Trench FS IGBT

Features

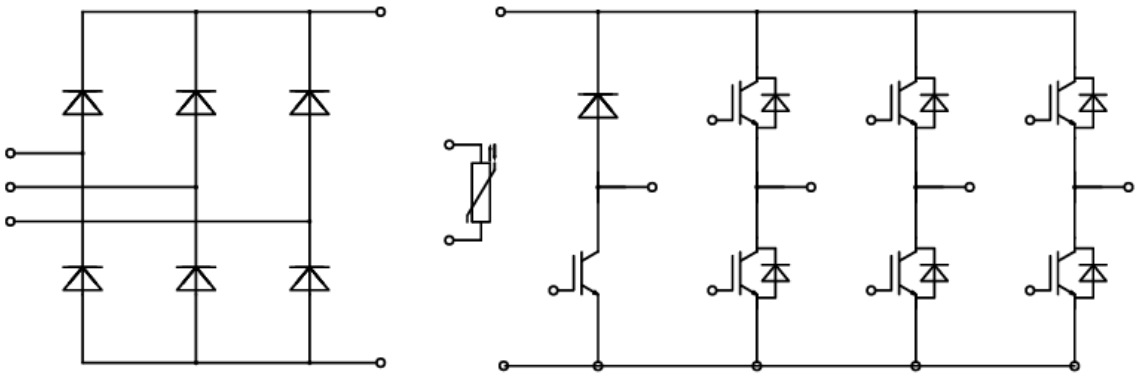
- High Power Density
- High mechanical robustness
- Compact design
- Isolated heatsink using DBC technology
- Very low forward voltage drop
- Fast & soft reverse recovery anti-parallel FWD

Product Summary

Parameter	Value	Unit
V_{CES}	1200	V
I_C(@ T_C= 100)	150	A
I_{CRM}(@ t_P= 1ms)	300	A
$V_{CE(sat)}$(Typ)	1.90	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 = 100°C	I_C	150	A
Repetitive peak collector current	t_P = 1ms	I_{CRM}	300	A
Total power dissipation	T_C = 25°C, T_{vj} = 175°C	P_{tot}	511	W

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stics (@ T_C = 25°C unless otherwise specified)

Conditions		Symbol	Values			Unit
			Min.	Typ.	Max.	
A, 5V	T_{vj} = 25°C	$V_{CE(sat)}$		1.90	2.25	V
	T_{vj} = 125°C			2.25		
E, I_C=4.0mA		$V_{GE(th)}$	5.6	6.2	6.8	V
V, V_{GE} = 20V		I_{GES}			100	nA
00V V_{GE}=0V		I_{CES}			1	mA
z, T_{vj} = 25°C, 5 V, V_{GE} = 0 V		C_{ies}		10.4		nF
		C_{oes}		0.29		nF
15V…+15V		Q_G		0.78		µC
		R_{Gint}		7.5		Ω
00V, I_C = 150A,		$t_{d(on)}$		240		ns
		t_r		126		ns
		$t_{d(off)}$		350		ns
		t_f		25		ns
		E_{on}		26.27		mJ
Turn-off energy loss per pulse		E_{off}		7.51		mJ
Turn-on delay time, inductive load	V_{CE} = 600V, I_C = 150A, R_G =6.9Ω, V_{GE} = ±15V, T_{vj} = 125 (	$t_{d(on)}$		244		µs
Rise time, inductive load		t_r		145		µs
Turn-off delay time, inductive load		$t_{d(off)}$		374		µs
Fall time, inductive load		t_f		51		µs
		E_{on}		36.93		mJ

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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	150	A
Repetitive peak forward current	t_P = 1ms	I_{FRM}	300	A

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

Parameter	Conditions	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	I_F | 150A, V_{GE} = 0V	V_F		1.80	2.20	V 530.7 f 01.24 (
	T_{vj} = 25°C					

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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
Bridge output current	T_C = 80 (	$I_{D(AV)}$	150	A
Repetitive peak forward current	t_P = 10 ms, T_{vj} = 25°C	I_{FSM}	1150	A
	t_P = 10 ms, T_{vj} = 150°C		880	
I^2t value for fusing	t_P = 10 ms, T_{vj} = 25°C	I^2t	6600	A^2s
	t_P = 10 ms, T_{vj} = 150°C		3850	

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=150A	V_F		1.10		V
Reverse current	T_{vj} = 150°C, V_R=1600V	I_R		2.0		mA
Thermal resistance, junction to case	per diode	$R_{th(j-c)}$			0.33	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 = 100°C	I_C	100	A
Repetitive peak collector current	t_P = 1ms	I_{CRM}	200	A
Total power dissipation	T_C = 25°C, T_{vj} = 175°C	P_{tot}	308	W

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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 = 100A, V_{GE} = 15V	T_{vj} = 25°C	$V_{CE(sat)}$		1.80	2.15	V
		T_{vj} = 125°C			2.15		
Gate threshold voltage	V_{CE}=V_{GE}, I_C=2.0mA		$V_{GE(th)}$	5.6	6.2	6.8	V
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V		I_{GES}			400	nA
Collector 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}		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		Ω
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 100A, R_G = 6.9Ω, V_{GE} = ±15V, T_{vj} = 25 (		$t_{d(on)}$		172		ns
Rise time, inductive load			t_r		126		ns
Turn-off delay time, inductive load			$t_{d(off)}$		302		ns
Fall time, inductive load			t_f		30		ns
Turn-on energy loss per pulse			E_{on}		11.30		mJ
Turn-off energy loss per pulse			E_{off}		4.34		mJ
Turn-on delay time, inductive load	V_{CC} = 600V, I_C = 100A, R_G = 6.9Ω, L_σ = 35 nH, V_{GE} = ±15V, T_{vj} = 125 (		$t_{d(on)}$		203		ns
Rise time, inductive load			t_r		129		ns
Turn-off delay time, inductive load			$t_{d(off)}$		342		ns
Fall time, inductive load			t_f		72		ns
Turn-on energy loss per pulse			E_{on}		16.21		mJ
Turn-off energy loss per pulse			E_{off}		5.62		mJ
SC Data	tp≤10us kV $_{GE}$≤15V k V_{CC}=900V T_{vj}=125 (		I_{SC}		550		A

T900V

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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	-				

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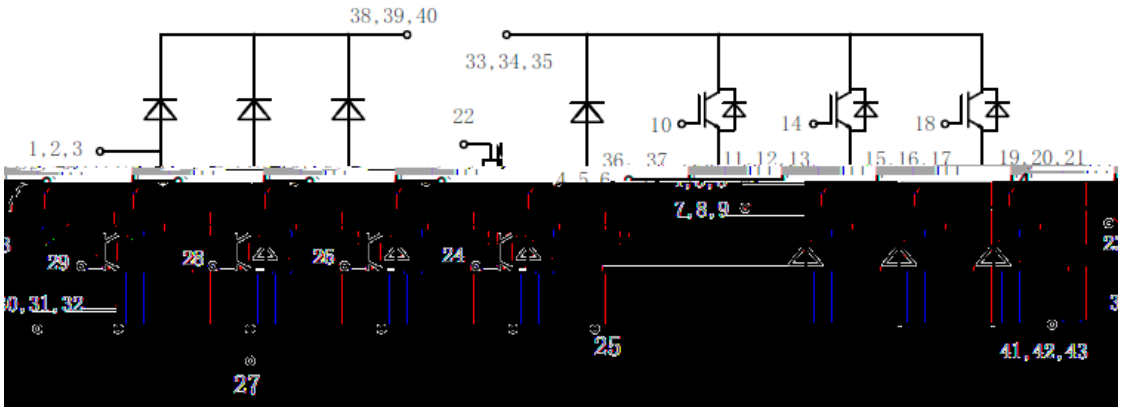
Circuit Diagram



Package Outlines (mm)

Unit of measurement: mm

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Typical Electrical & Thermal Characteristics

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

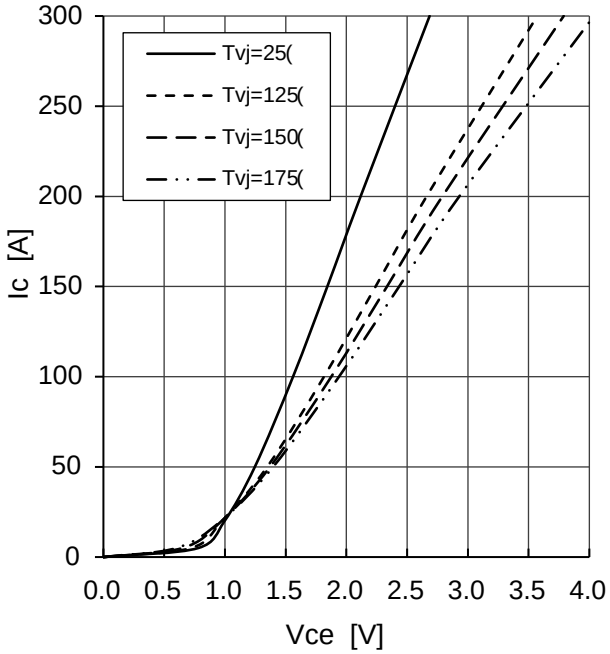

Fig 2. IGBT Output Characteristics
Inverter (typical)

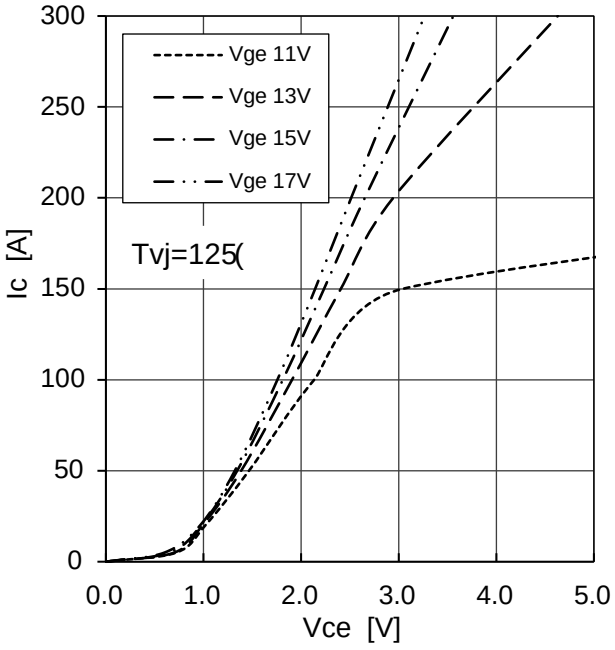

Fig 3. IGBT Transfer Characteristics
Inverter (typical) VCE=20 V

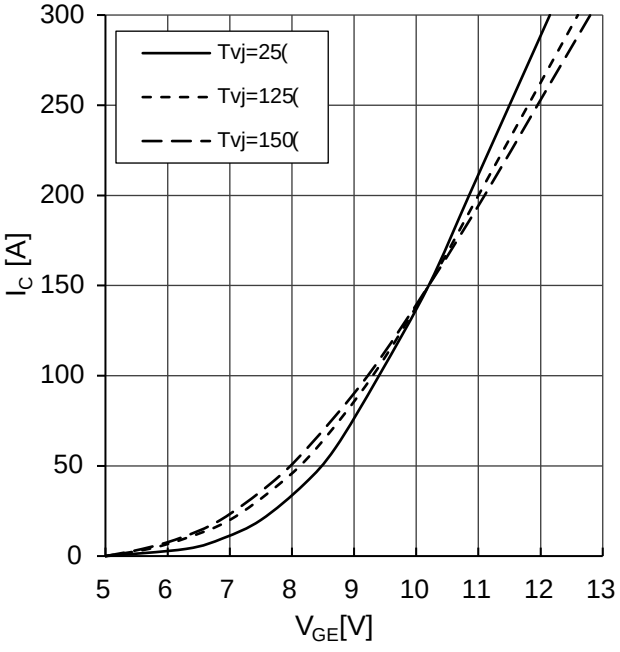

Fig 4. IGBT Switching Loss vs Ic
Inverter (typical)
Rg=6.9 Ω, VCE=600 V, VGE=±15 V

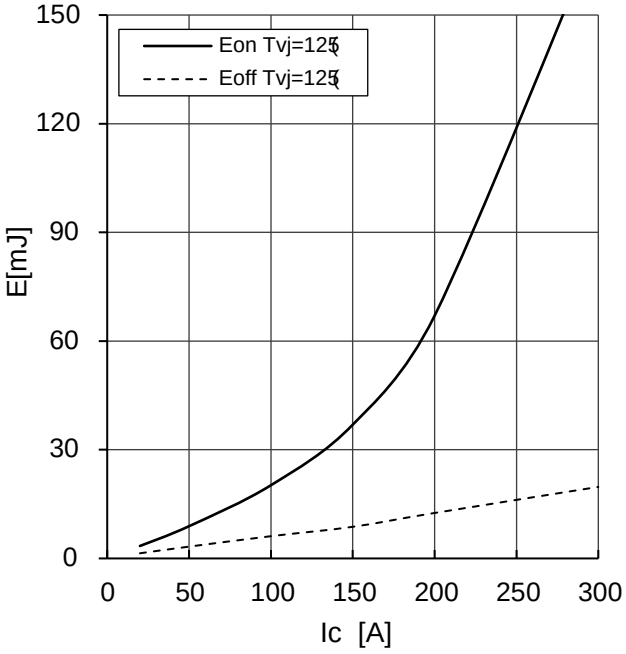

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Fig 9. FRED Switching Loss vs. Rg,
Inverter (typical)
Ic=150 A, VCE=600 V

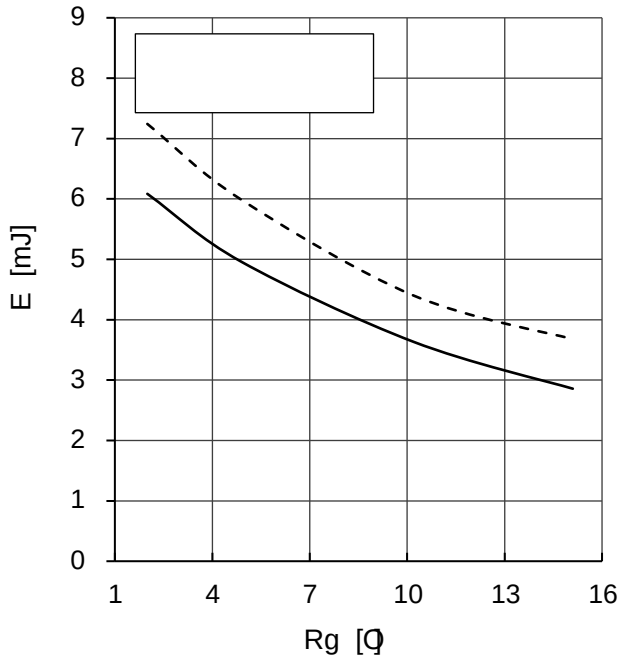

Fig 10. Diode Rectifier Forward Characteristics

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

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

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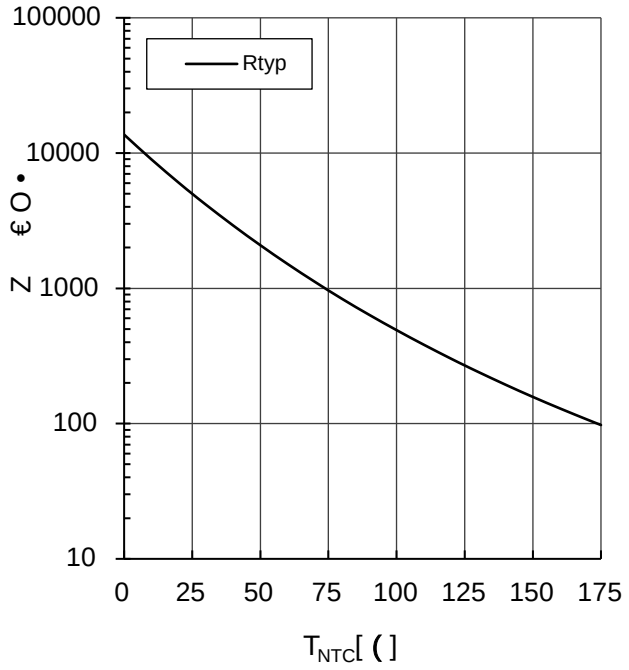
Fig 13. Temperature characteristics,
NTC thermistor (typical)



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