



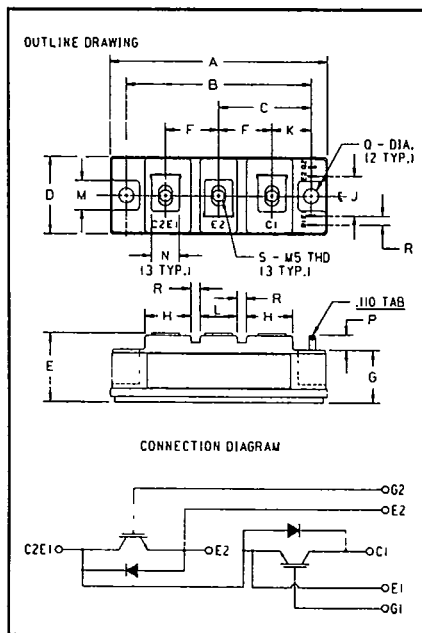
Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272  
 Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

ID226005

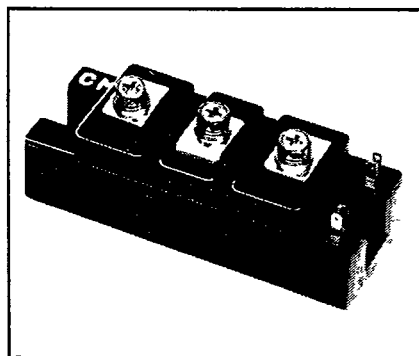
T-39-31

## Dual IGBTMOD™ Power Module

50 Amperes/600 Volts



ID226005  
Outline Drawing



ID226005  
Dual IGBTMOD™ Power Module  
50 Amperes/600 Volts

### Description

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of two IGBT Transistors in a half-bridge configuration, with each transistor having a reverse-connected super-fast recovery free wheel diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

### Features:

- ☐ Low Drive Power
- ☐ Low  $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery (150ns) Free Wheel Diode
- ☐ High Frequency Operation (15-20kHz)
- ☐ Isolated Base Plate for Easy Heat Sinking

### Applications:

- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ UPS
- ☐ Welding Power Supplies
- ☐ Laser Power Supplies

### Ordering Information

Example: Select the complete eight digit part module number you desire from the table below -i.e. ID226005 is a 600V ( $V_{CES}$ ), 50 Ampere Dual IGBTMOD™ Power Module.

| Dimension | Inches     | Millimeters |
|-----------|------------|-------------|
| A         | 3.70       | 94          |
| B         | 3.150±.010 | 80±0.25     |
| C         | 1.57       | 40          |
| D         | 1.34       | 34          |
| E         | 1.22Max.   | 31 Max.     |
| F         | .90        | 23          |
| G         | .85        | 21.5        |
| H         | .79        | 20          |
| J         | .71        | 18          |
| K         | .67        | 17          |
| L         | .63        | 16          |
| M         | .51        | 13          |
| N         | .47        | 12          |
| P         | .28        | 7           |
| Q         | .256 Dia.  | Dia. 6.5    |
| R         | .16        | 4           |
| S         | M5 Metric  | M5          |

| Type | $V_{CES}$<br>Volts (x10) | Current Rating<br>Amperes (x10) |
|------|--------------------------|---------------------------------|
| ID22 | 60                       | 05                              |



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

| Ratings                                 | Symbol    | ID226005   | Units            |
|-----------------------------------------|-----------|------------|------------------|
| Junction Temperature                    | $T_J$     | -40 to 150 | $^\circ\text{C}$ |
| Storage Temperature                     | $T_{stg}$ | -40 to 125 | $^\circ\text{C}$ |
| Collector-Emitter Voltage (G-E SHORT)   | $V_{CES}$ | 600        | Volts            |
| Gate-Emitter Voltage                    | $V_{GES}$ | $\pm 20$   | Volts            |
| Collector Current                       | $I_C$     | 50         | Amperes          |
| Peak Collector Current                  | $I_{CM}$  | 100*       | Amperes          |
| Diode Forward Current                   | $I_{FM}$  | 50         | Amperes          |
| Diode Forward Surge Current             | $I_{FM}$  | 100*       | Amperes          |
| Power Dissipation                       | $P_d$     | 250        | Watts            |
| Max. Mounting Torque M5 Terminal Screws | —         | 17         | in.-lb.          |
| Max. Mounting Torque M6 Mounting Screws | —         | 26         | in.-lb.          |
| Module Weight (Typical)                 | —         | 190        | Grams            |
| V isolation                             | $V_{RMS}$ | 2500       | Volts            |

\* Pulse width and repetition rate should be such that device junction temperature does not exceed the device rating.

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

| Characteristics                      | Symbol        | Test Conditions                                    | Min. | Typ. | Max.  | Units         |
|--------------------------------------|---------------|----------------------------------------------------|------|------|-------|---------------|
| Collector-Cutoff Current             | $I_{CES}$     | $V_{CE} = V_{CES}, V_{GE} = 0V$                    | —    | —    | 1.0   | mA            |
| Gate Leakage Current                 | $I_{GES}$     | $V_{GE} = V_{GES}, V_{CE} = 0V$                    | —    | —    | 0.5   | $\mu\text{A}$ |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $I_C = 5mA, V_{CE} = 10V$                          | 3.0  | 4.0  | 6.0   | Volts         |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 50A, V_{GE} = 15V$                          | —    | 3.0  | 5.0** | Volts         |
|                                      |               | $I_C = 50A, V_{GE} = 15V, T_J = 150^\circ\text{C}$ | —    | 3.2  | **    | Volts         |
| Total Gate Charge                    | $Q_G$         | $V_{CC} = 300V, I_C = 50A, V_{GS} = 15V$           | —    | 160  | —     | nC            |
| Diode Forward Voltage                | $V_{FM}$      | $I_C = -50A, V_{GS} = 0V$                          | —    | —    | 2.5   | Volts         |

\*\* Pulse width and repetition rate should be such that device junction temperature rise is negligible.

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

| Characteristics               | Symbol              | Test Conditions                                                          | Min. | Typ. | Max. | Units         |
|-------------------------------|---------------------|--------------------------------------------------------------------------|------|------|------|---------------|
| Input Capacitance             | $C_{ies}$           | $V_{GE} = 0V, V_{CE} = 10V, f = 1MHz$                                    | —    | —    | 5000 | pF            |
| Output Capacitance            | $C_{oes}$           |                                                                          | —    | —    | 1200 | pF            |
| Reverse Transfer Capacitance  | $C_{res}$           |                                                                          | —    | —    | 120  | pF            |
| Resistive                     | Turn-on Delay Time  | $V_{CC} = 300V, I_C = 50A,$<br>$V_{GE1} = V_{GE2} = 15V, R_G = 50\Omega$ | —    | —    | 250  | ns            |
|                               | Rise Time           |                                                                          | —    | —    | 700  | ns            |
| Switch Times                  | Turn-off Delay Time |                                                                          | —    | —    | 600  | ns            |
|                               | Fall Time           |                                                                          | —    | —    | 800  | ns            |
| Diode Reverse Recovery Time   | $t_{rr}$            | $I_E = 50A, di_E/dt = -100A/\mu s$                                       | —    | —    | 200  | ns            |
| Diode Reverse Recovery Charge | $Q_{rr}$            | $I_E = 50A, di_E/dt = -100A/\mu s$                                       | —    | 0.6  | —    | $\mu\text{C}$ |

#### Thermal and Mechanical Characteristics, $T_J = 25^\circ\text{C}$ unless otherwise specified

| Characteristics                      | Symbol        | Test Conditions      | Min. | Typ. | Max. | Units              |
|--------------------------------------|---------------|----------------------|------|------|------|--------------------|
| Thermal Resistance, Junction to Case | $R_{th(j-c)}$ | Per IGBT             | —    | —    | 0.50 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case | $R_{th(j-c)}$ | Per Free Wheel Diode | —    | —    | 1.00 | $^\circ\text{C/W}$ |
| Contact Thermal Resistance           | $R_{th(c-f)}$ | Per Half Module      | —    | —    | 0.15 | $^\circ\text{C/W}$ |



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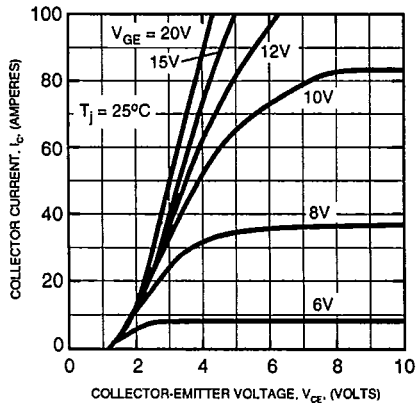
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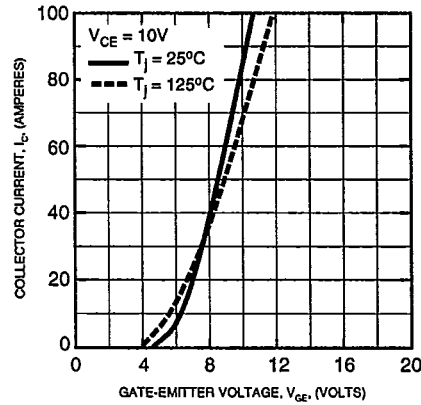
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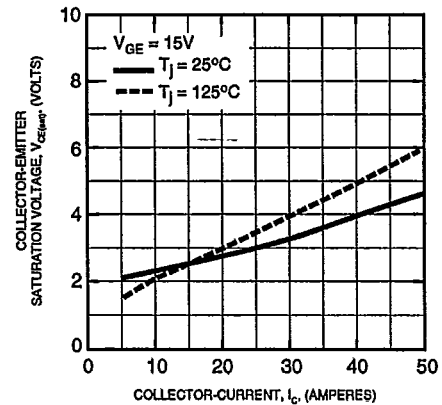
OUTPUT CHARACTERISTICS  
(TYPICAL)



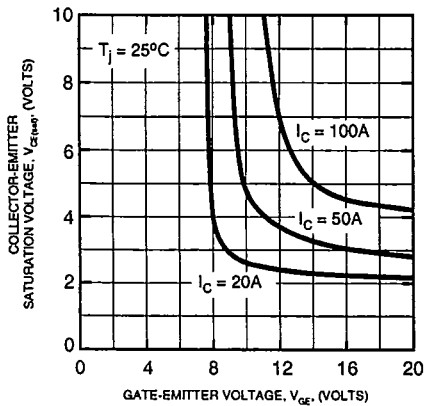
TRANSFER CHARACTERISTICS  
(TYPICAL)



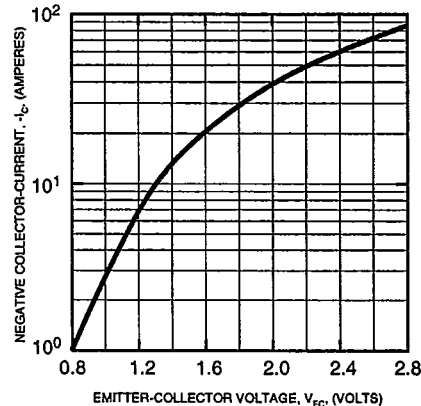
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



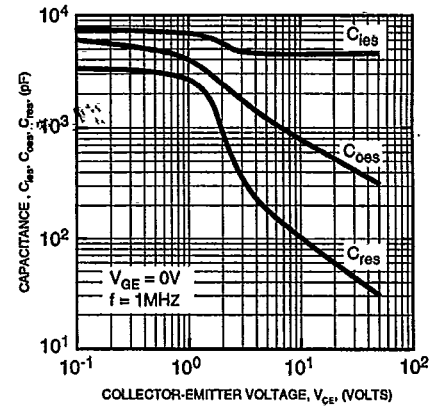
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



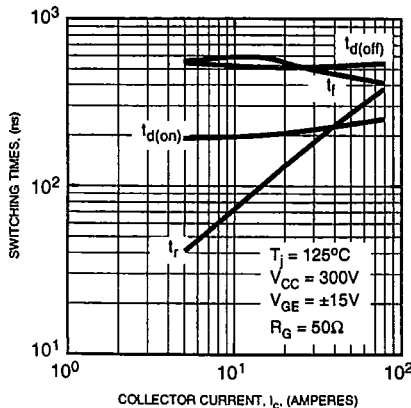
FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



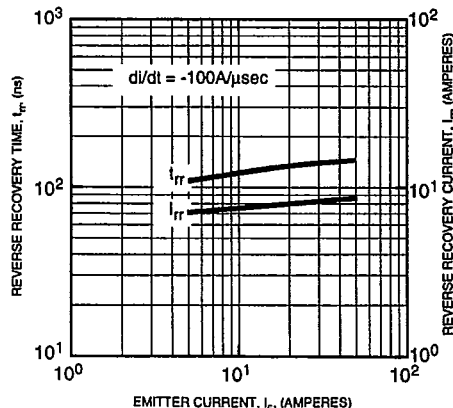
CAPACITANCE VS.  $V_{CE}$   
(TYPICAL)



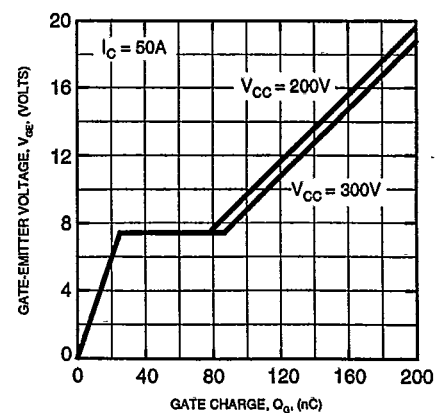
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)



GATE CHARGE,  $V_{GE}$





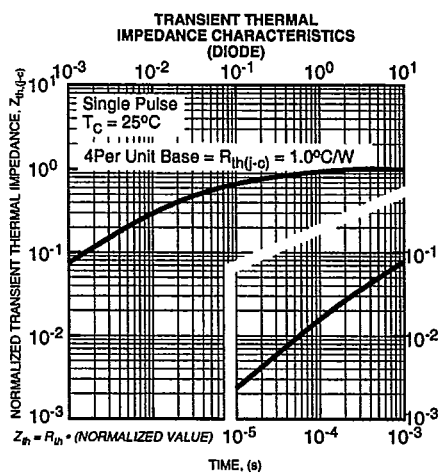
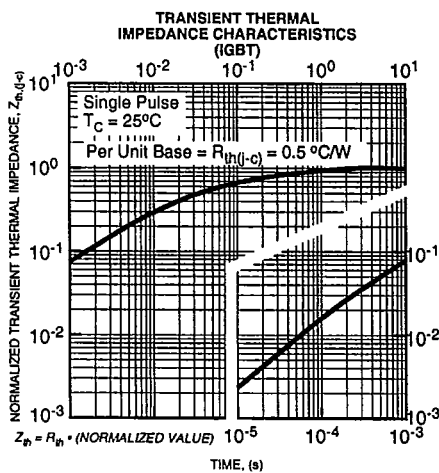
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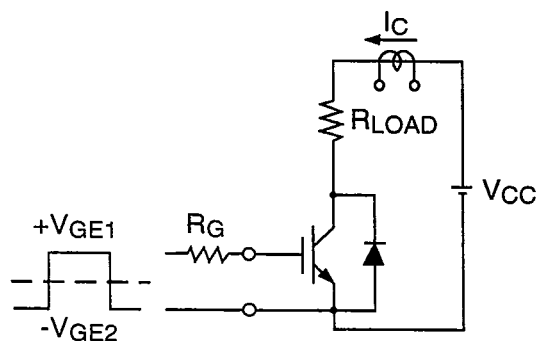
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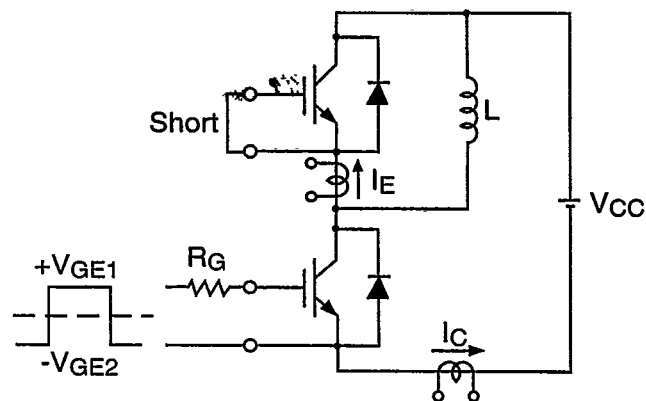
50 Amperes/600Volts



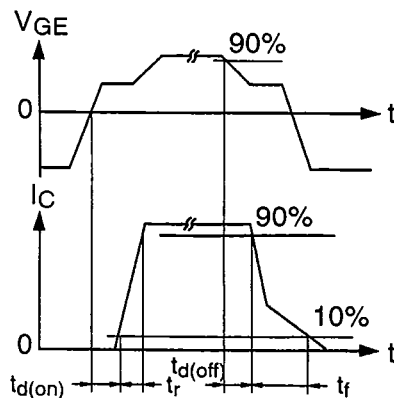
## SWITCHING TIME TEST CIRCUITS & WAVEFORMS



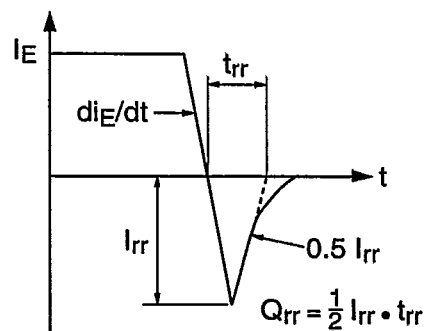
Resistance Load Switching Test Circuit



Half-Bridge Switching Test Circuit



Switching Time Test Waveforms



$t_{rr}$ ,  $Q_{rr}$  Waveforms