Features

- High Power Density
- High mechanical robustness
- Compact design
- Isolated heatsink using DBC technology
- Very low forward voltage drop
- Fast & soft reverse recovery anti-parallel FWD

Product Summary

Applications

- Active Rectifier
- Air Conditioning
- Motor Drives

IGBT **Absolute Maximum Ratings** (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Collector-emitter voltage	T_{vj} = 25°C	V_{CES}	1200	V
Gate-emitter peak voltage		V_{GES}	±20	V
Continuous collector current	T_c = 100°C	I_C	50	A
Repetitive peak collector current	t_P = 1ms	I_{CRM}	100	A
Total power dissipation	T_C = 25°C, T_{vj} = 175°C	P_{tot}	380	W

IGBT, Electrical Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 50A V_{GE} = 15V	T_{vj} = 25°C	$V_{CE(sat)}$		1.80	2.15	V
		T_{vj} = 125°C			2.10		
Gate threshold voltage	V_{CE}=V_{GE}, I_C=1mA		$V_{GE(th)}$	5.6	6.2	6.8	V
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V		I_{GES}			400	nA
Collector-emitter cut-off current	V_{CE}=1200V V_{GE}=0V		I_{CES}			1	mA
Input capacitance	f = 1MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		7.76		nF
Output capacitance			C_{oes}		0.22		nF
Gate charge	V_{GE} = -15V…+15V		Q_G		0.58		µC
Internal gate resistor			R_{Gint}		5.0		Ÿ
Turn-on delay time, inductive load	V_{CE} = 600V, I_C = 50A, R_G =15 Ÿ $_{GE}$ = ±15V, T_{vj} = 25		$t_{d(on)}$		158		ns
Rise time, inductive load			t_r		94		ns
Turn-off delay time, inductive load			$t_{d(off)}$		208		ns
Fall time, inductive load			t_f		142		ns
Turn-on energy loss per pulse			E_{on}		5.60		mJ
Turn-off energy loss per pulse			E_{off}		2.84		mJ
Turn-on delay time, inductive load	V_{CE} = 600V, I_C = 50A, R_G =15 Ÿ $_{GE}$ = ±15V, T_{vj} = 125		$t_{d(on)}$		152		µs
Rise time, inductive load			t_r		104		µs
Turn-off delay time, inductive load			$t_{d(off)}$		248		µs
Fall time, inductive load			t_f		179		µs
Turn-on energy loss per pulse			E_{on}		8.30		mJ
Turn-off energy loss per pulse			E_{off}		3.70		mJ
SC Data	W 8s ”1Ø$_{GE}$ 15V V_{CC}=900V T_{vj}=125		I_{SC}		300		A
Thermal resistance, junction to case	per IGBT		$R_{th(j-c)}$			0.60	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		175	

FRED, Inverter Absolute Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Continuous DC forward current		I_F	50	A
Repetitive peak forward current	t_P = 1ms	I_{FRM}	100	A

FRED, Inverter Electrical Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F 50A, V_{GE} = 0V	T_{vj} = 25°C	V_F		2.10	2.30	V
		T_{vj} = 125°C			1.80		
Peak reverse recovery current	I_F= 50A, V_R=600V, V_{GE}=-15V, di/dt=400 $	T_{vj} = 25°C	I_{RM}		11.7		A
		T_{vj} = 125°C			18.5		
Recovery charge		T_{vj} = 25°C	Q_{rr}		1.60		&
		T_{vj} = 125°C			4.74		
Peak reverse recovery energy		T_{vj} = 25°C	E_{rec}		0.45		mJ
		T_{vj} = 125°C			1.30		
Thermal resistance, junction to case	per diode		$R_{th(j-c)}$			1.06	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	

Diode, Rectifier Absolute Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	T_{vj}			

IGBT, Brake-Chopper Electrical Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 40A, V_{GE} = 15V	T_{vj} = 25°C	$V_{CE(sat)}$		1.80	2.15	V
		T_{vj} = 125°C			2.25		
Gate threshold voltage	V_{CE}=V_{GE}, I_C=0.7mA		$V_{GE(th)}$	5.6	6.2	6.8	V
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V		I_{GES}			400	nA
Collector-emitter cut-off current	V_{CE}=1200V V_{GE}=0V		I_{CES}			1	mA
Input capacitance	f = 1MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		5.18		nF
Output capacitance			C_{oes}		0.15		nF
Gate charge	V_{GE} = -15V…+15V		Q_G		0.39		µC
Internal gate resistor			R_{Gint}		0		
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 40A, R_G = 15 ŸV$_{GE}$ = ±15V, T_{vj} = 25		$t_{d(on)}$		104		ns
Rise time, inductive load			t_r		89		ns
Turn-off delay time, inductive load			$t_{d(off)}$		188		ns
Fall time, inductive load			t_f		62		ns
Turn-on energy loss per pulse			E_{on}		3.50		mJ
Turn-off energy loss per pulse			E_{off}		1.68		mJ
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 40A, R_G = 15 ŸL $_1$= 35 nH, V_{GE} = ±15V, T_{vj} = 125		$t_{d(on)}$		102		ns
Rise time, inductive load			t_r		100		ns
Turn-off delay time, inductive load			$t_{d(off)}$		211		ns
Fall time, inductive load			t_f		136		ns
Turn-on energy loss per pulse			E_{on}		5.39		mJ
Turn-off energy loss per pulse			E_{off}		2.30		mJ
SC Data	W 8s ” V_{GE} 15V V_{CC}=900V T_{vj}=125		I_{SC}		250		A
Thermal resistance, junction to case	per IGBT		$R_{th(j-c)}$			0.90	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	

FRED, Brake-Chopper Absolute Maximum Ratings (@ TC = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	T_{vj} = 25°C	V_{RRM}	1200	V
Continuous DC forward current		I_F	35	A
Repetitive peak forward current	t_P = 1ms	I_{FRM}	70	A

FRED, Brake-Chopper Electrical Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F 35A, V_{GE} = 0V	T_{vj} = 25°C	V_F		2.00	2.30	V
		T_{vj} = 125°C			1.70		
Peak reverse recovery current	I_F 35A, V_R = 600V, V_{GE} = -15V, di/dt =300 $	T_{vj} = 25°C	I_{RM}		9.5		A
		T_{vj} = 125°C			15.7		
Recovered charge		T_{vj} = 25°C	Q_{rr}		1.36		&
		T_{vj} = 125°C			3.57		
Peak reverse recovery energy		T_{vj} = 25°C	E_{rec}		0.45		mJ
		T_{vj} = 125°C			1.12		
Thermal resistance, junction to case	per diode		$R_{th(j-c)}$			1.43	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		175	

NTC-Thermistor Characteristics (@ T_C = 25°C unless otherwise specified)

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	T_C=25	R_{25}		5		K
Deviation of R100	T_C = 100°C, R_{100} = 493 Ω	- R/R	-5		5	%
Power dissipation	T_C = 25°C	P_{25}			20	mW
B-value	$R_2 = R_{25} \exp [B25/50(1/T2 - 1/(298,15\ K))]$	$B_{25/50}$		3375		K
B-value	$R_2 = R_{25} \exp [B25/80(1/T2 - 1/(298,15\ K))]$	$B_{25/80}$		3411		K
B-value	$R_2 = R_{25} \exp [B25/100(1/T2 - 1/(298,15\ K))]$	$B_{25/100}$		3433		K

Module Characteristics

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Isolation Voltage (All Terminals Shorted)	RMS, f = 50Hz,1minute	V_{iso}	2.5			KV
Thermal resistance, case to heatsink	per module	$R_{th(c-s)}$		0.009		K/W
Maximum Junction Temperature	Inverter, brake-chopper	$T_{vj\ max}$			175	
	rectifier				150	
Stray inductance module		L_{SCE}		25		nH
Module lead resistance, terminals - chip	per switch	$R_{CC'+EE'}$		1.6		P
		$R_{AA'+CC'}$		1.1		P
Storage Temperature		T_{stg}	-40		125	
Mounting force per clamp		F	3.0		6.0	N

Ordering Information

Device	Marking	Package	Weight	Inner Box	Per Carton
JMG50PM12P3S1	JMG50PM12P3S1	P3	300g/PCS	10PCS	50PCS

Typical Electrical & Thermal Characteristics

Fig 1. IGBT Output Characteristics
Inverter (typical) VGE=15 V

Fig 2. IGBT Output Characteristics
Inverter (typical)

Fig 3. IGBT Transfer Characteristics
Inverter (typical)

Fig 5. IGBT Switching Loss vs. Rg,
Inverter (typical
Ic=50 A, VCE=600 V, VGE=±15 V

Fig 6. Reverse bias safe operating area
IGBT, Inverter (RBSOA)

Fig 7. FRED Forward Characteristics,
Inverter (typical) I]TJ 0 Tc 0 .002 Tc 0.005c 0.000 s1 1 Tfd5 0 Td (7)Tj 0.007 Tc -0.007 Tw 0.569 0 Td (.)Tj

Fig 9. FRED Switching Loss vs. Rg,
Inverter (typical)
Ic=50 A, VCE=600 V

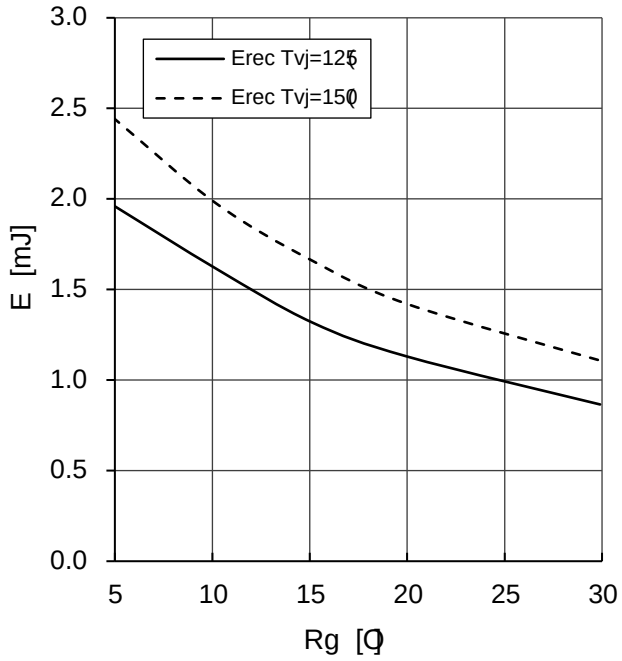


Fig 10. Diode Rectifier Forward Characteristics

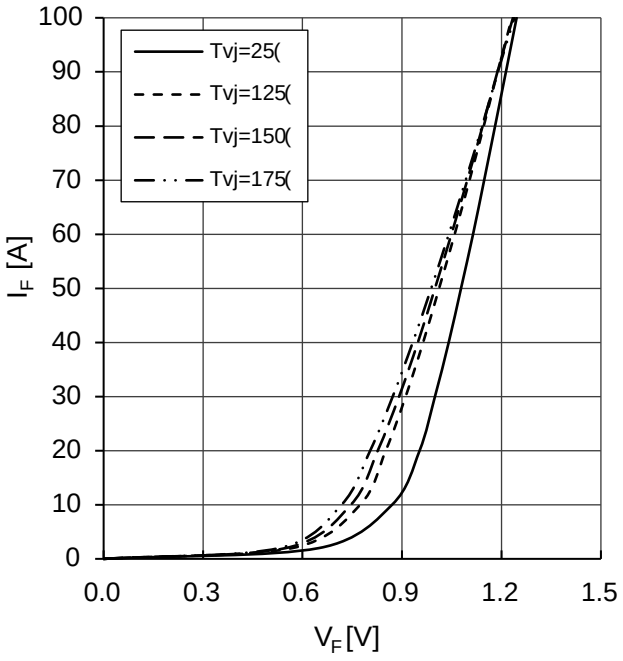


Fig 11. IGBT Output Characteristics
Brake-Chopper (typical) VGE=15 V

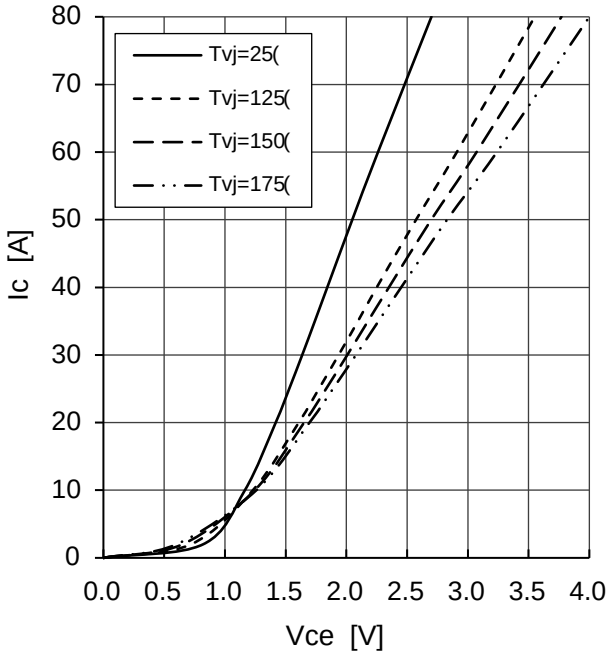


Fig 12. FRED Forward Characteristics,
Brake-Chopper (typical)

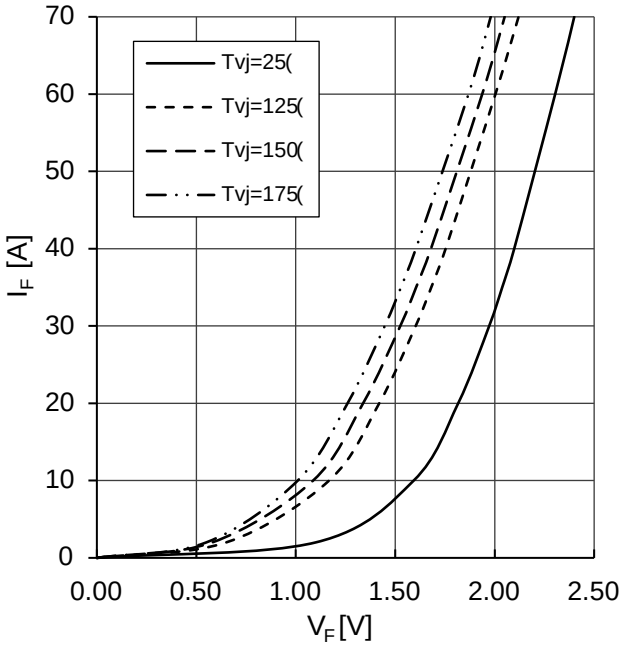
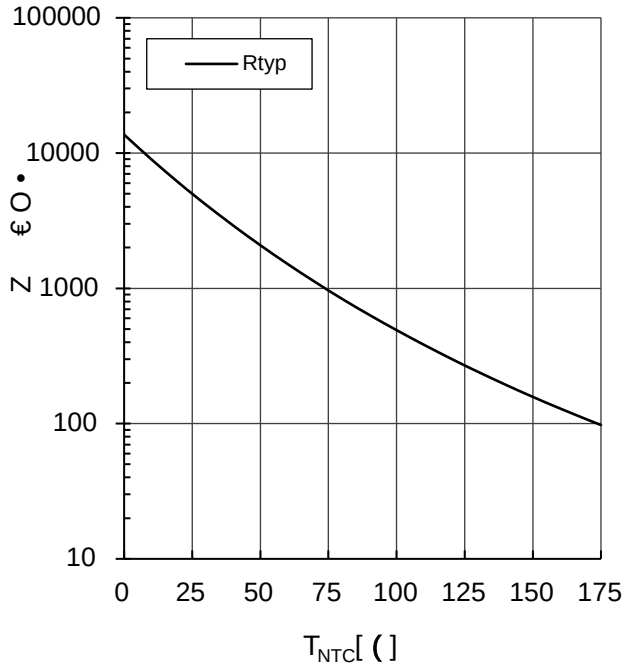


Fig 13. Temperature characteristics,
NTC thermistor (typical)



Information furnished in this document is believed to be accurate and reliable. However,
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