | $V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$                                                                                            |                                                      |                       | 100 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>$V_{CE} = 300\text{ V}; I_C = 40\text{ A}$<br>$V_{GE} = 15/0\text{ V}; R_G = 22\ \Omega$ |                                                      | 50<br>55<br>300<br>30 | ns<br>ns<br>ns<br>ns |
|                                                                        |                                                                                                                                            |                                                      | 1.8<br>1.4            | mJ<br>mJ             |
| $C_{ies}$                                                              | $V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$                                                                              |                                                      | 2.8                   | nF                   |
| $R_{thJC}$                                                             | (per IGBT)                                                                                                                                 |                                                      |                       | 0.6 K/W              |

### Output Inverter Reverse Diodes (FRED)

| Symbol    | Conditions                 | Maximum Ratings |   |
|-----------|----------------------------|-----------------|---|
| $I_{F25}$ | $T_C = 25^{\circ}\text{C}$ | 56              | A |
| $I_{F80}$ | $T_C = 80^{\circ}\text{C}$ | 35              | A |

| Symbol               | Conditions                                                                                                                         | Characteristic Values |              |             |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|-------------|
|                      |                                                                                                                                    | min.                  | typ.         | max.        |
| $V_F$                | $I_F = 40\text{ A}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                                 |                       | 2.32<br>1.58 | 2.59 V<br>V |
| $I_{RM}$<br>$t_{rr}$ | $I_F = 30\text{ A}; di_F/dt = 500\text{ A}/\mu\text{s}; T_{VJ} = 125^{\circ}\text{C}$<br>$V_R = 300\text{ V}; V_{GE} = 0\text{ V}$ |                       | 15<br>70     | A<br>ns     |
| $R_{thJC}$           |                                                                                                                                    |                       |              | 1.3 K/W     |

### Brake Chopper IGBT

| Symbol                | Conditions                                                                                                                          | Maximum Ratings |               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|
| $V_{CES}$             | $T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$                                                                               | 600             | V             |
| $V_{GES}$             |                                                                                                                                     | $\pm 20$        | V             |
| $I_{C25}$             | $T_C = 25^{\circ}\text{C}$                                                                                                          | 42.5            | A             |
| $I_{C80}$             | $T_C = 80^{\circ}\text{C}$                                                                                                          | 29              | A             |
| $I_{CM}$<br>$V_{CEK}$ | $V_{GE} = \pm 15\text{ V}; R_G = 33\ \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>RBSOA, Clamped inductive load; $L = 100\ \mu\text{H}$ | 60<br>$V_{CES}$ | A             |
| $t_{SC}$<br>(SCSOA)   | $V_{CE} = V_{CES}; V_{GE} = \pm 15\text{ V}; R_G = 33\ \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>non-repetitive                      | 10              | $\mu\text{s}$ |
| $P_{tot}$             | $T_C = 25^{\circ}\text{C}$                                                                                                          | 130             | W             |

| Symbol        | Conditions                                                                                                                                 | Characteristic Values                                |            |                  |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------|------------------|
|               |                                                                                                                                            | (T <sub>VJ</sub> = 25°C, unless otherwise specified) |            |                  |
|               |                                                                                                                                            | min.                                                 | typ.       | max.             |
| $V_{CE(sat)}$ | $I_C = 50\text{ A}; V_{GE} = 15\text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                   |                                                      | 2.4<br>2.9 | 2.9<br>V         |
| $V_{GE(th)}$  | $I_C = 0.7\text{ mA}; V_{GE} = V_{CE}$                                                                                                     | 4.5                                                  |            | 6.5 V            |
| $I_{CES}$     | $V_{CE} = V_{CES}; V_{GE} = 0\text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                     |                                                      |            | 0.6 mA<br>1.7 mA |
| $I_{GES}$     | $V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$                                                                                            |                                                      |            | 100 nA           |
| $t_{d(on)}$   | Inductive load, $T_{VJ} = 125^{\circ}\text{C}$<br>$V_{CE} = 300\text{ V}; I_C = 30\text{ A}$<br>$V_{GE} = 15/0\text{ V}; R_G = 33\ \Omega$ |                                                      | 50         | ns               |
| $t_r$         |                                                                                                                                            |                                                      | 50         | ns               |
| $t_{d(off)}$  |                                                                                                                                            |                                                      | 270        | ns               |
| $t_f$         |                                                                                                                                            |                                                      | 40         | ns               |
| $E_{on}$      |                                                                                                                                            |                                                      | 1.4        | mJ               |
| $E_{off}$     |                                                                                                                                            |                                                      | 1.0        | mJ               |
| $C_{ies}$     | $V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$                                                                              |                                                      | 16         | nF               |
| $R_{thJC}$    | (per IGBT)                                                                                                                                 |                                                      |            | 0.96 K/W         |

### Brake Chopper Diode (FRED)

| Symbol    | Conditions                 | Maximum Ratings |   |
|-----------|----------------------------|-----------------|---|
| $I_{F25}$ | $T_C = 25^{\circ}\text{C}$ | 30              | A |
| $I_{F80}$ | $T_C = 80^{\circ}\text{C}$ | 19              | A |

| Symbol               | Conditions                                                                                                                         | Characteristic Values |             |           |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|-----------|
|                      |                                                                                                                                    | min.                  | typ.        | max.      |
| $V_F$                | $I_F = 30\text{ A}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                                 |                       | 2.57<br>1.8 | 2.84<br>V |
| $I_{RM}$<br>$t_{rr}$ | $I_F = 15\text{ A}; di_F/dt = 400\text{ A}/\mu\text{s}; T_{VJ} = 125^{\circ}\text{C}$<br>$V_R = 300\text{ V}; V_{GE} = 0\text{ V}$ |                       | 7<br>50     | A<br>ns   |
| $R_{thJC}$           |                                                                                                                                    |                       |             | 2.3 K/W   |

## Temperature Sensor NTC

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

## Module

| Symbol     | Conditions                                     | Maximum Ratings |                  |
|------------|------------------------------------------------|-----------------|------------------|
| $T_{VJ}$   |                                                | -40...+125      | °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<br>26         | N<br>lb.in       |
| $a$        | Max. allowable acceleration                    | 50              | m/s <sup>2</sup> |

| Symbol               | Conditions                                     | Characteristic Values |      |      |
|----------------------|------------------------------------------------|-----------------------|------|------|
|                      |                                                | min.                  | typ. | max. |
| <b>d<sub>s</sub></b> | Creepage distance on surface (Pin to heatsink) | 11.2                  |      | mm   |
| <b>d<sub>A</sub></b> | Strike distance in air (Pin to heatsink)       | 11.2                  |      | mm   |
| <b>Weight</b>        |                                                |                       | 86   |      |

## Package style and outline

Dimensions in mm (1mm = 0.0394")

