



JMG75PM12P3S1

Trench FS IGBT

Features

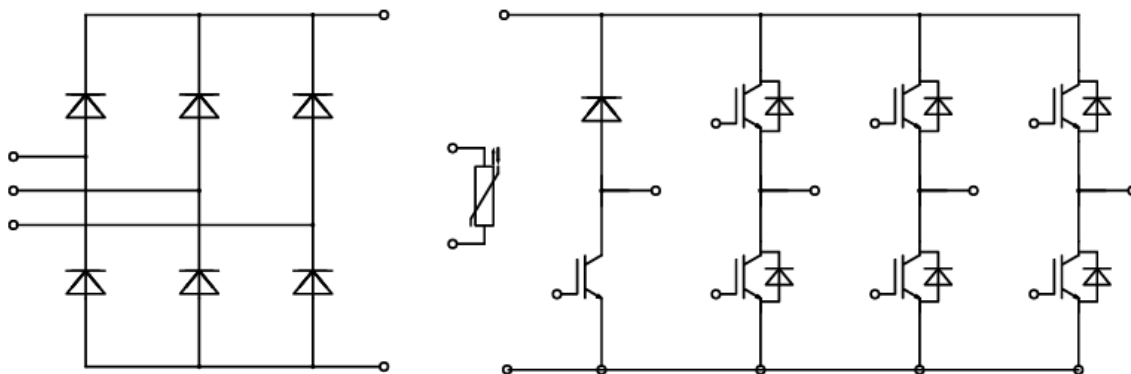
- High Power Density
- High mechanical robustness
- Compact design
- Isolated heatsink using DBC technology
- Very low forward voltage drops
- Fast & soft reverse recovery anti-parallel FWD

Product Summary

Parameter	Value	Unit
V_{CES}	1200	V
$I_C(@ T_C = 100^\circ\text{C})$	75	A
$I_{CRM}(@ t_p = 1\text{ms})$	150	A
$V_{CE(sat)}(\text{Typ})$	1.80	V

Applications

- Active Rectifier
- Air Conditioning
- Motor Drives



IGBT, Inverter Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Collector-emitter voltage	$T_{vj} = 25^\circ\text{C}$	V_{CES}	1200	V
Gate-emitter peak voltage		V_{GES}	± 20	V
Continuous collector current	$T_C = 100^\circ\text{C}$	I_C	75	A
Repetitive peak collector current	$t_p = 1\text{ms}$	I_{CRM}	150	A
Total power dissipation	$T_C = 25^\circ\text{C}, T_{vj} = 175^\circ\text{C}$	P_{tot}	312	W

**IGBT, Inverter Electrical Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)**

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$I_C = 75\text{A}$ $V_{GE} = 15\text{V}$	$T_{vj} = 25^\circ\text{C}$		1.80	2.15	V
		$T_{vj} = 125^\circ\text{C}$		2.15		
		$T_{vj} = 150^\circ\text{C}$		2.25		
Gate threshold voltage	$V_{CE}=V_{GE}$, $I_C=3\text{mA}$	$V_{GE(th)}$	5.4	6.0	6.6	V
Gate-emitter leakage current	$V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$	I_{GES}			400	nA
Collector-emitter cut-off current	$V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$	I_{CES}			1	mA
Input capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$	C_{ies}		7.76		nF
Reverse transfer capacitance		C_{res}		0.22		nF
Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$	Q_G		0.58		μC
Internal gate resistor		R_{Gint}		5.0		Ω ,
Turn-on delay time, inductive load	$V_{CE} = 600\text{V}$, $I_C = 75\text{A}$, $R_G = 15\Omega$, $V_{GE} = \pm 15\text{V}$, $T_{vj} = 25^\circ\text{C}$	$t_{d(on)}$		219		ns
Rise time, inductive load		t_r		134		ns
Turn-off delay time, inductive load		$t_{d(off)}$		347		ns
Fall time, inductive load		t_f		60		ns
Turn-on energy loss per pulse		E_{on}		12.16		mJ
Turn-off energy loss per pulse		E_{off}		3.81		mJ
Turn-on delay time, inductive load	$V_{CE} = 600\text{V}$, $I_C = 75\text{A}$, $R_G = 15\Omega$, $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^\circ\text{C}$	$t_{d(on)}$		220		ns
Rise time, inductive load		t_r		145		ns
Turn-off delay time, inductive load		$t_{d(off)}$		379		ns
Fall time, inductive load		t_f		108		ns
Turn-on energy loss per pulse		E_{on}		16.54		mJ
Turn-off energy loss per pulse		E_{off}		4.81		mJ
SC Data	$t_p \leq 10\mu\text{s}$, $V_{GE} \leq 15\text{V}$, $V_{CC} = 900\text{V}$, $V_{CEM} \leq 1200\text{V}$, $T_{vj} = 125^\circ\text{C}$	I_{SC}		460		A
Thermal resistance, junction to case	per IGBT	$R_{th(j-c)}$			0.48	K/W
Temperature under switching conditions		$T_{vj op}$	-40		150	$^\circ\text{C}$

**FRED, Inverter Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)**

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	$T_{vj} = 25^\circ\text{C}$	V_{RRM}	1200	V
Continuous DC forward current		I_F	75	A
Repetitive peak forward current	$t_p = 1\text{ms}$	I_{FRM}	150	A
I^2t value for fusing	$t = 10\text{ms}$, $V_R = 0\text{V}$, $T_{vj} = 150^\circ\text{C}$,	I^2t	1600	A^2s

FRED, Inverter Electrical Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I _F = 75A, V _{GE} = 0V	T _{vj} = 25°C	V _F		2.10	2.40	V
		T _{vj} = 125°C			1.80		
		T _{vj} = 150°C			1.70		
Peak reverse recovery current	I _F =75A, V _R =600V, V _{GE} =-15V, di/dt=400A/μs	T _{vj} = 25°C	I _{RM}		12.2		A
		T _{vj} = 125°C			22.1		
Recovery charge		T _{vj} = 25°C	Q _{rr}		1.93		μC
		T _{vj} = 125°C			6.02		
Peak reverse recovery energy		T _{vj} = 25°C	E _{rec}		0.45		mJ
		T _{vj} = 125°C			1.42		
Thermal resistance, junction to case	per diode		R _{th(j-c)}			0.72	K/W
Temperature under switching conditions			T _{vj op}	-40		150	°C

**Diode, Rectifier Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)**

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	$T_{vj} = 25^\circ\text{C}$	V_{RRM}	1600	V
Bridge output current	$T_C = 80^\circ\text{C}$	I_D	75	A
Repetitive peak forward current	$t_P = 10\text{ ms}, T_{vj} = 25^\circ\text{C}$	I_{FSM}	1000	A
	$t_P = 10\text{ ms}, T_{vj} = 150^\circ\text{C}$		800	
I^2t value for fusing	$t_P = 10\text{ ms}, T_{vj} = 25^\circ\text{C}$	I^2t	5000	A^2s
	$t_P = 10\text{ ms}, T_{vj} = 150^\circ\text{C}$		3200	

Diode, Rectifier Electrical Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$T_{vj} = 150^\circ\text{C}, I_F = 75\text{A}$	V_F		1.0		V
Reverse current	$T_{vj} = 25^\circ\text{C}, V_R = 1600\text{V}$	I_R			0.1	mA
	$T_{vj} = 150^\circ\text{C}, V_R = 1600\text{V}$			2		mA
Thermal resistance, junction to case	per diode	$R_{th(j-c)}$			0.60	K/W
Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^\circ\text{C}$

IGBT, Brake-Chopper Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions	Symbol	Values	Unit
Collector-emitter voltage	$T_{vj} = 25^\circ\text{C}$	V_{CES}	1200	V
Gate-emitter peak voltage		V_{GES}	± 20	V
Continuous collector current	$T_C = 100^\circ\text{C}$	I_C	50	A
Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	100	A
Total power dissipation	$T_C = 25^\circ\text{C}, T_{vj} = 175^\circ\text{C}$	P_{tot}	250	W

IGBT, Brake-Chopper Electrical Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	$I_C = 50\text{A}$, $V_{GE} = 15\text{V}$	$T_{vj} = 25^\circ\text{C}$	$V_{CE(sat)}$		1.80	2.15	V
		$T_{vj} = 125^\circ\text{C}$			2.10		
		$T_{vj} = 150^\circ\text{C}$			2.20		
Gate threshold voltage	$V_{CE}=V_{GE}$, $I_C=2.0\text{mA}$,		$V_{GE(th)}$	5.4	6.0	6.6	V
Gate-emitter leakage current	$V_{CE} = 0\text{V}$, $V_{GE} = 20\text{V}$		I_{GES}			400	nA
Collector-emitter cut-off current	$V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$		I_{CES}			1	mA
Input capacitance	$f = 1\text{MHz}$, $T_{vj} = 25^\circ\text{C}$, $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$		C_{ies}		5.18		nF
Reverse transfer capacitance			C_{res}		0.15		nF
Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		Q_G		0.39		μC
Internal gate resistor			R_{Gint}		5.0		Ω
Turn-on delay time, inductive load	$V_{CC} = 600\text{V}$, $I_C = 50\text{A}$, $R_G = 15\Omega$, $V_{GE} = \pm 15\text{V}$, $T_{vj} = 25^\circ\text{C}$		$t_{d(on)}$		108		ns
Rise time, inductive load			t_r		96		ns
Turn-off delay time, inductive load			$t_{d(off)}$		219		ns
Fall time, inductive load			t_f		137		ns
Turn-on energy loss per pulse			E_{on}		4.20		mJ
Turn-off energy loss per pulse			E_{off}		2.98		mJ
Turn-on delay time, inductive load	$V_{CC} = 600\text{V}$, $I_C = 150\text{A}$, $R_G = 15\Omega$, $V_{GE} = \pm 15\text{V}$, $T_{vj} = 125^\circ\text{C}$		$t_{d(on)}$		108		ns
Rise time, inductive load			t_r		99		ns
Turn-off delay time, inductive load			$t_{d(off)}$		257		ns
Fall time, inductive load			t_f		204		ns
Turn-on energy loss per pulse			E_{on}		6.00		mJ
Turn-off energy loss per pulse			E_{off}		4.06		mJ
SC Data	$t_p \leq 10\mu\text{s}$, $V_{GE} \leq 15\text{V}$, $V_{CC} = 900\text{V}$, $V_{CEM} \leq 1200\text{V}$, $T_{vj} = 125^\circ\text{C}$		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		150	$^\circ\text{C}$

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

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
Continuous DC forward current		I_F	35	A
Repetitive peak forward current	$t_P = 1\text{ms}$	I_{FRM}	70	A
I^2t value for fusing	$t = 10\text{ms}$, $V_R = 0\text{V}$, $T_{vj} = 150^{\circ}\text{C}$,	I^2t	160	A^2s

FRED, Brake-Chopper Electrical Characteristics (@ $T_C = 25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	$I_F = 35A$, $V_{GE} = 0V$	$T_{vj} = 25^{\circ}C$	V_F		2.00	2.30	V
		$T_{vj} = 125^{\circ}C$			1.70		
		$T_{vj} = 150^{\circ}C$			1.60		
Peak reverse recovery current	$I_F = 35A$, $V_R = 600V$, $V_{GE} = -15V$, $di/dt = 400A/\mu s$	$T_{vj} = 25^{\circ}C$	I_{RM}		12.7		A
		$T_{vj} = 125^{\circ}C$			19.5		
Recovered charge		$T_{vj} = 25^{\circ}C$	Q_{rr}		1.81		μC
		$T_{vj} = 125^{\circ}C$			4.51		
Peak reverse recovery energy		$T_{vj} = 25^{\circ}C$	E_{rec}		0.64		mJ
		$T_{vj} = 125^{\circ}C$			1.57		
Thermal resistance, junction to case	per diode		$R_{th(j-c)}$			1.43	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	$^{\circ}C$

**NTC-Thermistor Characteristics (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)**

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance	$T_C = 25^\circ\text{C}$	R_{25}		5		K Ω
Deviation of R_{100}	$T_C = 100^\circ\text{C}$, $R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
Power dissipation	$T_C = 25^\circ\text{C}$	P_{25}			20	mW
B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/50}$		3375		K
B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/80}$		3411		K
B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/100}$		3433		K

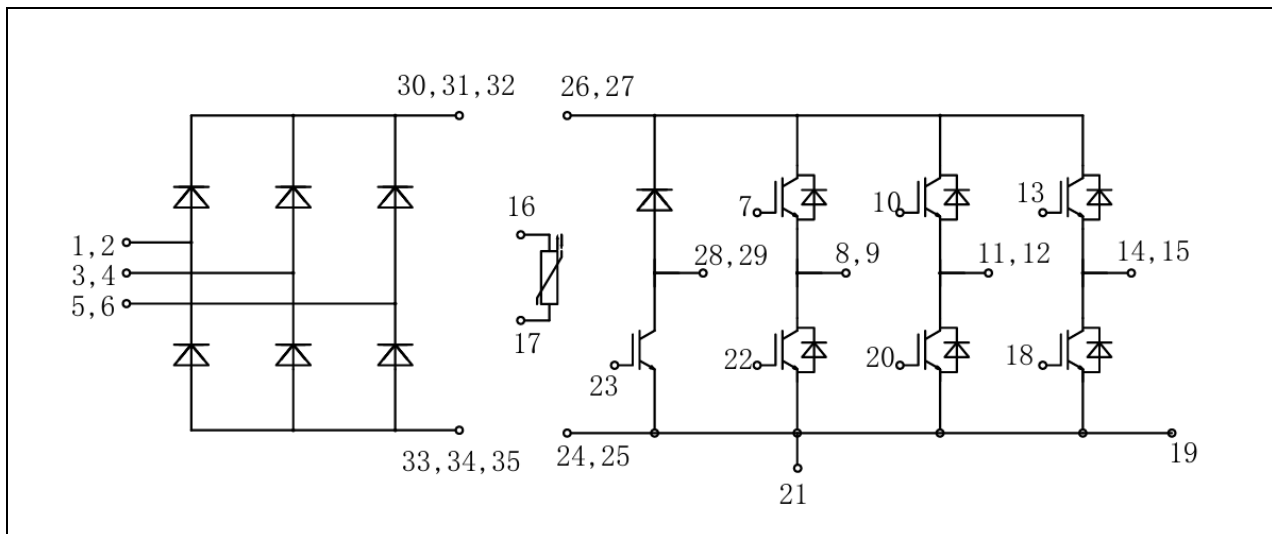
Module Characteristics

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Isolation Voltage (All Terminals Shorted)	RMS, $f = 50\text{Hz}$, 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	$^\circ\text{C}$
	rectifier				150	$^\circ\text{C}$
Stray inductance module		L_{SCE}		60		nH
Module lead resistance, terminals - chip	per switch	$R_{CC'+EE'}$		4		m Ω
		$R_{AA'+CC'}$		2		m Ω
Storage Temperature		T_{stg}	-40		125	$^\circ\text{C}$
Mounting torque	Module and heatsink fixed torque M5	M	3.0		6.0	N m

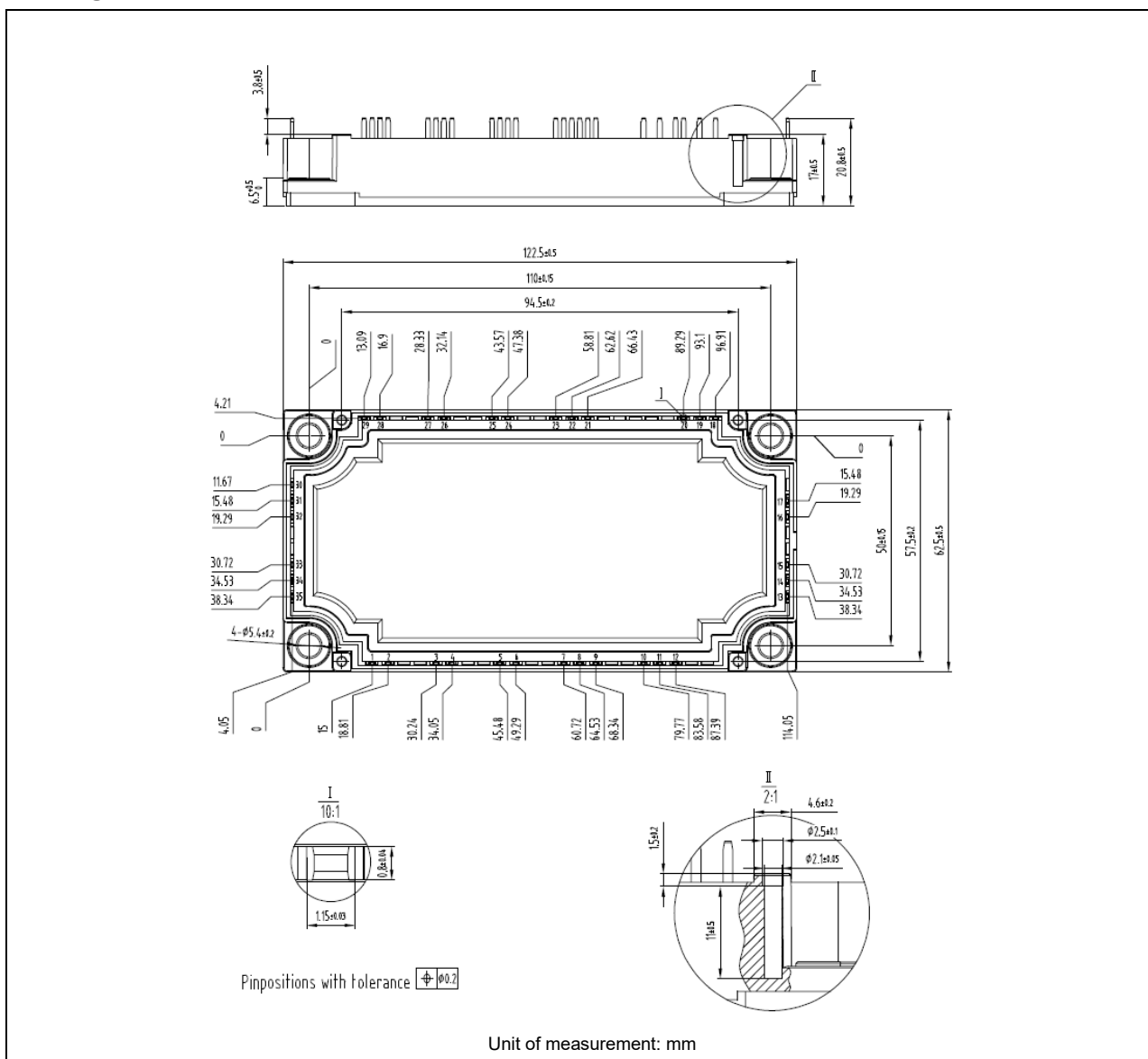
Ordering Information

Device	Marking	Package	Weight	Inner Box	Per Carton
JMG75PM12P3S1	JMG75PM12P3S1	P3	300g/PCS	10PCS	50PCS

Circuit Diagram



Package Outlines (mm)



Typical Electrical & Thermal Characteristics

Fig 1. IGBT Output Characteristics
Inverter (typical) $V_{GE}=15\text{ V}$

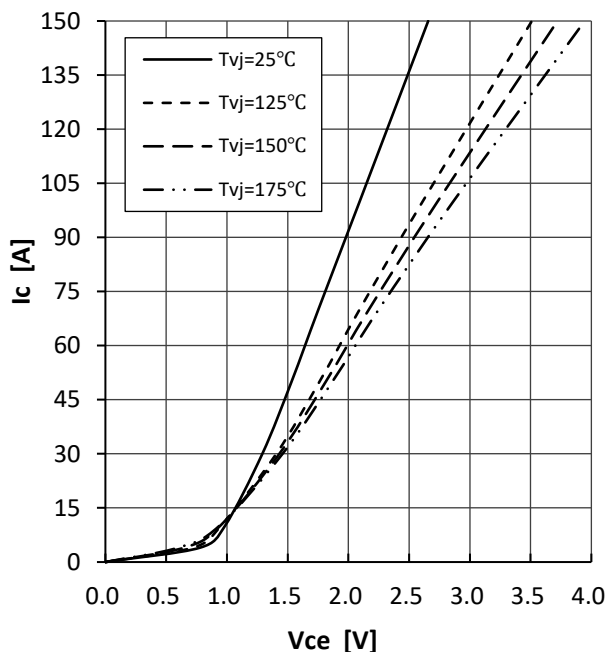


Fig 2. IGBT Output Characteristics
Inverter (typical)

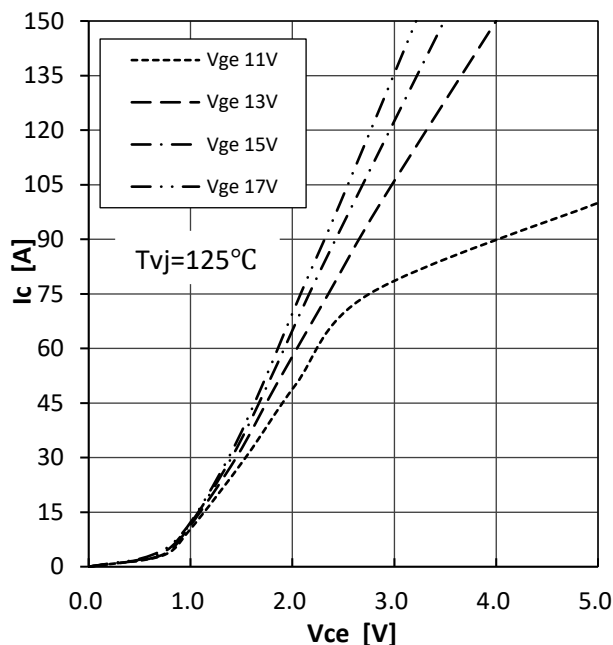


Fig 3. IGBT Transfer Characteristics
Inverter (typical) $V_{CE}=20\text{ V}$

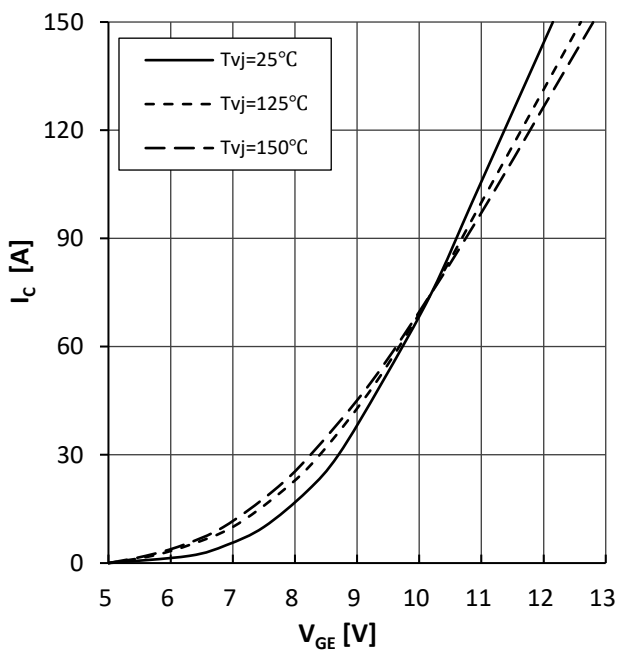


Fig 4. IGBT Switching Loss vs I_c
Inverter (typical)
 $R_g=15\ \Omega$, $V_{CE}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$

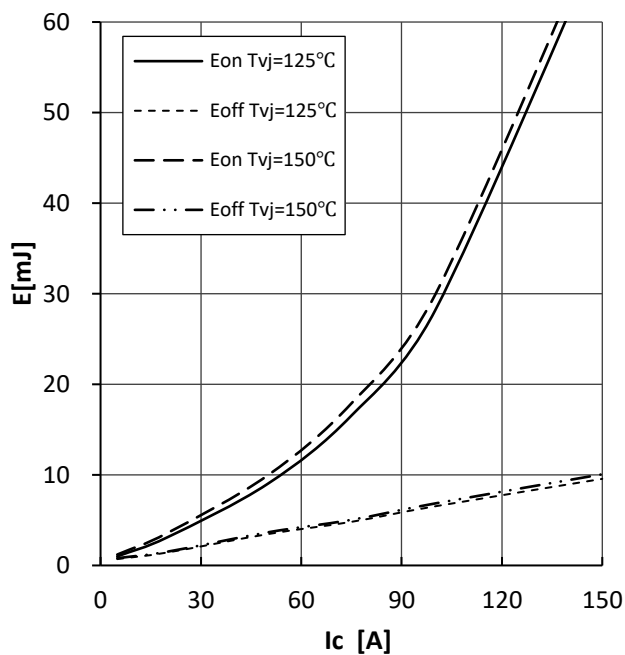


Fig 5. IGBT Switching Loss vs. R_g ,
Inverter (typical)
 $I_c=75\text{ A}$, $V_{CE}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$

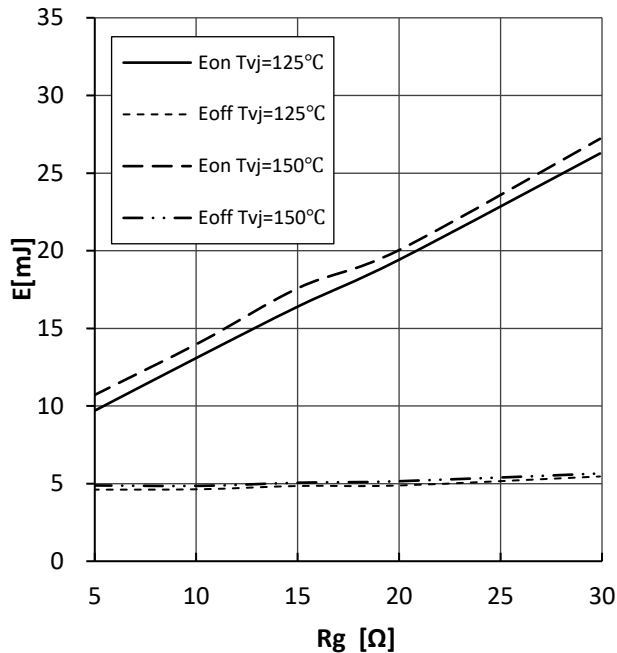


Fig 6. IGBT Transient Thermal Impedance
Inverter

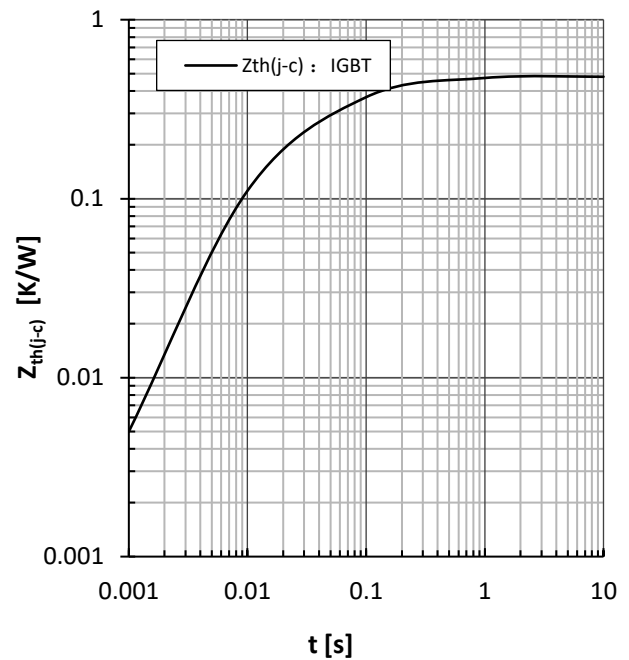


Fig 7. Reverse bias safe operating area
IGBT, Inverter (RBSOA)

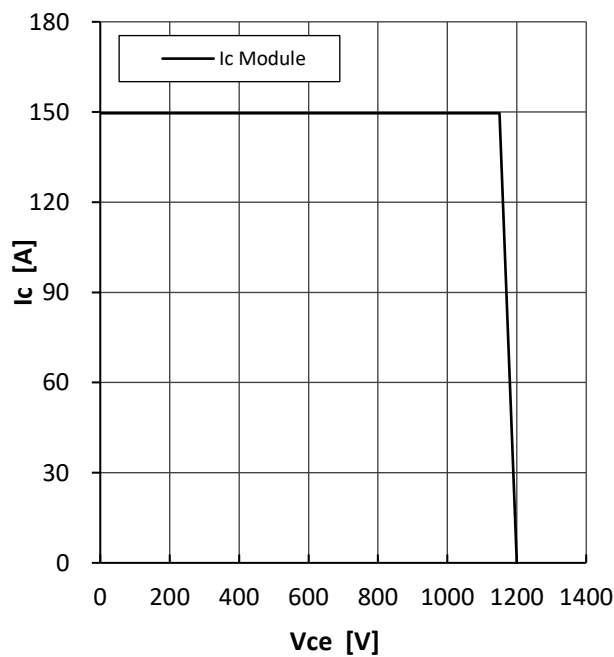


Fig 8. FRED Forward Characteristics,
Inverter (typical)

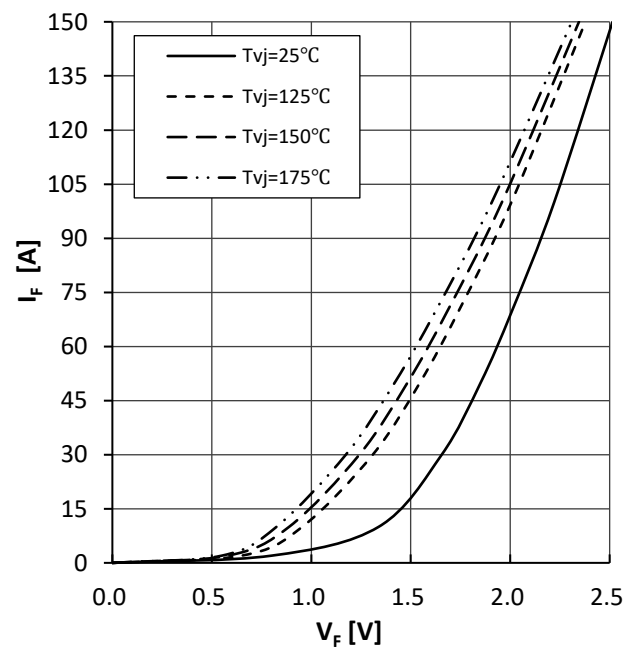


Fig 9. FRED Switching Loss vs. I_c ,
Inverter (typical)
 $R_g=15\ \Omega$, $V_{CE}=600\ V$

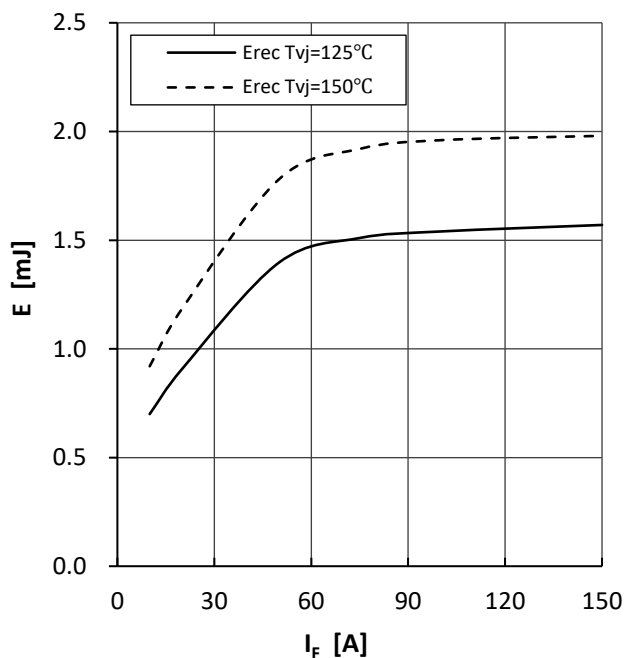


Fig 10. FRED Switching Loss vs. R_g ,
Inverter (typical)
 $I_c=75\ A$, $V_{CE}=600\ V$

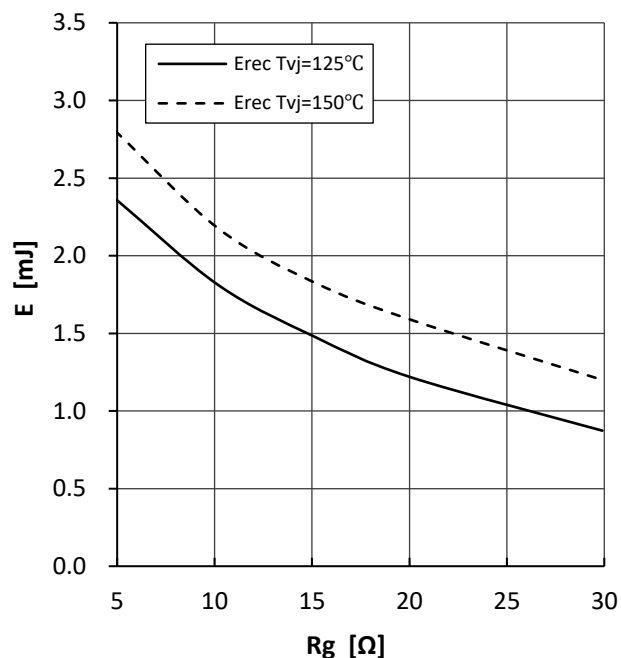


Fig 11. FRED Transient Thermal Impedance
Inverter

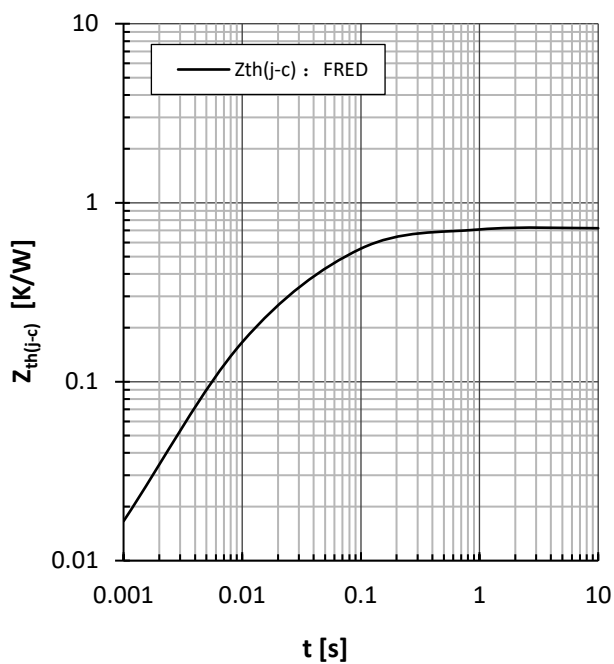


Fig 12. Diode Rectifier Forward Characteristics

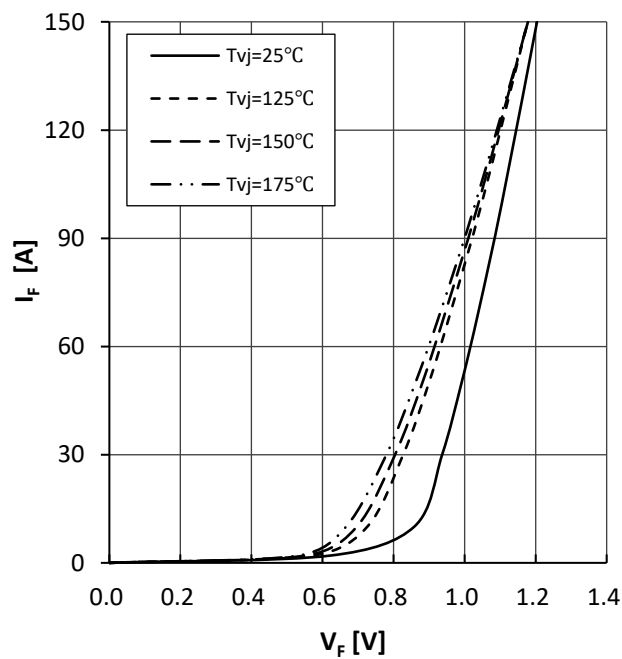


Fig 13. Diode Rectifier Transient Thermal Impedance

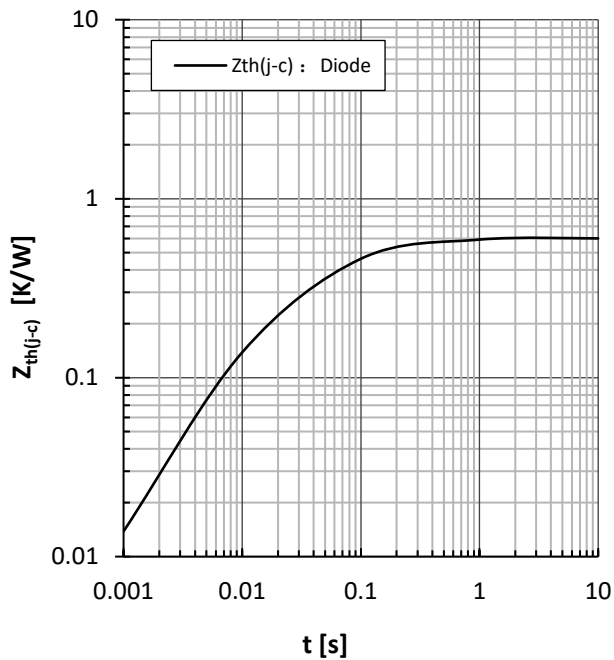


Fig 14. IGBT Output Characteristics, Brake-Chopper (typical) VGE=15 V

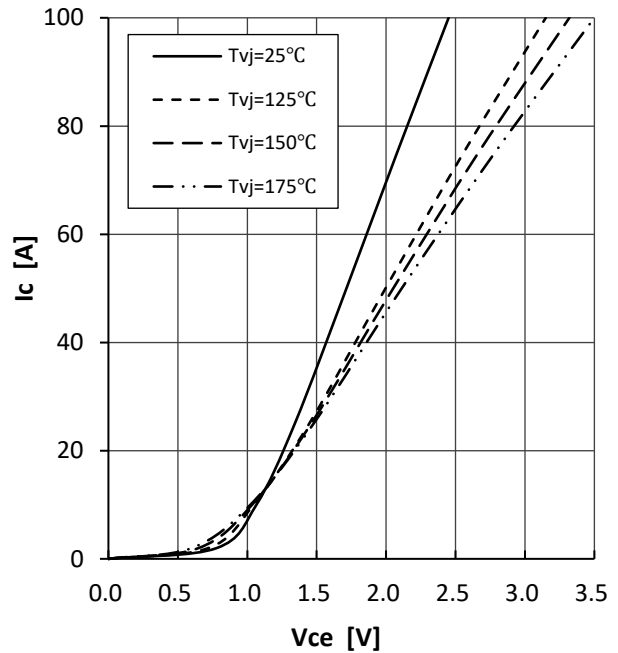


Fig 15. FRED Forward Characteristics, Brake-Chopper (typical)

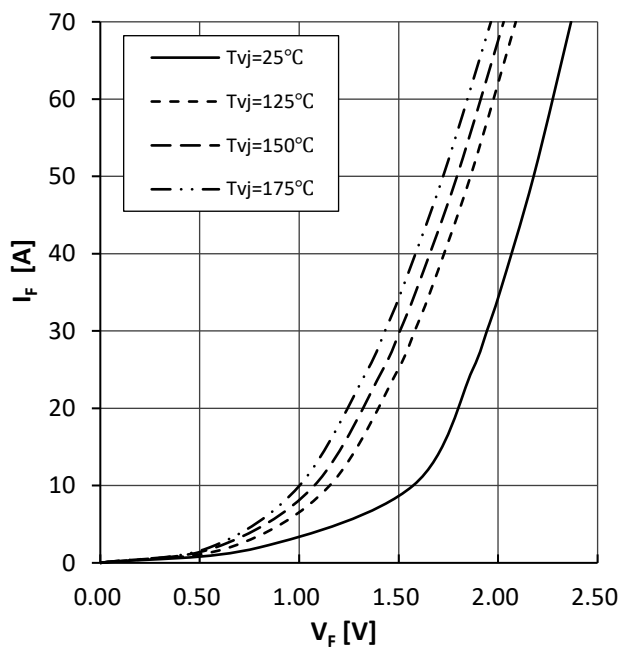
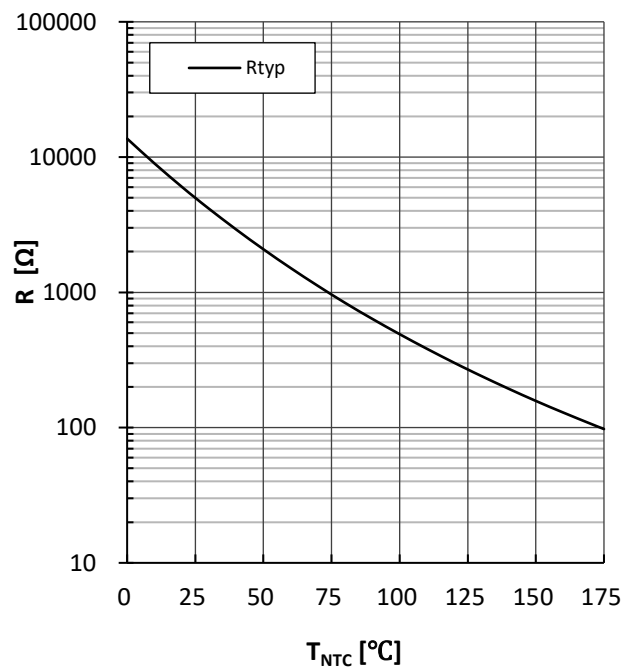


Fig 16. Temperature characteristics, NTC thermistor (typical)





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