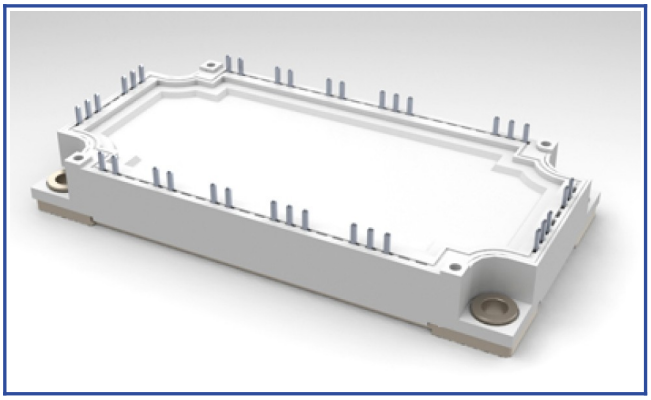
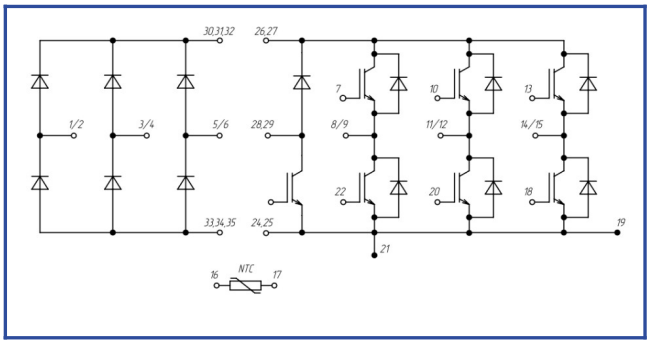
Low Inductance IGBT Module with 17 mm Height Housing

1200 V 100 A





Chip features

- IGBT chip
  - low $V_{CE(sat)}$ and E_{off} value
  - 10 µs short circuit duration at 150°C
- FRD chip
  - fast and soft reverse recovery
  - low voltage drop
- Rectifier Diode Chip
  - high value of blocking voltage

Design features

- copper baseplate
- high level of integration
- improved thermal cycling
- RoHS compliant
- integrated temperature sensor
- soldering pins

Typical application

- AC motor drives
- inverters and power supplies

Maximum rated values (inverter)

Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	V_{GE} = 0.	1200	V
Maximum allowable collector current (continuous)	$I_{C\ 25}$	$T_{vj\ (max)}$ = 175°C; T_c = 25°C.	140	A
	$I_{C\ 100}$	$T_{vj\ (max)}$ = 175°C; T_c = 100°C.	100	A
Repetitive peak collector current*1	I_{CRM}	I_{CRM} = 2 x $I_{C\ nom}$; t_p = 1 ms.	200	A
Short-circuit duration	t_{psc}	T_{vj} = 25°C; V_{GE} = ±15 V; V_{CE} = 600 V.	10	µs
		T_{vj} = 150°C; V_{GE} = ±15 V; V_{CE} = 600 V.	10	
Gate-Emitter voltage	V_{GES}		±20	V
Junction area operating temperature*2	$T_{vj\ (op)}$		-40…+175	°C
Inverse diode				
Repetitive peak reverse voltage	V_{RRM}	V_{GE} = 0 V.	1200	V
Maximum allowable forward current (continuous)	$I_{F\ 25}$	$T_{vj\ (max)}$ = 175°C; T_c = 25°C.	140	A
	$I_{F\ 100}$	$T_{vj\ (max)}$ = 175°C; T_c = 100°C.	100	A
Repetitive peak forward current*1	I_{FRM}	I_{FRM} = 2 x $I_{F\ nom}$; t_p = 1 ms.	200	A
Junction area operating temperature*2	$T_{vj\ (op)}$		-40…+175	°C

Characteristics (inverter)

Definition	Symbol	Conditions		Value min.	Value typ.	Value max.	Unit.
IGBT							
Collector-Emitter saturation voltage	V_{CEsat}	V_{GE} = +15 V; I_C = 100 A; t_u = 1000 µs.	T_{vj} = 25°C	-	1.70	-	V
			T_{vj} = 150°C	-	2.00	-	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 4 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		5.20	5.80	6.50	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 1200 V; t_u = 50 ms; V_{GE} = 0.	T_{vj} = 25°C	-	-	1.00	mA
			T_{vj} = 150°C	-	-	10.00	mA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0; V_{GE} = ±20 V; T_{vj} = 25°C; t_u = 30 ms.		-	-	400	nA
Input capacitance	C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz; T_{vj} = 25°C.		-	-	-	nF
Reverse transfer capacitance	C_{res}			-	-	-	nF
Total gate charge	Q_G	I_C = 100 A; V_{CE} = 600 V; V_{GE} = -8...+15 V.		-	-	-	nC
Internal gate resistance	R_{Gint}	T_{vj} = 25°C.		-	-	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{CE} = 600 V; V_{GE} = ±15 V; $I_{C\,max}$ = 100 A; R_G = - Ω; L_s = 56 nH.	T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	ns
Rise time	t_{ri}		T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	ns
Turn-on energy	E_{on}		T_{vj} = 25°C	-	-	-	mJ
			T_{vj} = 150°C	-	-	-	mJ
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	ns
Fall time	t_{fi}		T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	ns
Turn-off energy	E_{off}		T_{vj} = 25°C	-	-	-	mJ
			T_{vj} = 150°C	-	-	-	mJ
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 150°C; I_{CE1} = 25 A; I_{CE2} = 100 A; t_u = 1000 µs.		-	-	-	V
On-State slope resistance (IGBT)	r_{CE0}			-	-	-	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; I_{test} = 1.5 A; V_{GE} = +15 V.		-	-	-	K/W
Inverse diode							
Forward voltage drop	V_F	I_F = 100 A; V_{GE} = 0; t_u = 1000 µs.	T_{vj} = 25°C	-	2.00	-	V
			T_{vj} = 150°C	-	1.65	-	V
Reverse recovery time	t_{rr}	V_{CE} = 600 V; V_{GE} = ±15 V; $I_{C\,max}$ = 100 A; R_G = - Ω; L_s = 56 nH.	T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	ns
Peak reverse current	I_{RM}		T_{vj} = 25°C	-	-	-	A
			T_{vj} = 150°C	-	-	-	A
Recovered charge	Q_r		T_{vj} = 25°C	-	-	-	µC
			T_{vj} = 150°C	-	-	-	µC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	-	-	mJ
			T_{vj} = 150°C	-	-	-	mJ
Threshold voltage	$V_{(T0)}$	T_{vj} = 150°C; V_{GE} = 0; I_{F1} = 25 A; I_{F2} = 100 A; t_u = 1000 µs		-	-	-	V
Forward slope resistance	r_T			-	-	-	mΩ
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; I_{test} = 1.5 A; V_{GE} = +15 V.		-	-	-	K/W

Maximum rated values (chopper)

Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	V_{GE} = 0.	1200	V
Maximum allowable collector current (continuous)	$I_{C\ 25}$	$T_{vj\ (max)}$ = 175°C; T_c = 25°C.	100	A
	$I_{C\ 100}$	$T_{vj\ (max)}$ = 175°C; T_c = 100°C.	75	A
Repetitive peak collector current*1	I_{CRM}	I_{CRM} = 2 x $I_{C\ nom}$; t_p = 1 ms.	150	A
Short-circuit duration	t_{psc}	T_{vj} = 25°C; V_{GE} = ±15 V; V_{CE} = 600 V.	10	µs
		T_{vj} = 150°C; V_{GE} = ±15 V; V_{CE} = 600 V.	10	
Gate-Emitter voltage	V_{GES}		±20	V
Junction area operating temperature*2	$T_{vj\ (op)}$		-40...+175	°C
Inverse diode				
Repetitive peak reverse voltage	V_{RRM}	V_{GE} = 0 V.	1200	V
Maximum allowable forward current (continuous)	$I_{F\ 25}$	$T_{vj\ (max)}$ = 175°C; T_c = 25°C.	70	A
	$I_{F\ 100}$	$T_{vj\ (max)}$ = 175°C; T_c = 100°C.	50	A
Repetitive peak forward current*1	I_{FRM}	I_{FRM} = 2 x $I_{F\ nom}$; t_p = 1 ms.	100	A
Junction area operating temperature*2	$T_{vj\ (op)}$		-40...+175	°C

Characteristics (chopper)

Definition	Symbol	Conditions		Value min.	Value typ.	Value max.	Unit.
IGBT							
Collector-Emitter saturation voltage	V_{CEsat}	V_{GE} = +15 V; I_C = 75 A; t_u = 1000 µs.	T_{vj} = 25°C	-	1.65	-	V
			T_{vj} = 150°C	-	2.00	-	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 3 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		5.20	5.80	6.50	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 1200 V; t_u = 50 ms; V_{GE} = 0.	T_{vj} = 25°C	-	-	1.00	mA
			T_{vj} = 150°C	-	-	10.00	mA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0; V_{GE} = ±20 V; T_{vj} = 25°C; t_u = 30 ms.		-	-	400	nA
Input capacitance	C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V;		-	6.60	-	nF
Reverse transfer capacitance	C_{res}	f = 1 MHz; T_{vj} = 25°C.		-	0.062	-	nF
Total gate charge	Q_G	I_C = 75 A; V_{CE} = 600 V; V_{GE} = -8...+15 V.		-	-	-	nC
Internal gate resistance	R_{Gint}	T_{vj} = 25°C.		-	10.00	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{CE} = 600 V; V_{GE} = ±15 V; $I_{C\ max}$ = 75 A; R_G = - Ω; L_s = 56 nH.	T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	
Rise time	t_{ri}		T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	
Turn-on energy	E_{on}		T_{vj} = 25°C	-	-	-	mJ
			T_{vj} = 150°C	-	-	-	
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	
Fall time	t_{fi}		T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	
Turn-off energy	E_{off}		T_{vj} = 25°C	-	-	-	mJ
			T_{vj} = 150°C	-	-	-	
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 150°C; I_{CE1} = 20 A; I_{CE2} = 75 A; t_u = 1000 µs.		-	-	-	V
On-State slope resistance (IGBT)	r_{CE0}			-	-	-	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; I_{test} = 1.5 A; V_{GE} = +15 V.		-	-	-	K/W

Inverse diode							
Forward voltage drop	V_F	I_F = 50 A; V_{GE} = 0; t_u = 1000 µs.	T_{vj} = 25°C	-	2.00	-	V
			T_{vj} = 150°C	-	1.70	-	V
Reverse recovery time	t_{rr}	V_{CE} = 600 V; V_{GE} = ±15 V; $I_{C\,max}$ = 50 A; R_G = - Ω; L_s = 56 nH.	T_{vj} = 25°C	-	-	-	ns
			T_{vj} = 150°C	-	-	-	ns
Peak reverse current	I_{RM}		T_{vj} = 25°C	-	-	-	A
			T_{vj} = 150°C	-	-	-	A
Recovered charge	Q_r		T_{vj} = 25°C	-	-	-	µC
			T_{vj} = 150°C	-	-	-	µC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	-	-	mJ
			T_{vj} = 150°C	-	-	-	mJ
Threshold voltage	$V_{(T0)}$	T_{vj} = 150°C; V_{GE} = 0; I_{F1} = 12.5 A; I_{F2} = 50 A; t_u = 1000 µs		-	-	-	V
Forward slope resistance	r_T			-	-	-	mΩ
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; I_{test} = 1.5 A; V_{GE} = +15 V.		-	-	-	K/W

Maximum rated values (rectifier)

Definition	Symbol	Conditions	Value	Unit
Repetitive peak reverse voltage	V_{RRM}		1800	V
Maximum allowable forward current (continuous)	$I_{F\,25}$	$T_{vj\,(max)}$ = 150°C; T_c = 25°C.	100	A
	$I_{F\,100}$	$T_{vj\,(max)}$ = 150°C; T_c = 100°C.	-	A
Repetitive peak forward current[*1]	I_{FRM}	t_p = 10 ms.	840	A
Safety factor	I^2t	t_p = 10 ms.	3500	A^2s
Junction area operating temperature[*2]	$T_{vj\,(op)}$		-40…+150	°C

Characteristics (rectifier)

Definition	Symbol	Conditions		Value			Unit.
				min.	typ.	max.	
Forward voltage drop	V_F	I_F = 100 A; V_{GE} = 0; t_u = 1000 µs.	T_{vj} = 25°C	-	1.00	-	V
			T_{vj} = 150°C	-	-	-	V
Repetitive peak reverse current	I_{RRM}	V_R = 1800 V.	T_{vj} = 25°C	-	10.00	-	µA
			T_{vj} = 125°C	-	2.00	-	mA
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; I_{test} = 1.5 A; V_{GE} = +15 V.		-	-	-	K/W

Maximum rated values (module)

Definition	Symbol	Conditions	Value	Unit
Storage temperature	T_{stg}		-40…+50	°C
Isolation voltage	V_{isol}	AC sin 50 Hz; t = 1 min.	3000	V

Characteristics (module)

Definition	Symbol	Conditions		Value min.	Value typ.	Value max.	Unit.
Pin resistance	R_{Pxy}	T_{vj} = 25°C.	$R_{CC'+EE'}$	-	4.00	-	mΩ
			$R_{AA'+CC'}$	-	2.00	-	
Parasitic inductance between terminals	L_{Pce}			-	60.00	-	nH
Thermistor resistance	R_{t25}	T_{vj} = 25°C		4850	-	6225	Ω
		T_{vj} = 100°C		475	-	554	
Coefficient of temperature sensitivity	$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50} (1/T_2 - 1/T_1)]$, T_1 = 298.15 K		-	3375	-	K
Thermal resistance case to heatsink	R_{thCH}	per module		-	-	-	K/W
Mounting torque for screws to heatsink	M_s	to heatsink M5		3.00	-	6.00	N*m
Weight	W			-	300	-	g

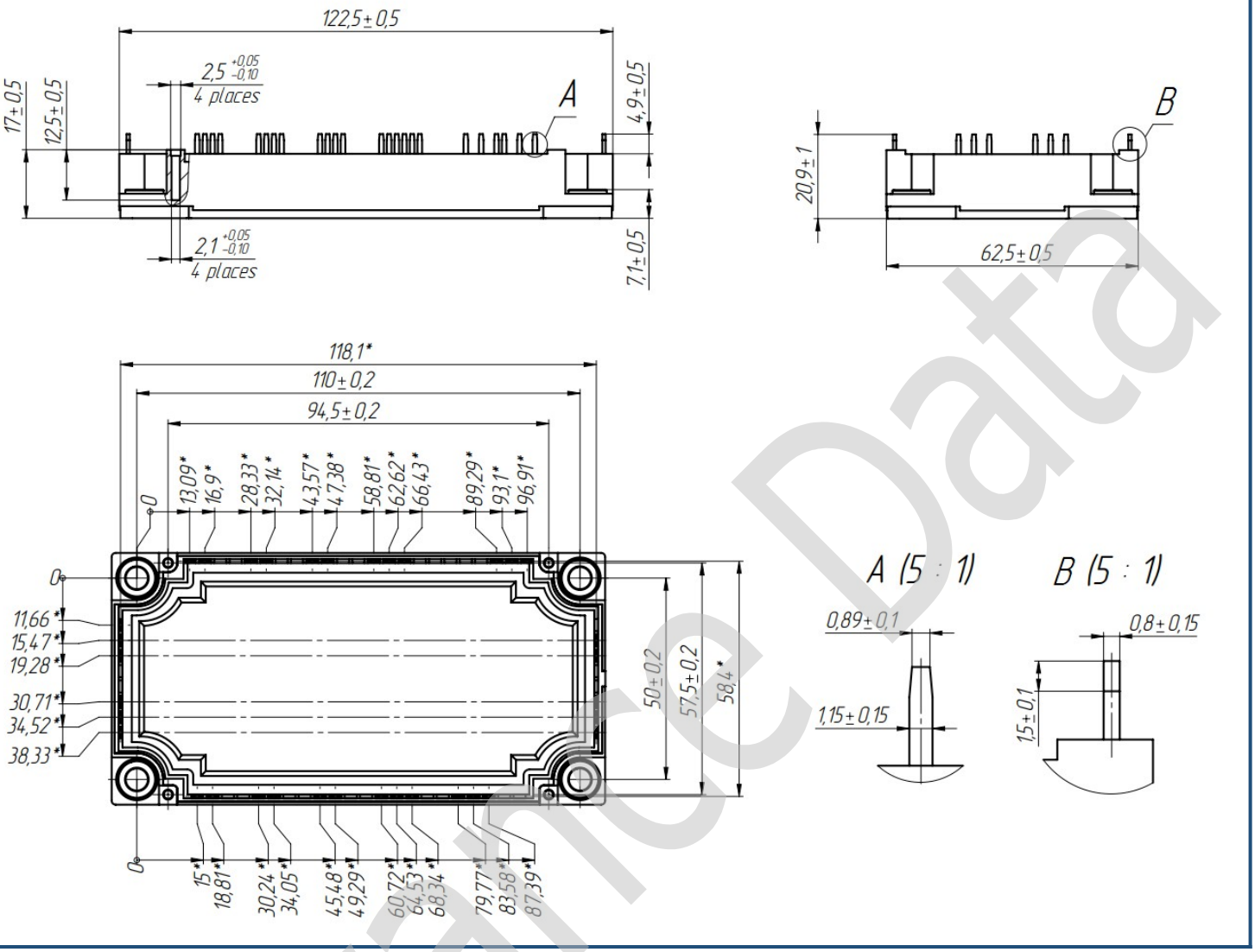
Notes:

*1 Pulse width and repetition rate should be such that device junction temperature does not exceed maximum T_{vj} rating;

*2 The recommended operating junction temperature $T_{vj\,op}$ = -40...+150°C.
Case temperature 125°C max;
Insulating material operating temperature 125°C max;

«-» Data will be refined as additional tests are conducted and statistics are collected.

Overall dimensions: Package type – RA



Part numbering guide

MIRA	-	IRB	12	LA	-	100	N	
MIRA								IGBT module package type: DA
		IRB						The module integrates an inverter, a rectifier and a brake chopper
			12					Voltage rating (V_{CES}/100)
				LA				IGBT+FRD chipset modification
						100		Current Rating
							N	Climatic version: normal climate