

QM20KD-HB

MEDIUM POWER SWITCHING USE
INSULATED TYPE

QM20KD-HB



- **IC** Collector current **20A**
- **V_{CEX}** Collector-emitter voltage **600V**
- **h_{FE}** DC current gain **250**
- **Insulated Type**
- **UL Recognized**

Yellow Card No. E80276 (N)

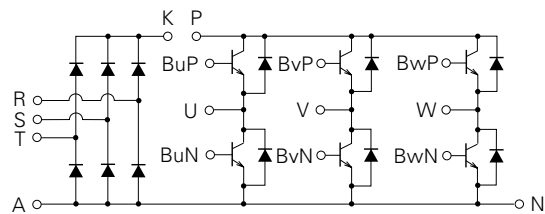
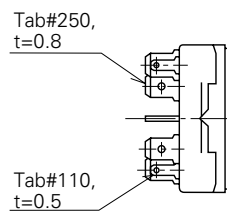
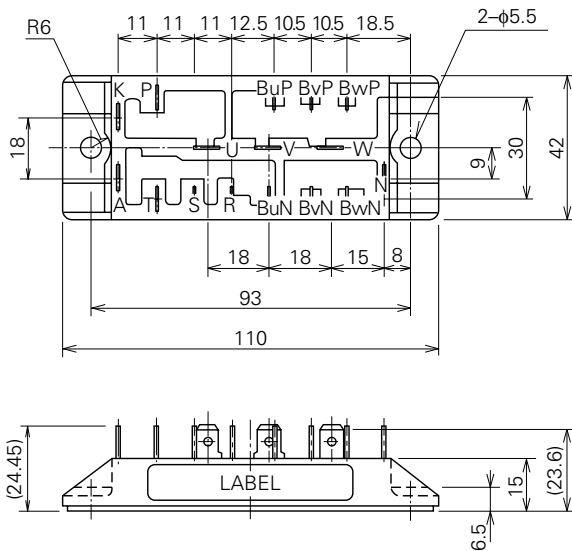
File No. E80271

APPLICATION

Inverters, Servo drives, DC motor controllers, NC equipment, Welders.

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



QM20KD-HB

**MEDIUM POWER SWITCHING USE
INSULATED TYPE**

ABSOLUTE MAXIMUM RATINGS (Inverter part, $T_j=25^\circ\text{C}$)

| Symbol | Parameter | Conditions | Ratings | Unit |
|------------|---|---|---------|------|
| VCEX (SUS) | Collector-emitter voltage | $I_c=1\text{A}$, $V_{EB}=2\text{V}$ | 600 | V |
| VCEX | Collector-emitter voltage | $V_{EB}=2\text{V}$ | 600 | V |
| VCBO | Collector-base voltage | Emitter open | 600 | V |
| VEBO | Emitter-base voltage | Collector open | 7 | V |
| I_c | Collector current | DC | 20 | A |
| $-I_c$ | Collector reverse current | DC (forward diode current) | 20 | A |
| P_c | Collector dissipation | $T_c=25^\circ\text{C}$ | 83 | W |
| I_b | Base current | DC | 1 | A |
| $-I_{CSM}$ | Surge collector reverse current (forward diode current) | Peak value of one cycle of 60Hz (half wave) | 200 | A |

ABSOLUTE MAXIMUM RATINGS (Converter part, $T_j=25^\circ\text{C}$)

| Symbol | Parameter | Conditions | Ratings | Unit |
|--------|--|--|---------|----------------------|
| VRRM | Repetitive peak reverse voltage | | 800 | V |
| VRSM | Non-repetitive peak reverse voltage | | 900 | V |
| E_a | Recommended AC input voltage | | 220 | V |
| I_o | DC output current | Three phase full wave rectifying circuit, $T_c=79^\circ\text{C}$ | 30 | A |
| IFSM | Surge (non-repetitive) forward current | One half cycle at 60 Hz, peak value | 300 | A |
| I^2t | I^2t for fusing | Value for one cycle of surge current | 375 | A^2s |

ABSOLUTE MAXIMUM RATINGS (Common)

| Symbol | Parameter | Conditions | Ratings | Unit |
|-----------|----------------------|---------------------------------------|---------------|------------------|
| T_j | Junction temperature | | $-40\sim 150$ | $^\circ\text{C}$ |
| T_{stg} | Storage temperature | | $-40\sim 125$ | $^\circ\text{C}$ |
| V_{iso} | Isolation voltage | Charged part to case, AC for 1 minute | 2500 | V |
| — | Mounting torque | Mounting screw M5 | 1.47~1.96 | N·m |
| — | Weight | Typical value | 15~20 | kg·cm |
| — | Weight | Typical value | 125 | g |

ELECTRICAL CHARACTERISTICS (Inverter part, $T_j=25^\circ\text{C}$)

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|----------------|--|---|--------|------|------|---------------------------|
| | | | Min. | Typ. | Max. | |
| I_{CEX} | Collector cutoff current | $V_{CE}=600\text{V}$, $V_{EB}=2\text{V}$ | — | — | 1.0 | mA |
| I_{CBO} | Collector cutoff current | $V_{CB}=600\text{V}$, Emitter open | — | — | 1.0 | mA |
| I_{EBO} | Emitter cutoff current | $V_{EB}=7\text{V}$ | — | — | 40 | mA |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $I_c=20\text{A}$, $I_b=80\text{mA}$ | — | — | 2.0 | V |
| $V_{BE(sat)}$ | Base-emitter saturation voltage | | — | — | 2.5 | V |
| $-V_{CEO}$ | Collector-emitter reverse voltage | $-I_c=20\text{A}$ (diode forward voltage) | — | — | 1.5 | V |
| h_{FE} | DC current gain | $I_c=20\text{A}$, $V_{CE}=2\text{V}$ | 250 | — | — | — |
| t_{on} | Switching time | $V_{CC}=300\text{V}$, $I_c=20\text{A}$, $I_{B1}=120\text{mA}$, $-I_{B2}=0.4\text{A}$ | — | — | 1.5 | μs |
| t_s | | | — | — | 12 | μs |
| t_f | | | — | — | 2.0 | μs |
| $R_{th(j-c)Q}$ | Thermal resistance (junction to case) | Transistor part (per 1/6 module) | — | — | 1.5 | $^\circ\text{C}/\text{W}$ |
| $R_{th(j-c)R}$ | Thermal resistance (junction to case) | Diode part (per 1/6 module) | — | — | 2.5 | $^\circ\text{C}/\text{W}$ |
| $R_{th(c-f)}$ | Contact thermal resistance (case to fin) | Conductive grease applied | — | — | 0.35 | $^\circ\text{C}/\text{W}$ |

ELECTRICAL CHARACTERISTICS (Converter part, $T_j=25^\circ\text{C}$)

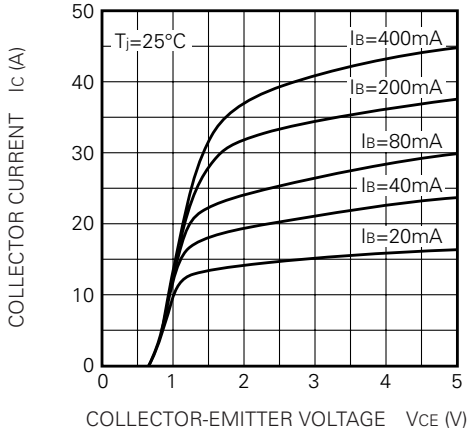
| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---------------|---------------------------------|---|--------|------|------|---------------------------|
| | | | Min. | Typ. | Max. | |
| IRRM | Repetitive peak reverse current | $V_R=V_{RRM}$, $T_j=150^\circ\text{C}$ | — | — | 5.0 | mA |
| VFM | Forward voltage | $I_f=30\text{A}$ | — | — | 1.3 | V |
| $R_{th(j-c)}$ | Thermal resistance | Junction to case | — | — | 0.9 | $^\circ\text{C}/\text{W}$ |
| $R_{th(c-f)}$ | Contact thermal resistance | Case to fin, conductive grease applied | — | — | 0.35 | $^\circ\text{C}/\text{W}$ |

QM20KD-HB

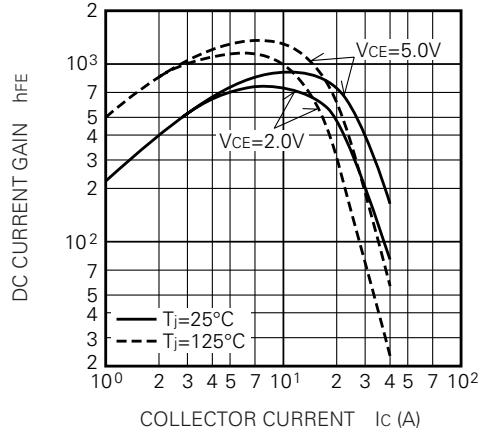
MEDIUM POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

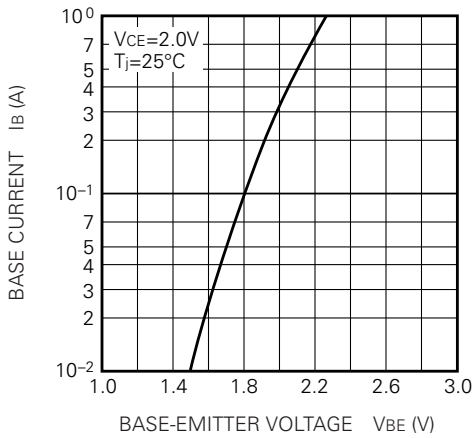
COMMON EMITTER OUTPUT CHARACTERISTICS (TYPICAL)



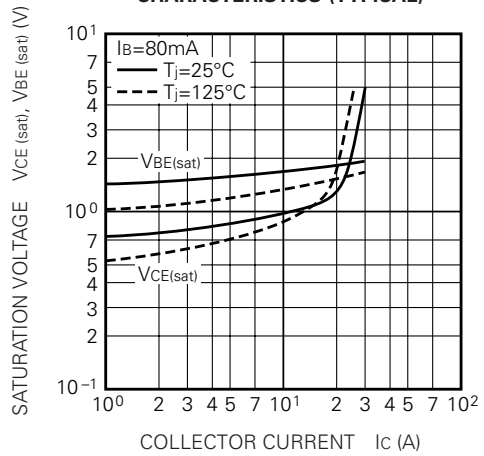
DC CURRENT GAIN VS. COLLECTOR CURRENT (TYPICAL)



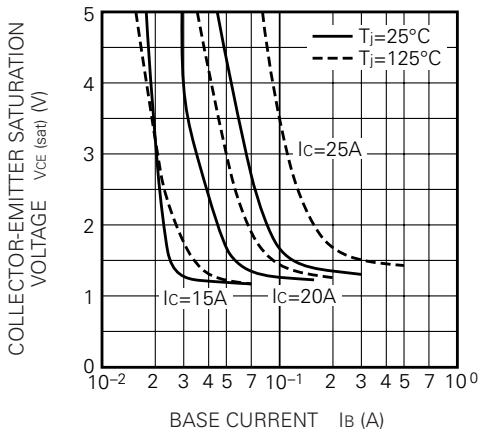
COMMON EMITTER INPUT CHARACTERISTIC (TYPICAL)



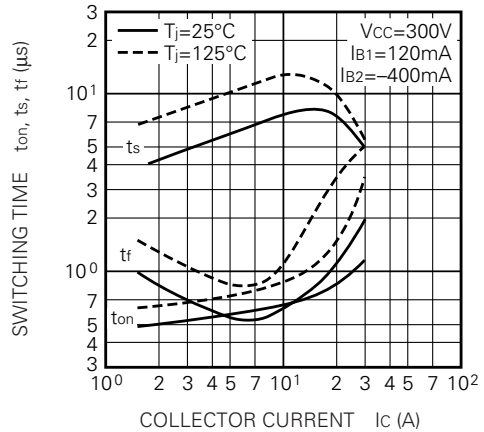
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



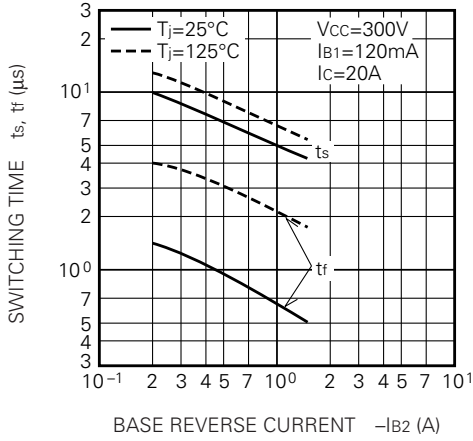
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



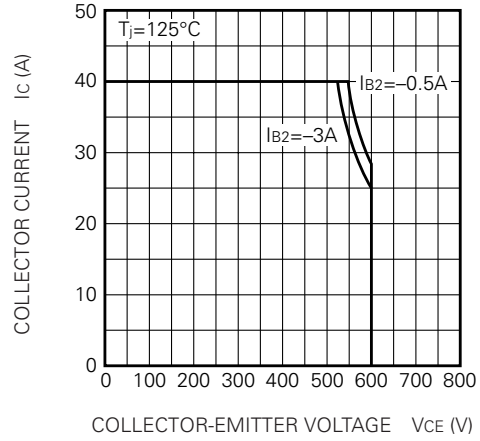
QM20KD-HB

MEDIUM POWER SWITCHING USE
INSULATED TYPE

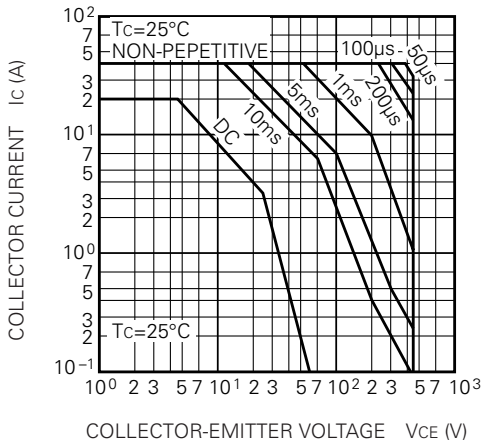
SWITCHING TIME VS. BASE CURRENT (TYPICAL)



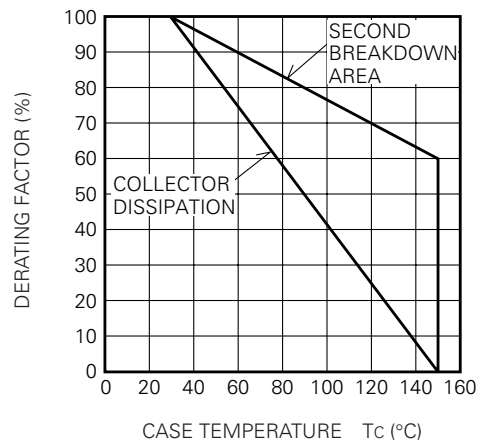
REVERSE BIAS SAFE OPERATING AREA



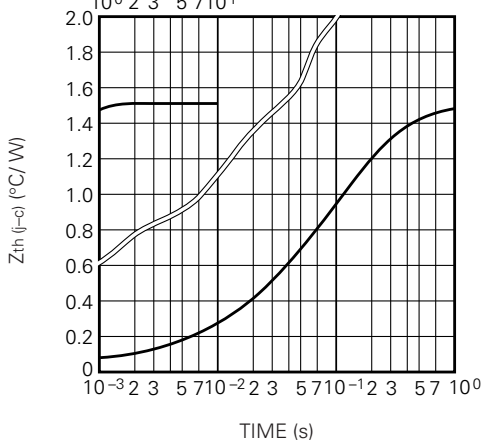
FORWARD BIAS SAFE OPERATING AREA



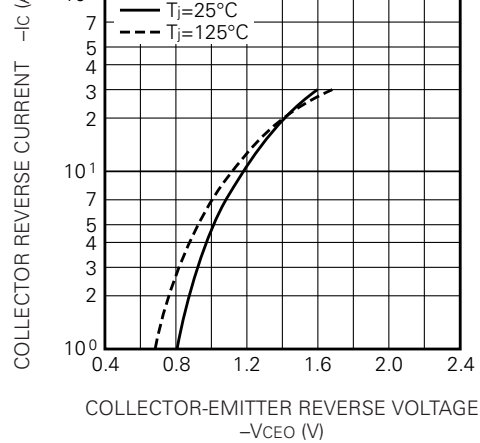
DERATING FACTOR OF F. B. S. O. A.



TRANSIENT THERMAL IMPEDANCE CHARACTERISTIC (TRANSISTOR)



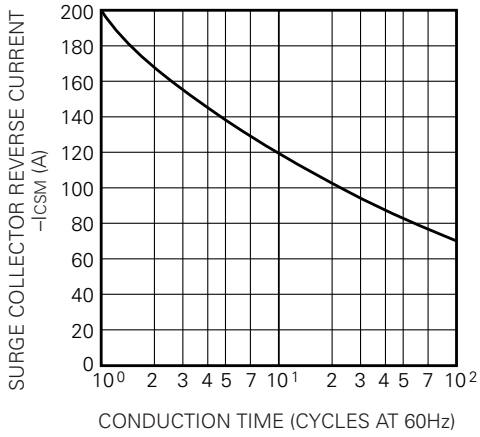
REVERSE COLLECTOR CURRENT VS. COLLECTOR-EMITTER REVERSE VOLTAGE (DIODE FORWARD CHARACTERISTICS) (TYPICAL)



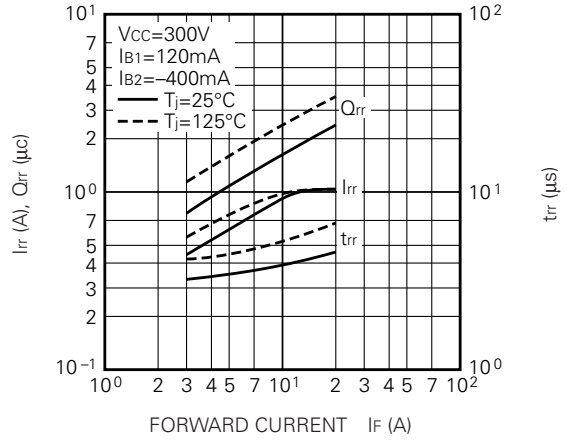
QM20KD-HB

MEDIUM POWER SWITCHING USE
INSULATED TYPE

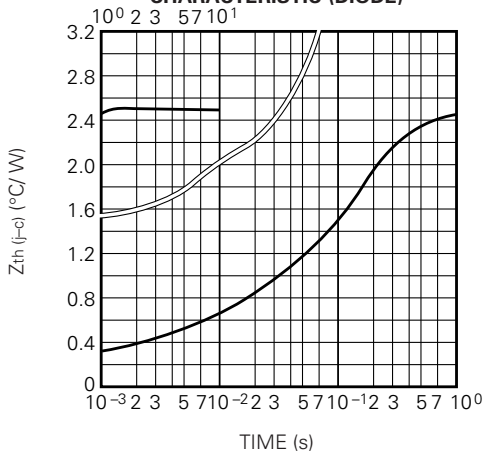
**RATED SURGE COLLECTOR REVERSE CURRENT
(DIODE FORWARD SURGE CURRENT)**



**REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE
CHARACTERISTIC (DIODE)**

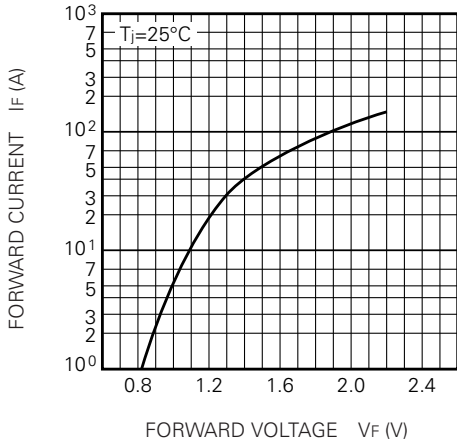


QM20KD-HB

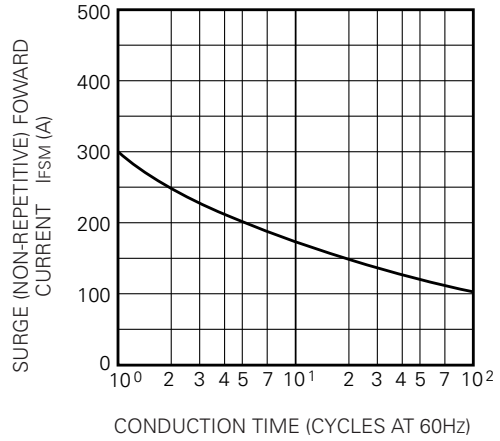
MEDIUM POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES (Converter parts)

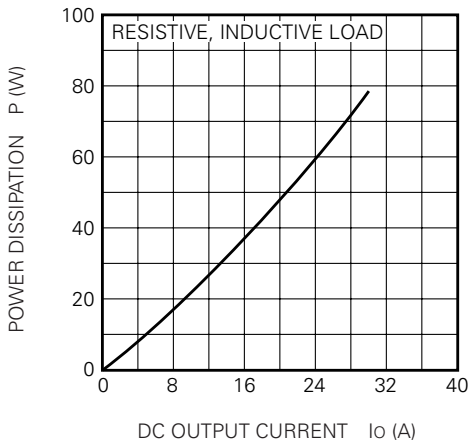
MAXIMUM FORWARD CHARACTERISTIC



ALLOWABLE SURGE (NON-REPETITIVE) FORWARD CURRENT



MAXIMUM POWER DISSIPATION



ALLOWABLE CASE TEMPERATURE VS. DC OUTPUT CURRENT

