Trench FS IGBT

Features

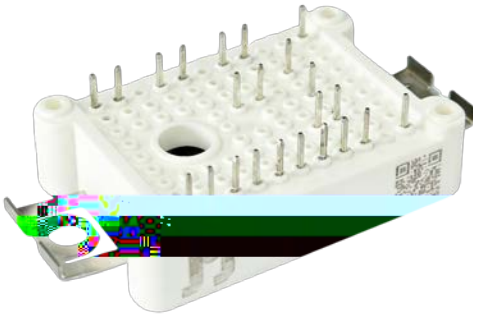
- High Power Density
- High mechanical robustness
- Compact design
- Isolated heatsink using DBC technology
- Very low forward voltage drop
- Fast & soft reverse recovery anti-parallel FWD

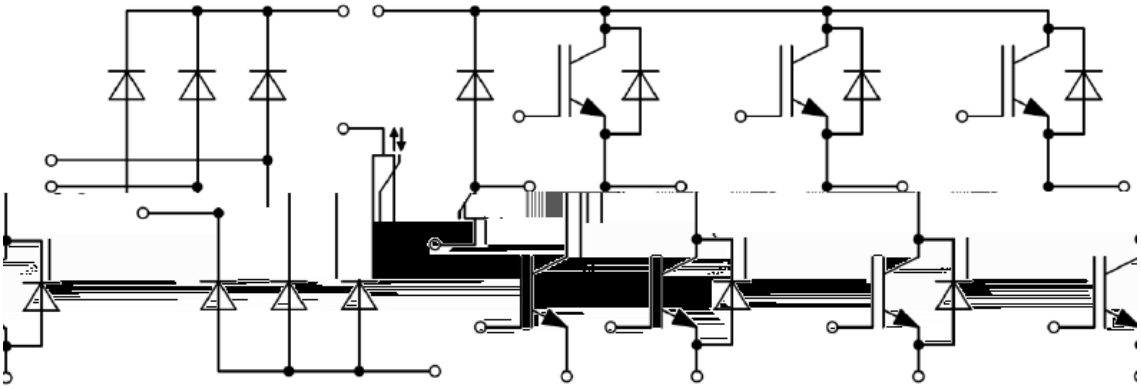
Product Summary

Parameter	Value	Unit
V_{CES}	1200	V
I_C(@ T_C= 100)	15	A
I_{CRM}(@ t_P= 1ms)	30	A
$V_{CE(sat)}$(Typ)	1.85	V

Applications

- Active Rectifier
- Air Conditioning
- Motor Drives





IGBT, Inverter 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 = 25°C, T_{vj} = 175°C	I_C	28	A
	T_C = 100°C, T_{vj} = 175°C	$I_{C\ nom}$	15	
Repetitive peak collector current	t_P = 1ms	I_{CRM}	30	A
Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	Ptot	130	W

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

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	I_C = 15A, V_{GE} = 15V	T_{vj} = 25°C	$V_{CE(sat)}$		1.85	2.25	V
		T_{vj} = 125°C			2.30		
		T_{vj} = 150°C			2.35		
Gate threshold voltage	V_{CE}=V_{GE}, I_C=0.3mA		$V_{GE(th)}$	5.2	5.8	6.4	V
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V		I_{GES}			400	nA
Collector leakage 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}		0.89		nF
Output capacitance			C_{oes}		0.03		nF
Gate charge	V_{GE} = -15V…+15V		Q_G		0.12		uC
Turn-on delay time, inductive load	V_{CE} = 600V, I_C = 15A , R_G = 51Ω, V_{GE} = ±15V , T_{vj} = 25		$t_{d(on)}$		98.4		ns
Rise time, inductive load			t_r		98.2		ns
Turn-off delay time, inductive load			$t_{d(off)}$		114		ns
Fall time, inductive load			t_f		174		ns
Turn-on energy loss per pulse			E_{on}		1.81		mJ
Turn-off energy loss per pulse			E_{off}		0.69		mJ
Turn-on delay time, inductive load	V_{CE} = 600V, I_C = 15A , R_G =51Ω, V_{GE} = ±15V , T_{vj} = 125		$t_{d(on)}$		94.2		ns
Rise time, inductive load			t_r		107.2		ns
Turn-off delay time, inductive load			$t_{d(off)}$		132		ns
Fall time, inductive load			t_f		220		ns
Turn-on energy loss per pulse			E_{on}		2.61		mJ
Turn-off energy loss per pulse			E_{off}		0.86		mJ
SC date	tp≤10us V_{GE}≤15V V_{CC}=800V,V_{CEM}≤1200V, T_{vj}=125		I_{SC}		55		A
Thermal resistance, junction to case	per module		$R_{th(j-c)}$		1.05	1.15	K/W
Temperature under switching conditions			$T_{vj\ op}$	-40		150	

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

Parameter	Conditions	Symbol	Values	Unit

Diode, Rectifier 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}	1600	V
Maximum RMS forward current per chip	T_C = 80°C	I_{FRMSM}	30	A
Maximum RMS current at rectifier output	T_C = 80°C	I_{RMSM}	30	A
Repetitive peak forward current	t_P = 10 ms, T_{vj} = 25°C	I_{FSM}	300	A
I^2t value for fusing	t_P = 10 ms, T_{vj} = 25°C	I^2t	450	A^2s

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

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	T_{vj} = 150°C, I_F=15A	V_F		1.10		V
Reverse current	T_{vj} = 150°C, V_R=1600V	I_R		1.0		mA
Thermal resistance, junction to case	per module	$R_{th(j-c)}$		1.20	1.35	K/W
Temperature under switching conditions		$T_{vj\ op}$	-40		150	

IGBT, Brake-Chopper 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 = 25°C, T_{vj} = 175°C	I_C	28	A
	T_C = 100°C, T_{vj} = 175°C	$I_{C\ nom}$	15	
Repetitive peak collector current	t_P = 1ms	I_{CRM}	30	A
Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 125°C	P_{tot}	130	W

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 = 15A, V_{GE} = 15V	T_{vj} = 25°C	$V_{CE(sat)}$		1.85	2.25	V
		T_{vj} = 125°C			2.30		
		T_{vj} = 150°C			2.35		
Gate threshold voltage	V_{CE}=V_{GE}, I_C=0.3mA		$V_{GE(th)}$	5.2	5.8	6.4	V
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V		I_{GES}			400	nA
Collector leakage current	V_{CE}=1200V V_{GE}=0V		I_{CES}			1.0	mA
Input capacitance	f = 1MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		0.89		nF
Output capacitance			C_{oes}		0.03		nF
Gate charge	V_{GE} = -15V…+15V		Q_G		0.12		uC
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 15A , R_G = 51Ω, V_{GE} = ±15V , T_{vj} = 25		$t_{d(on)}$		93.6		ns
Rise time, inductive load			t_r		81.6		ns
Turn-off delay time, inductive load			$t_{d(off)}$		112.8		ns
Fall time, inductive load			t_f		131.2		ns
Turn-on energy loss per pulse			E_{on}		0.95		mJ
Turn-off energy loss per pulse			E_{off}		0.47		mJ
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 15A , R_G =51Ω, V_{GE} = ±15V , T_{vj} = 125		$t_{d(on)}$		88		ns
Rise time, inductive load			t_r		84.8		ns
Turn-off delay time, inductive load			$t_{d(off)}$		123.2		ns

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FRED, Brake-Chopper 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	10	A
Repetitive peak forward current	t_P = 1ms	I_{FRM}	20	A
I^2t value for fusing	T_{vj} =125 , t_P = 10ms, V_R = 0V	I^2t	16	A^2s

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

Parameter	Conditions		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage	I_F 10A, V_{GE} = 0V	T_{vj} = 25°C	V_F		1.90	2.25	V
		T_{vj} = 125°C			1.55		
		T_{vj} = 150°C			1.50		

Peak reverse recovery current

I_F 10A,
di/dt = 100A/µs,
V_R = 600V,
V

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		KΩ
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

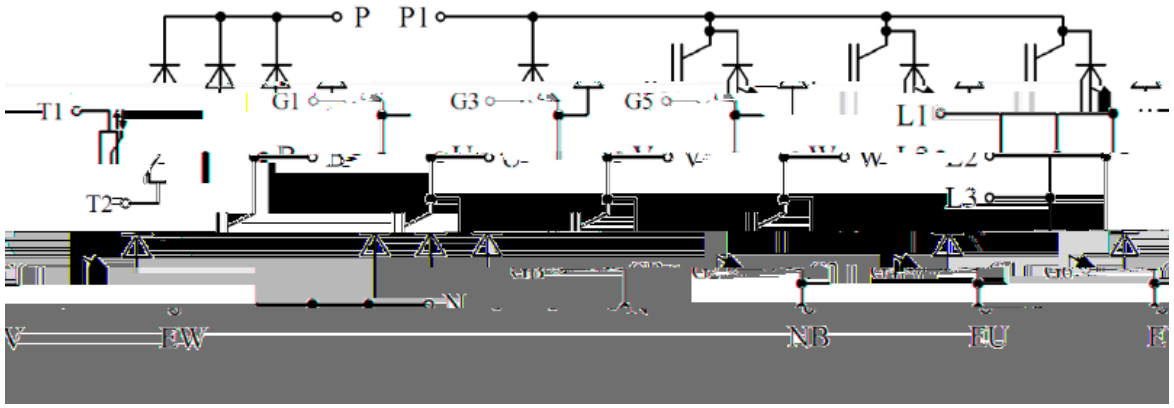
Module Characteristics

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	$R_{th(c-s)}$		0.037		K/W
Maximum Junction Temperature	Inverter, brake-chopper	$T_{vj\ max}$			175	
	rectifier				150	
Stray inductance module		L_{SCE}		30		nH
Module lead resistance, terminals - chip	per switch	$R_{CC'+EE'}$		8.0		mΩ
		$R_{AA'+CC'}$		6.0		mΩ
Storage Temperature		T_{stg}	-40		125	
Mounting force per clamp		F	20		50	N

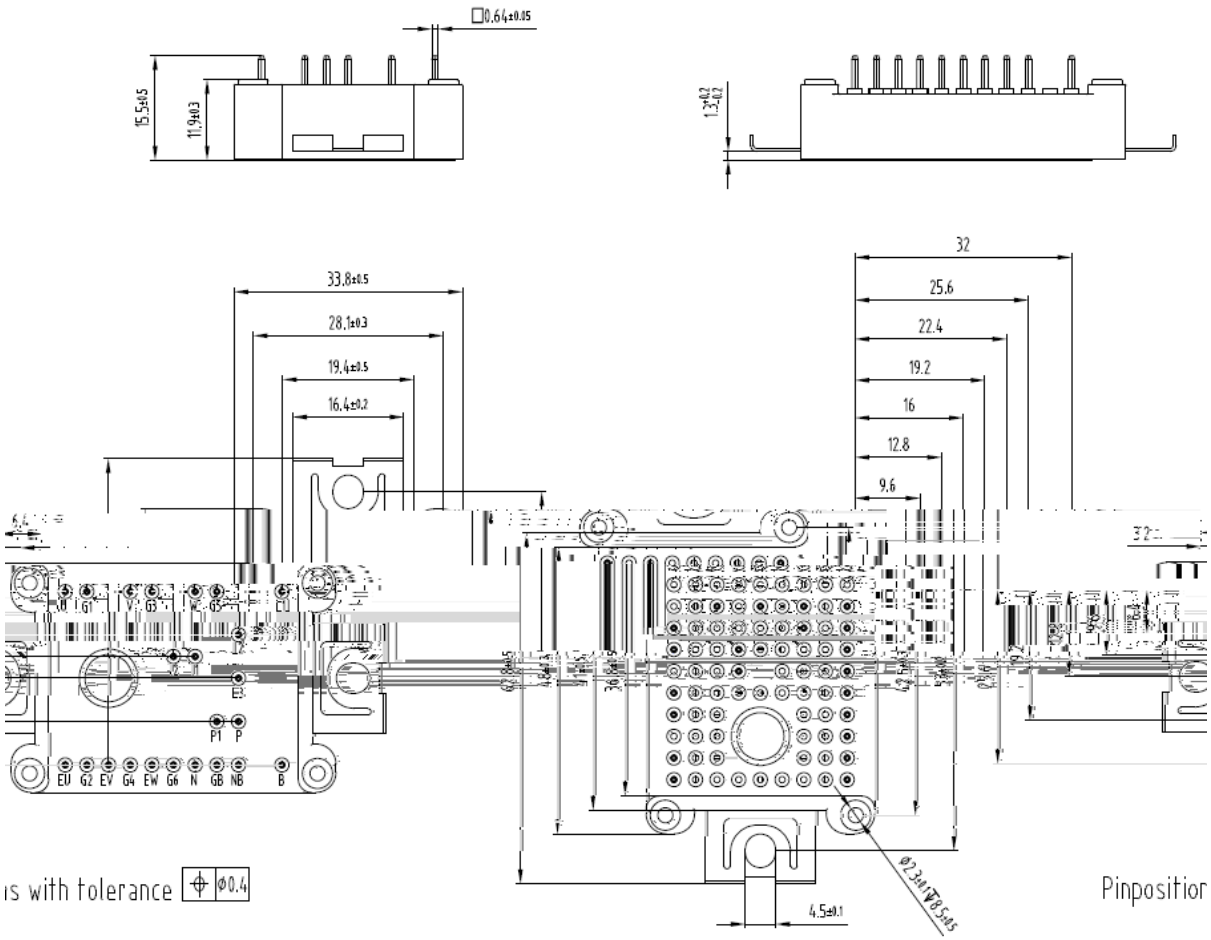
Ordering Information

Device	Marking	Package	Weight	Inner Box	Pre Carton
JMG15PM12E1S1	JMG15PM12E1S1	E1(33.8mm)	24±3g/PCS	30PCS	150PCS

Circuit Diagram

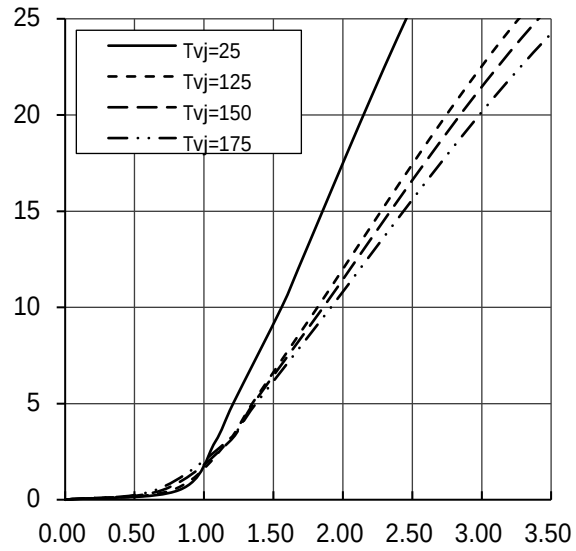


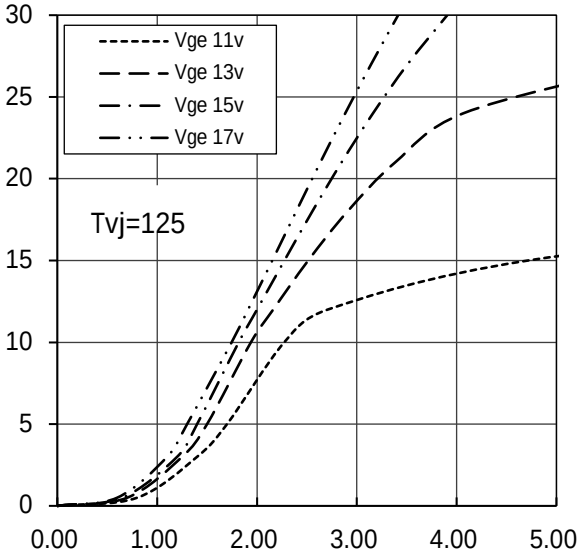
Package Outlines (mm)



Unit of measurement: mm

Typical Electrical & Thermal Characteristics





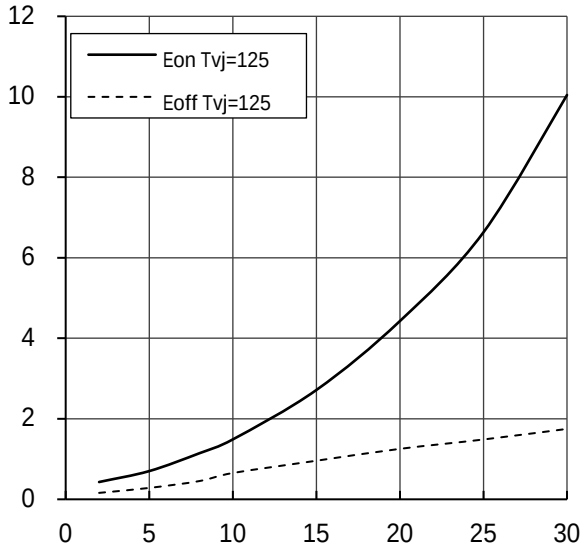


Fig 5. FRED Foward Characteristics, Inverter(typcial)

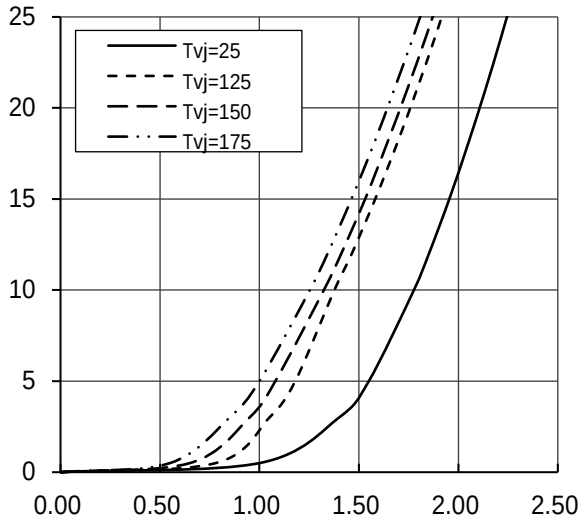


Fig 6. FRED Forward Characteristics, Inverter(typcial)

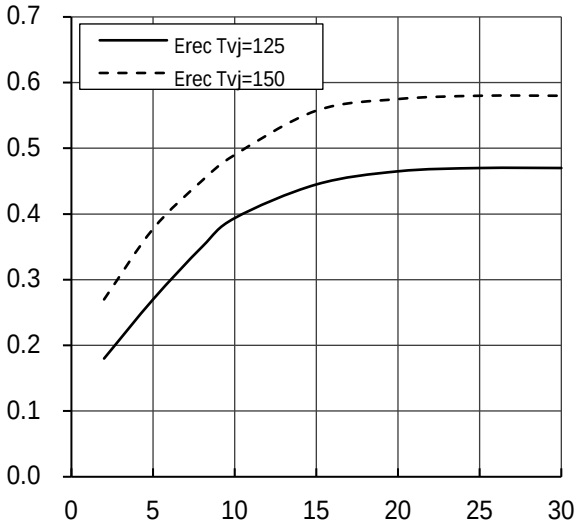
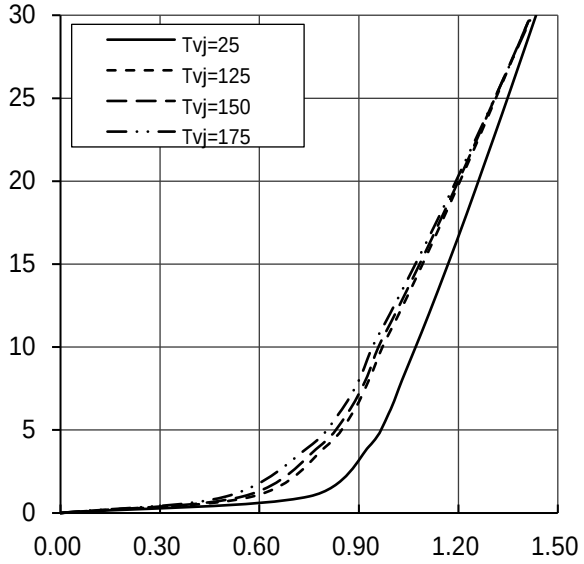


Fig 7. Diode Rectifier Forward Characteristics



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