

MITSUBISHI TRANSISTOR MODULES

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)

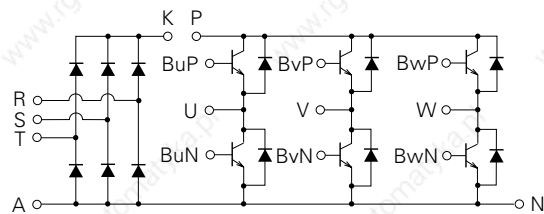
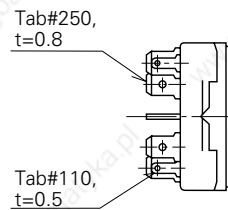
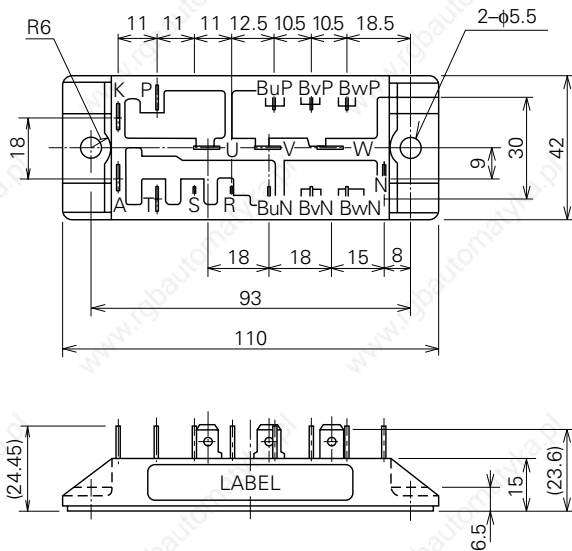
File No. E80271

APPLICATION

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

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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**MEDIUM POWER SWITCHING USE
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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, $T_j=25^\circ\text{C}$)

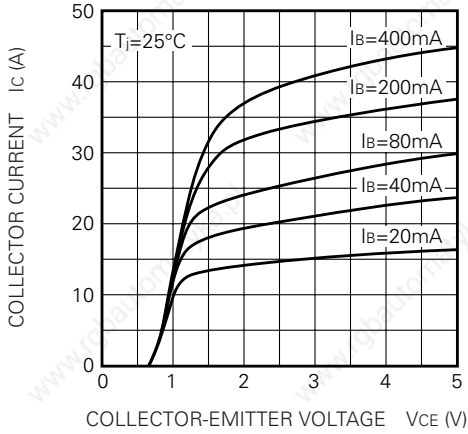
Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
IRRM	Repetitive peak reverse current	$V_R=V_{RRM}$, $T_j=150^\circ\text{C}$	—	—	5.0	mA
VFM	Forward voltage	$I_f=30\text{A}$	—	—	1.3	V
$R_{th(j-c)}$	Thermal resistance	Junction to case	—	—	0.9	$^\circ\text{C}/\text{W}$
$R_{th(c-f)}$	Contact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

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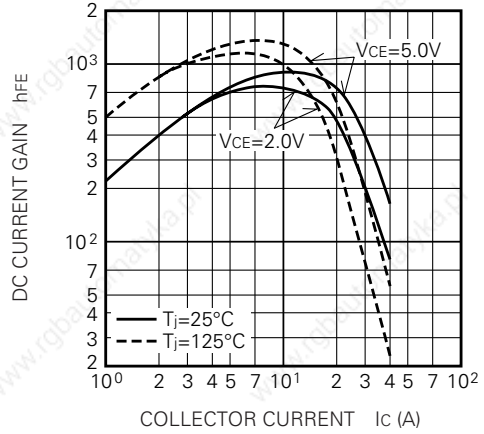
MEDIUM POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

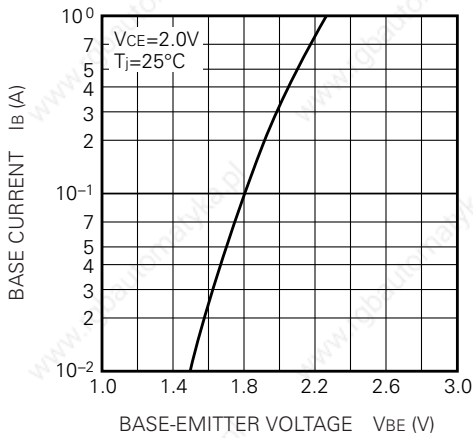
COMMON EMITTER OUTPUT CHARACTERISTICS (TYPICAL)



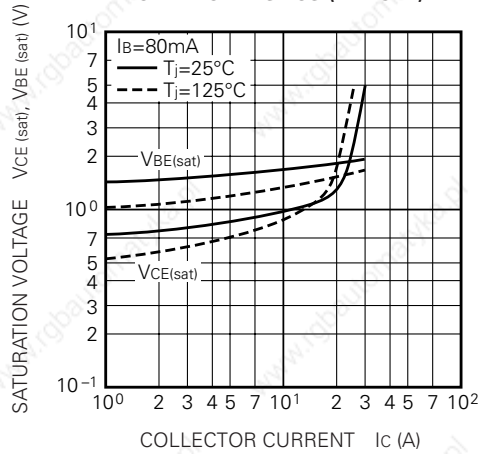
DC CURRENT GAIN VS. COLLECTOR CURRENT (TYPICAL)



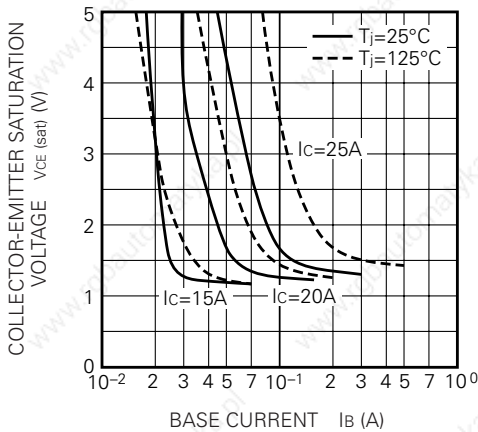
COMMON EMITTER INPUT CHARACTERISTIC (TYPICAL)



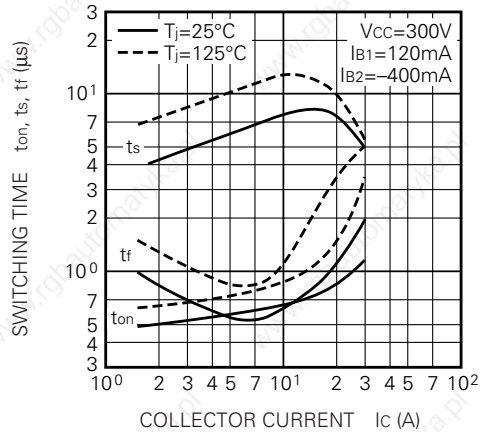
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE (TYPICAL)



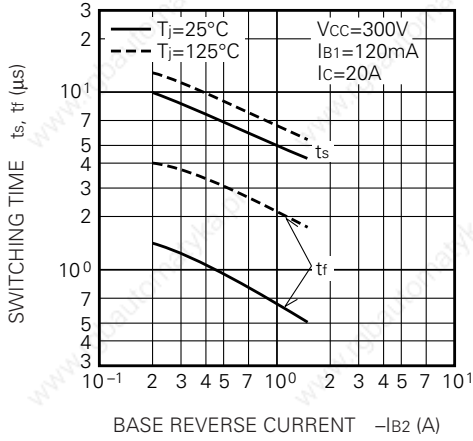
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



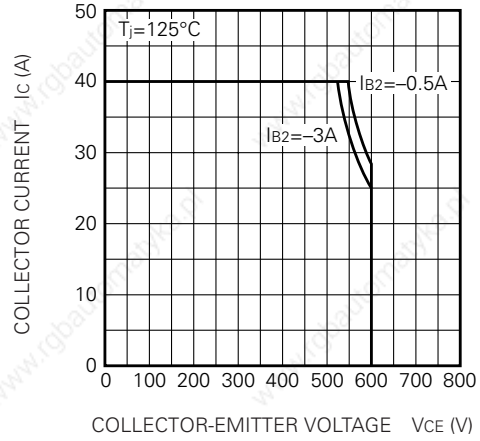
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**MEDIUM POWER SWITCHING USE
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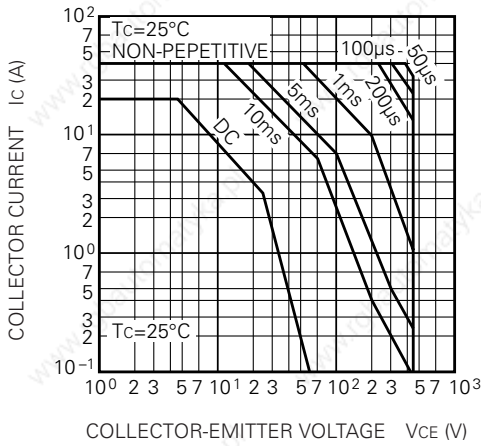
SWITCHING TIME VS. BASE CURRENT (TYPICAL)



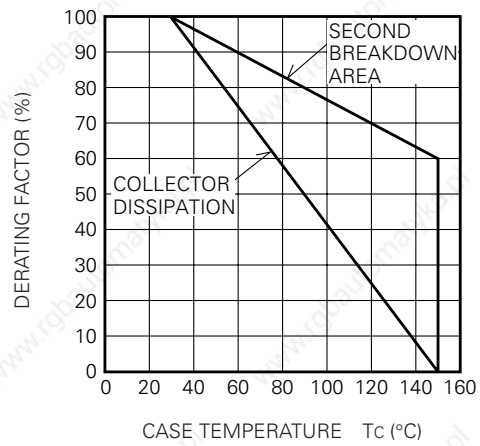
REVERSE BIAS SAFE OPERATING AREA



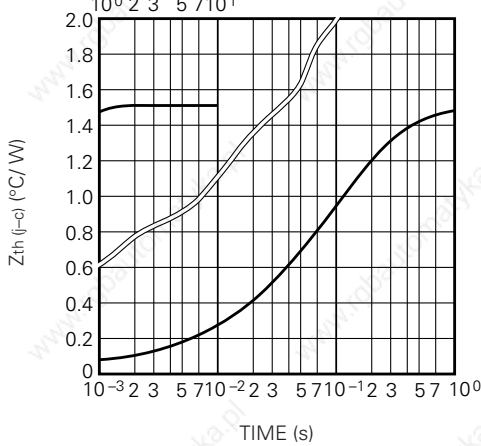
FORWARD BIAS SAFE OPERATING AREA



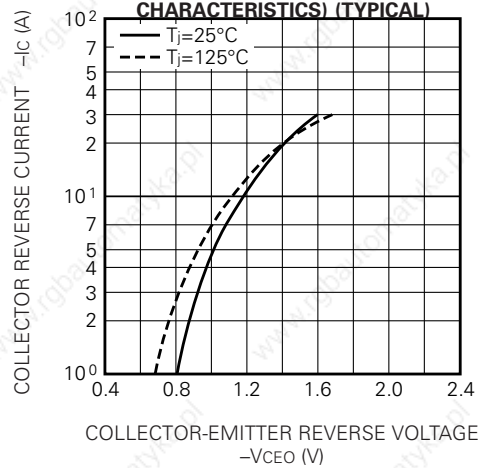
DERATING FACTOR OF F. B. S. O. A.



TRANSIENT THERMAL IMPEDANCE CHARACTERISTIC (TRANSISTOR)



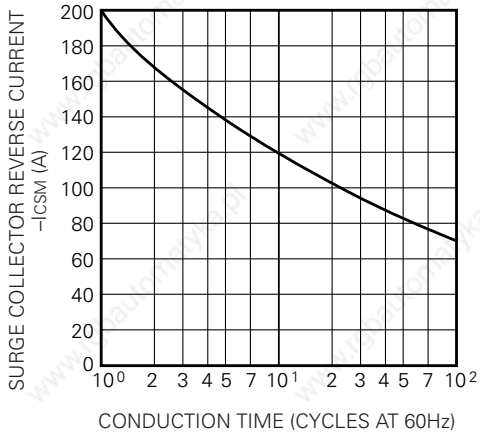
REVERSE COLLECTOR CURRENT VS. COLLECTOR-EMITTER REVERSE VOLTAGE (DIODE FORWARD CHARACTERISTICS) (TYPICAL)



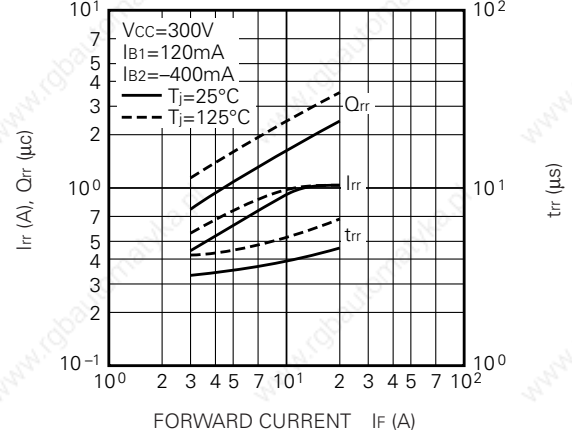
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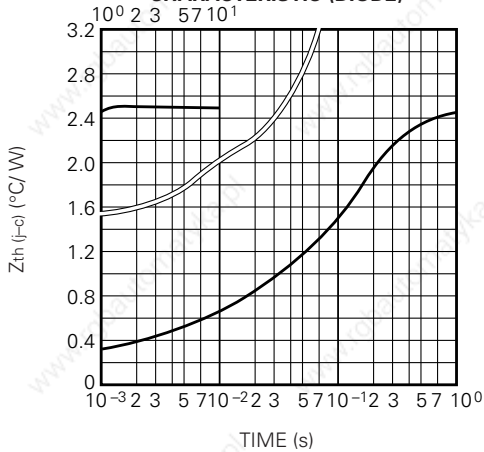
**RATED SURGE COLLECTOR REVERSE CURRENT
(DIODE FORWARD SURGE CURRENT)**



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



**TRANSIENT THERMAL IMPEDANCE
CHARACTERISTIC (DIODE)**

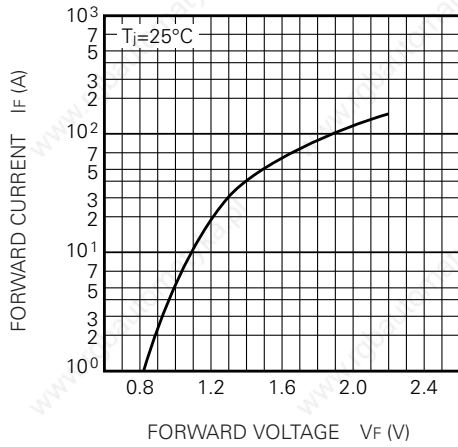


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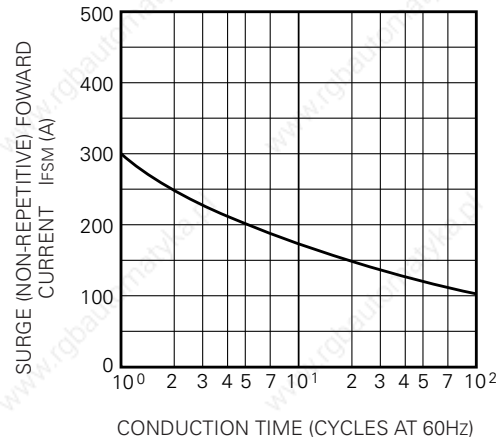
MEDIUM POWER SWITCHING USE
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PERFORMANCE CURVES (Converter parts)

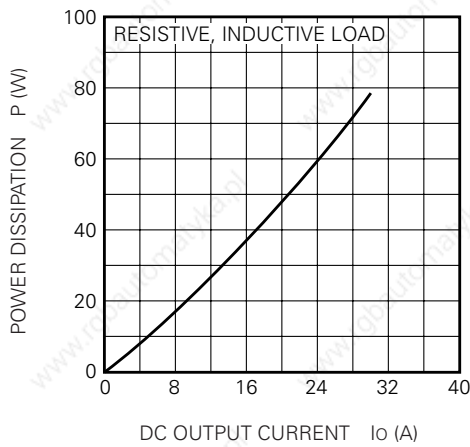
MAXIMUM FORWARD CHARACTERISTIC



ALLOWABLE SURGE (NON-REPETITIVE) FORWARD CURRENT



MAXIMUM POWER DISSIPATION



ALLOWABLE CASE TEMPERATURE VS. DC OUTPUT CURRENT

