

MITSUBISHI IGBT MODULES
CM150RL-24NF

HIGH POWER SWITCHING USE

CM150RL-24NF



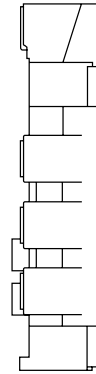
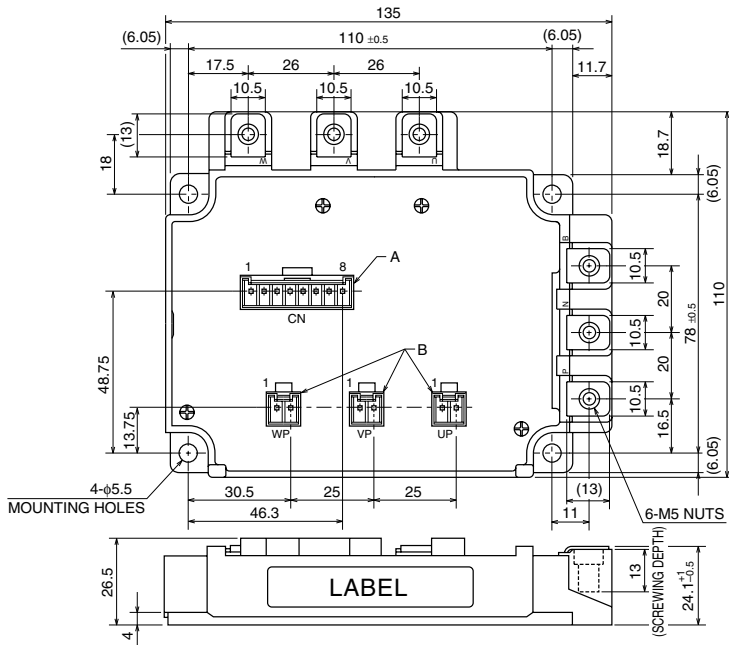
- IC 150A
- VCES 1200V
- Insulated Type
- 7-elements in a pack

APPLICATION

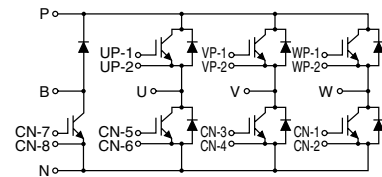
AC drive inverters & Servo controls, etc

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



Housing Type of A and B
 (J.S.T.Mfg.Co.Ltd)
 A = B8P-VH-FB-B, B = B2P-VH-FB-B



CIRCUIT DIAGRAM

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HIGH POWER SWITCHING USE

ABSOLUTE MAXIMUM RATINGS (T_j = 25°C, unless otherwise specified)

INVERTER PART

| Symbol | Parameter | Conditions | Ratings | Unit |
|--------------------------|-------------------------------|---|---------|------|
| V _{CES} | Collector-emitter voltage | G-E Short | 1200 | V |
| V _{GES} | Gate-emitter voltage | C-E Short | ±20 | V |
| I _C | Collector current | DC, T _c = 76°C ^{*1} | 150 | A |
| I _{CM} | | Pulse (Note 2) | 300 | A |
| I _E (Note 1) | Emitter current | | 150 | A |
| I _{EM} (Note 1) | | Pulse (Note 2) | 300 | A |
| P _C (Note 3) | Maximum collector dissipation | T _c = 25°C | 890 | W |

BRAKE PART

| Symbol | Parameter | Conditions | Ratings | Unit |
|-------------------------|---------------------------------|---|---------|------|
| V _{CES} | Collector-emitter voltage | G-E Short | 1200 | V |
| V _{GES} | Gate-emitter voltage | C-E Short | ±20 | V |
| I _C | Collector current | DC, T _c = 86°C ^{*1} | 75 | A |
| I _{CM} | | Pulse (Note 2) | 150 | A |
| P _C (Note 3) | Maximum collector dissipation | T _c = 25°C | 520 | W |
| V _{RRM} | Repetitive peak reverse voltage | Clamp diode part | 1200 | V |
| I _{FM} | Forward current | Clamp diode part | 75 | A |

(COMMON RATING)

| Symbol | Parameter | Conditions | Ratings | Unit |
|------------------|----------------------|--|------------|------------------|
| T _j | Junction temperature | | -40 ~ +150 | °C |
| T _{stg} | Storage temperature | | -40 ~ +125 | °C |
| V _{iso} | Isolation voltage | Terminals to base plate, f = 60Hz, AC 1 minute | 2500 | V _{rms} |
| — | Torque strength | Main terminals M5 screw | 2.5 ~ 3.5 | N • m |
| — | | Mounting M5 screw | 2.5 ~ 3.5 | N • m |
| — | Weight | Typical value | 750 | g |

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HIGH POWER SWITCHING USE

ELECTRICAL CHARACTERISTICS (T_j = 25°C, unless otherwise specified)
INVERTER PART

| Symbol | Parameter | Test conditions | Limits | | | Unit | |
|--------------|--------------------------------------|---|------------------------|-------|------|------|---|
| | | | Min. | Typ. | Max. | | |
| ICES | Collector cutoff current | VCE = VCES, VGE = 0V | — | — | 1 | mA | |
| VGE(th) | Gate-emitter threshold voltage | IC = 15mA, VCE = 10V | 6 | 7 | 8 | V | |
| IGES | Gate leakage current | ±VGE = VGES, VCE = 0V | — | — | 0.5 | μA | |
| VCE(sat) | Collector-emitter saturation voltage | IC = 150A, VGE = 15V | T _j = 25°C | — | 2.1 | 3.0 | V |
| | | | T _j = 125°C | — | 2.4 | — | |
| Cies | Input capacitance | VCE = 10V VGE = 0V | — | — | 23 | nF | |
| Coes | Output capacitance | | — | — | 2 | nF | |
| Cres | Reverse transfer capacitance | | — | — | 0.45 | nF | |
| QG | Total gate charge | VCC = 600V, IC = 150A, VGE = 15V | — | 675 | — | nC | |
| td(on) | Turn-on delay time | VCC = 600V, IC = 150A VGE = ±15V RG = 2.1Ω, Inductive load IE = 150A | — | — | 130 | ns | |
| tr | Turn-on rise time | | — | — | 70 | ns | |
| td(off) | Turn-off delay time | | — | — | 400 | ns | |
| tf | Turn-off fall time | | — | — | 350 | ns | |
| trr (Note 1) | Reverse recovery time | | — | — | 150 | ns | |
| Qrr (Note 1) | Reverse recovery charge | — | 5.8 | — | μC | | |
| VEC(Note 1) | Emitter-collector voltage | IE = 150A, VGE = 0V | — | — | 3.8 | V | |
| Rth(j-c)Q | Thermal resistance | IGBT part (1/6 module) ^{*1} | — | — | 0.14 | K/W | |
| Rth(j-c)R | | FWDi part (1/6 module) ^{*1} | — | — | 0.23 | K/W | |
| Rth(c-f) | Contact thermal resistance | Case to heat sink, Thermal compound Applied (1/6 module) ^{*2} | — | 0.051 | — | K/W | |
| RG | External gate resistance | | 2.1 | — | 31 | Ω | |

BRAKE PART

| Symbol | Parameter | Test conditions | Limits | | | Unit | |
|-----------|--------------------------------------|---------------------------------|------------------------|------|------|------|---|
| | | | Min. | Typ. | Max. | | |
| ICES | Collector cutoff current | VCE = VCES, VGE = 0V | — | — | 1 | mA | |
| VGE(th) | Gate-emitter threshold voltage | IC = 7.5mA, VCE = 10V | 6 | 7 | 8 | V | |
| IGES | Gate leakage current | ±VGE = VGES, VCE = 0V | — | — | 0.5 | μA | |
| VCE(sat) | Collector-emitter saturation voltage | IC = 75A, VGE = 15V | T _j = 25°C | — | 2.1 | 3.0 | V |
| | | | T _j = 125°C | — | 2.4 | — | |
| Cies | Input capacitance | VCE = 10V VGE = 0V | — | — | 11.5 | nF | |
| Coes | Output capacitance | | — | — | 1.0 | nF | |
| Cres | Reverse transfer capacitance | | — | — | 0.23 | nF | |
| QG | Total gate charge | VCC = 600V, IC = 75A, VGE = 15V | — | 338 | — | nC | |
| VFM | Forward voltage drop | IF = 75A | — | — | 3.8 | V | |
| Rth(j-c)Q | Thermal resistance | IGBT part ^{*1} | — | — | 0.24 | K/W | |
| Rth(j-c)R | | Clamp diode part ^{*1} | — | — | 0.36 | K/W | |
| RG | External gate resistance | | 4.2 | — | 42 | Ω | |

*1 : Case temperature (T_c) measured point is just under the chips.

If you use this value, Rth(f-a) should be measured just under the chips.

*2 : Typical value is measured by using thermally conductive grease of λ = 0.9[W/(m • K)].

Note 1. IE, VEC, trr & Qrr represent characteristics of the anti-parallel, emitter-collector free-wheel diode (FWDi).

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

3. Junction temperature (T_j) should not increase beyond 150°C.

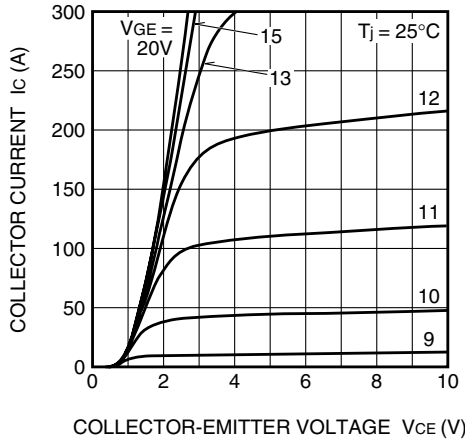
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

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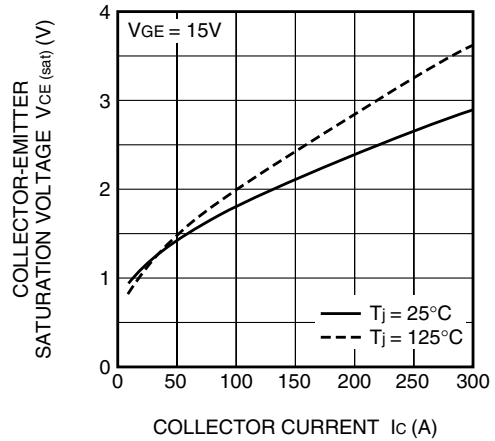
HIGH POWER SWITCHING USE

PERFORMANCE CURVES

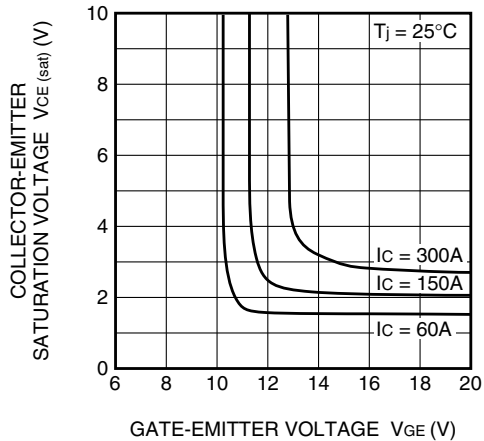
OUTPUT CHARACTERISTICS (TYPICAL)



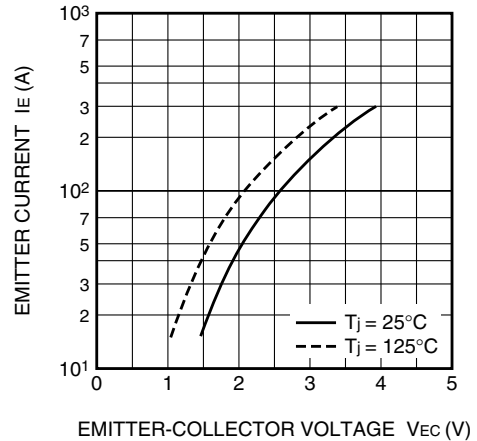
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



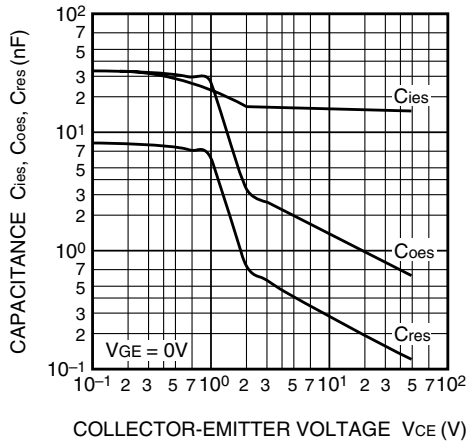
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



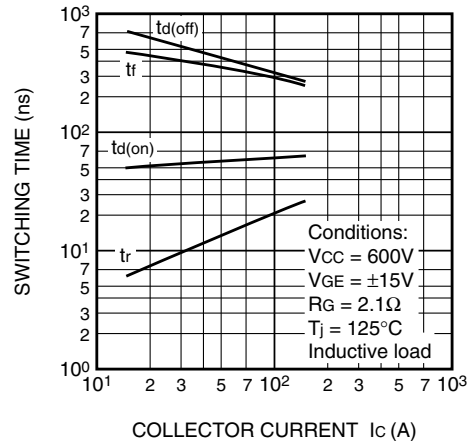
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)



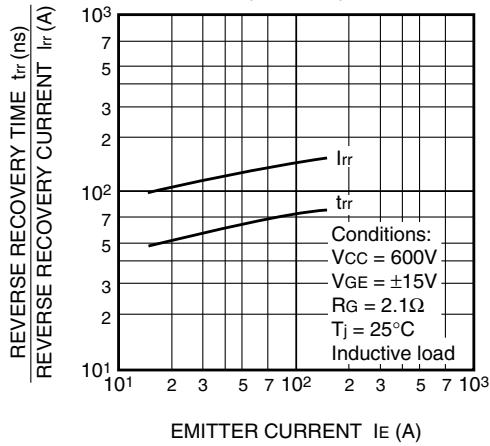
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



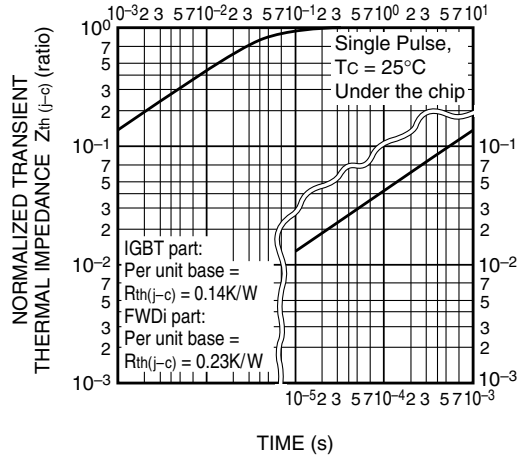
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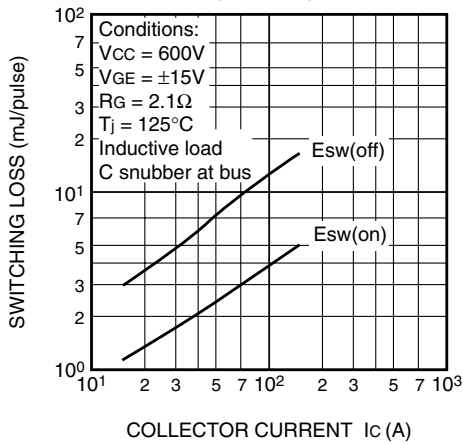
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



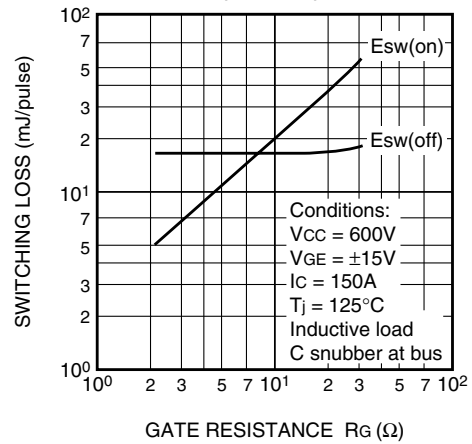
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



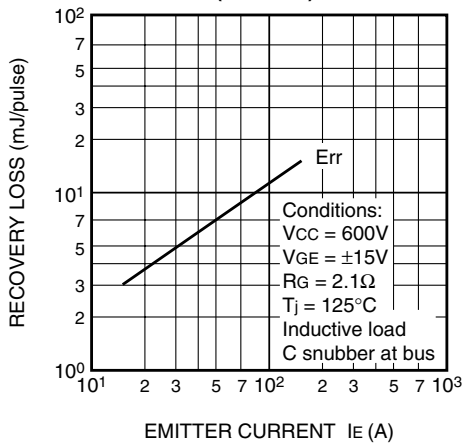
SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)



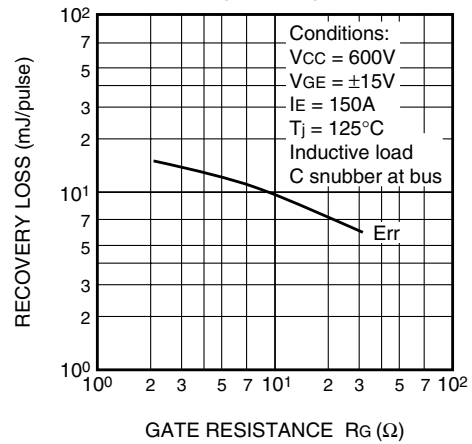
SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)



RECOVERY LOSS vs. IE (TYPICAL)



RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)



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