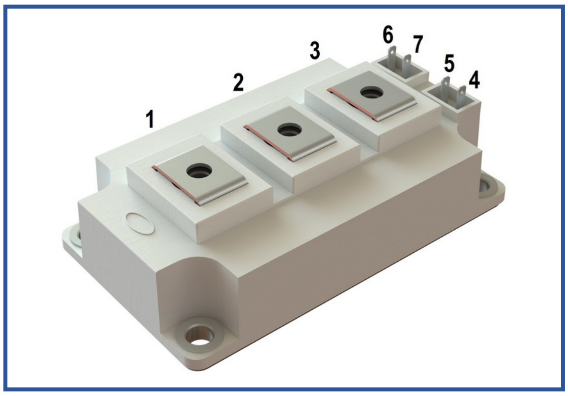
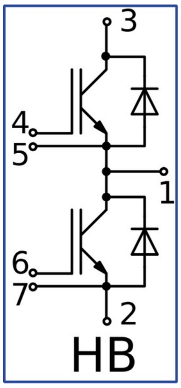
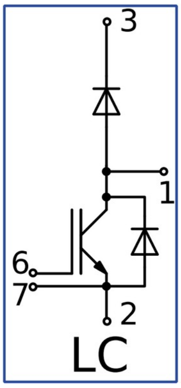
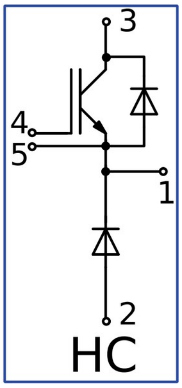
Industry standard 62mm IGBT module

1700 V 300 A









Chip features

- IGBT chip
  - Trench FS
  - low $V_{CE(sat)}$ value
  - 10 µs short circuit of 150°C
  - square RBSOA of $2xI_C$
  - low EMI
- FRD chip
  - fast and soft reverse recovery
  - low voltage drop

Design features

- copper baseplate
- Al_2O_3 DBC substrate
- ultrasonically welded power terminals
- Improved thermal cycling
- RoHS compliant

Typical application

- AC motor drives
- solar inverter
- air conditioning
- high power converters and UPS

Maximum rated values

Definition	Symbol	Conditions	Value	Unit
IGBT				
Collector-Emitter voltage	V_{CES}	V_{GE} = 0.	1700	V
Collector current (nominal)	$I_{C\ nom}$		300	A
Collector current (maximum continuous)	$I_{C\ 25}$	$T_{vj\ (max)}$ = 175°C; T_c = 25°C.	366	A
	$I_{C\ 80}$	$T_{vj\ (max)}$ = 175°C; T_c = 80°C.	300	A
Repetitive peak collector current[*1]	I_{CRM}	I_{CRM} = 3 x $I_{C\ nom}$; t_p = 1 ms.	900	A
Short-circuit duration	t_{psc}	T_{vj} = 25°C; V_{GE} = ±15 V; V_{CE} = 1000 V; $R_{G\ on}$ = $R_{G\ off}$ = 2.2 Ω; I_{Cmax} < 1900 A.	10	µs
		T_{vj} = 150°C; V_{GE}= ±15 V; V_{CE}= 1000 V; $R_{G\ on}$ = $R_{G\ off}$ = 2.2 Ω; I_{Cmax} < 1550 A.	10	
Gate-Emitter voltage	V_{GES}		±20	V
Junction operating temperature	$T_{vj\ (op)}$		-40…+150	ºC
Inverse diode \ Freewheeling diode				
Repetitive peak reverse voltage	V_{RRM}	V_{GE} = 0 V.	1700	V
Forward current (nominal)	$I_{F\ nom}$		300	A
Forward current (maximum continuous)	$I_{F\ 25}$	$T_{vj\ (max)}$ = 175°C; T_c = 25°C.	290	A
	$I_{F\ 80}$	$T_{vj\ (max)}$ = 175°C; T_c = 80°C.	218	A
Repetitive peak forward current[*1]	I_{FRM}	I_{FRM} = 3 x $I_{F\ nom}$; t_p = 1 ms.	900	A
Junction operating temperature	$T_{vj\ (op)}$		-40…+150	°C
Module				
Storage temperature	T_{stg}		-55…+50	°C
Isolation voltage	U_{isol}	AC sin 50 Hz; t = 1 min.	4000	V

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

Characteristics

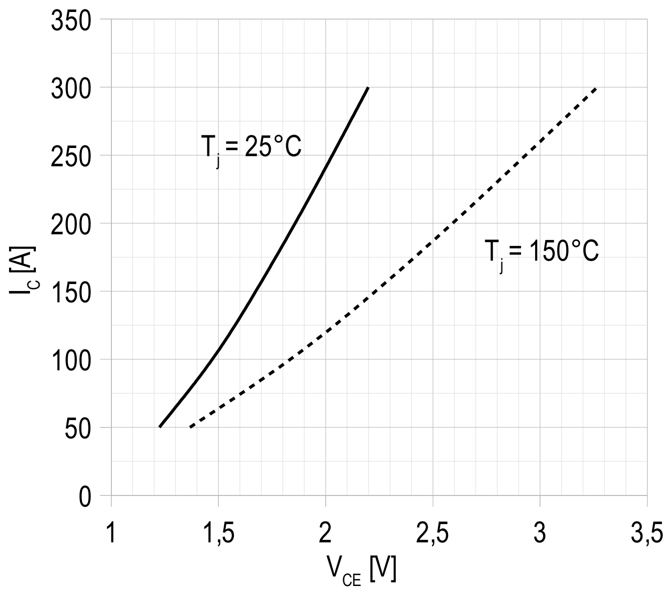
Definition	Symbol	Conditions		Value			Unit.
				min.	typ.	max.	
IGBT							
Collector-Emitter saturation voltage	V_{CEsat}	V_{GE} = +15 V; I_C = 300 A; t_u = 1000 мкс.	T_{vj} = 25°C	2.16	2.19	2.33	V
			T_{vj} = 150°C	2.95	3.23	2.96	V
Gate-Emitter threshold voltage	$V_{GE(th)}$	I_C = 6 mA; V_{CE} = V_{GE}; T_{vj} = 25°C; t_u = 2 ms.		5.29	5.64	6.36	V
Collector-Emitter cut-off current	I_{CES}	V_{CE} = 1700 V; t_u = 50 ms; V_{GE} = 0.	T_{vj} = 25°C	3.71	4.57	300	μA
			T_{vj} = 150°C	0.98	1.41	5.00	mA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0; V_{GE} = ±20 V; T_{vj} = 25°C; t_u = 30 ms.		12.2	20.4	500	nA
Input capacitance	C_{ies}	V_{CE} = 10 V; V_{GE} = 0 V; f = 1 MHz; T_{vj} = 25°C.		-	27.2	-	nF
Output capacitance	C_{oes}			-	1.40	-	nF
Reverse transfer capacitance	C_{res}			-	2.80	-	nF
Total gate charge	Q_G	I_C = 300 A; V_{CE} = 920 V; V_{GE} = - 8÷15 V.		-	3483	3738	nC
Internal gate resistance	R_{Gint}	T_{vj} = 25°C.		-	2.50	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{CE} = 920 V; V_{GE} = ±15 V; $I_{C\ max}$ = 300 A; R_G = 2.2 Ω; L = 56 nH.	T_{vj} = 25°C	452	488	580	ns
			T_{vj} = 150°C	556	568	660	
Rise time	t_{ri}		T_{vj} = 25°C	58.0	59.0	70.0	ns
			T_{vj} = 150°C	63.0	64.0	80.0	
Turn-on energy	E_{on}		T_{vj} = 25°C	39.0	41.0	56.0	mJ
			T_{vj} = 150°C	68.0	72.0	88.0	
Turn-off delay time	$t_{d(off)}$		T_{vj} = 25°C	640	650	815	ns
			T_{vj} = 150°C	820	840	990	
Fall time	t_{fi}		T_{vj} = 25°C	468	480	550	ns
			T_{vj} = 150°C	596	616	740	
Turn-off energy	E_{off}		T_{vj} = 25°C	63.0	66.0	82.0	mJ
			T_{vj} = 150°C	89.0	93.0	120	
Collector-emitter threshold voltage	V_{CE0}	V_{GE} = +15 V; T_{vj} = 150°C; I_{CE1} = 75 A; I_{CE2} = 300 A; t_u = 1000 μs.		0.98	1.02	1.07	V
On-State slope resistance (IGBT)	r_{CE0}			6.36	7.26	8.25	mΩ
Thermal resistance junction to case	$R_{th(j-c)}$	DC; I_{CE} = 220±10 A; I_{test} = 1.0 A; V_{GE} = +15 V.		-	0.096	0.100	K/W
Inverse diode \ Freewheeling diode							
Forward voltage drop	V_F	I_F = 300 A; V_{GE} = 0; t_u = 1000 μs.	T_{vj} = 25°C	1.89	1.94	2.10	V
			T_{vj} = 150°C	2.24	2.51	2.33	V
Reverse recovery time	t_{rr}	V_{CE} = 920 V; V_{GE} = ±15 V; $I_{C\ max}$ = 300 A; $R_{G\ on}$ = 2.2 Ω; L = 56 nH.	T_{vj} = 25°C	157	168	200	ns
			T_{vj} = 150°C	259	330	470	ns
Peak reverse recovery current	I_{rrM}		T_{vj} = 25°C	324	339	390	A
			T_{vj} = 150°C	355	376	440	A
Reverse recovered charge	Q_{rr}		T_{vj} = 25°C	31.0	33.0	60.0	μC
			T_{vj} = 150°C	53.0	60.0	100	μC
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	47.0	50.0	63.0	mJ
			T_{vj} = 150°C	83.0	87.0	110	mJ
Threshold voltage	$V_{(T0)}$	T_{vj} = 150°C; V_{GE} = 0; I_{CE1} = 75 A; I_{CE2} = 300 A; t_u = 1000 μs		0.87	0.90	0.96	V
Forward slope resistance	r_T			4.40	5.19	6.10	mΩ
Thermal resistance junction to case	$R_{th(JC-D)}$	DC; I_{CE} = 200±10 A; I_{test} = 1.0 A; V_{GE} = +15 V.		-	0.176	0.190	K/W

Module							
Pin resistance	R_{Pxy}	T_{vj} = 25°C.	R_{P12}	-	0.28	0.50	mΩ
			R_{P13}	-	0.38	0.50	
Parasitic inductance between terminals	L_{Pce}			-	22	-	nH
Thermal resistance case to heatsink	R_{thCH}	per module		-	0.02	0.04	K/W
Mounting torque for screws to heatsink	M_s	to heatsink M6		3	-	5	N*m
Mounting torque for terminal screws	M_t	to terminals M6		2.25	2.50	2.75	N*m
Weight	W			-	318	340	g

Notes:

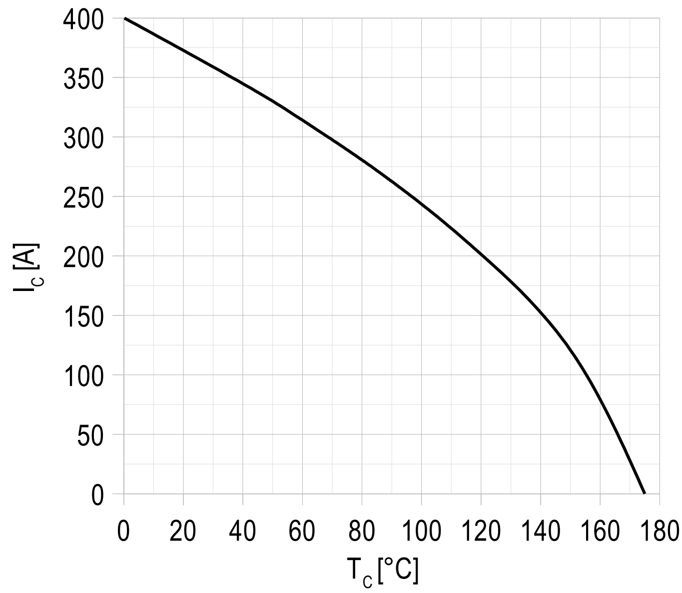
- Insulating material operating temperature 125°C max;
- Case temperature 125°C max;
- The recommended operating junction temperature $T_{vj\ op}$ = - 40 ÷ +150°C.

Chart 1 – typ. output characteristic, IGBT.



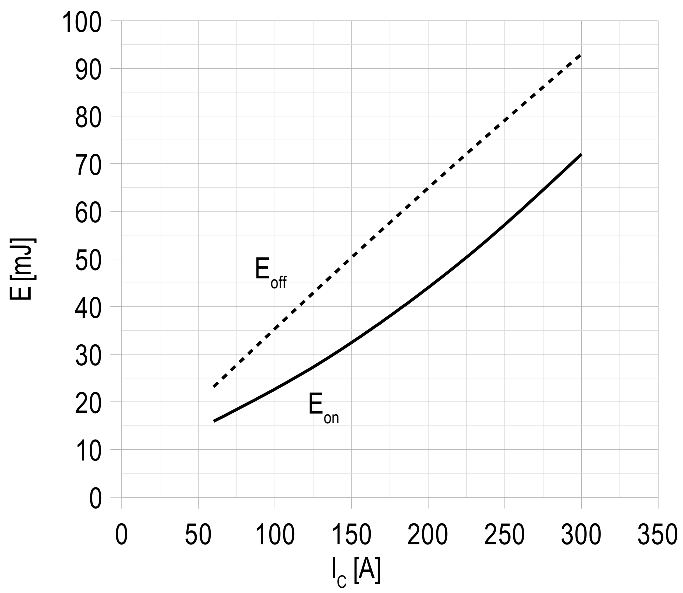
V_{GE} = +15 V.

Chart 2 – max. rated current vs temperature.



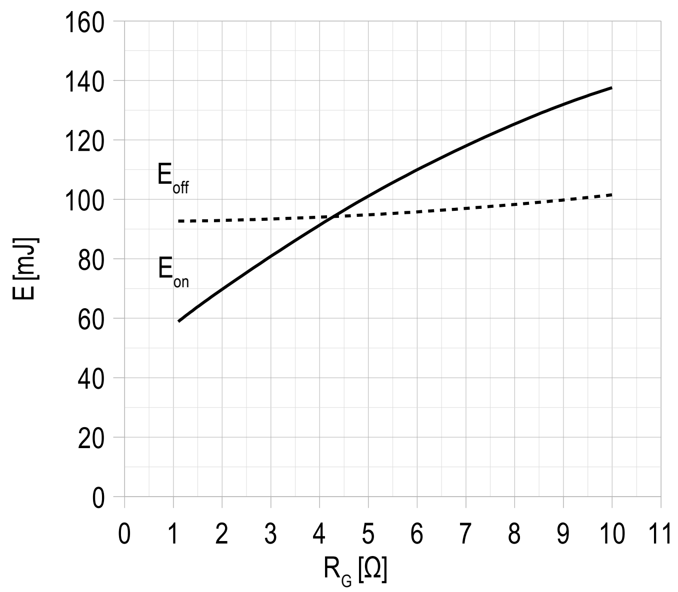
DC;
V_{GE} = +15 V;
$T_{vj\ (max)}$ = 175°C.

Chart 3 – typ. turn-on/-off energy vs rated current, IGBT.



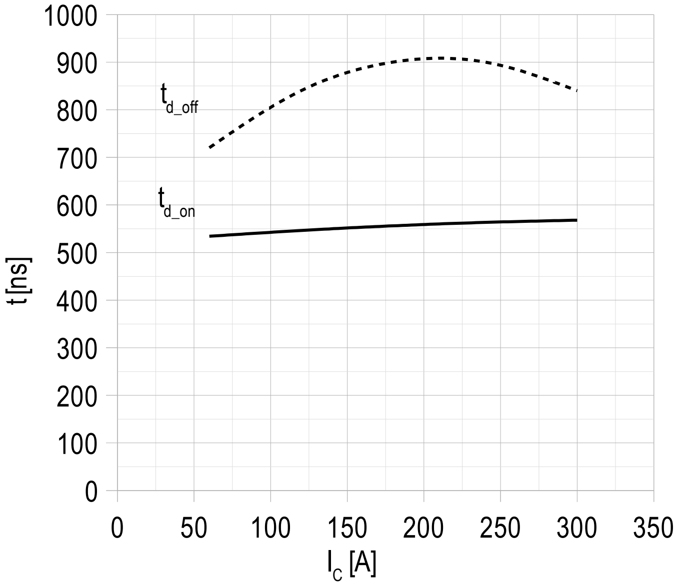
V_{CE} = 920 V;
V_{GE} = ±15 V;
R_G = 2.2 Ω;
L = 56 nH;
$T_{vj\ (max)}$ = 150°C.

Chart 4 – typ. turn-on/-off energy vs gate resistance, IGBT.



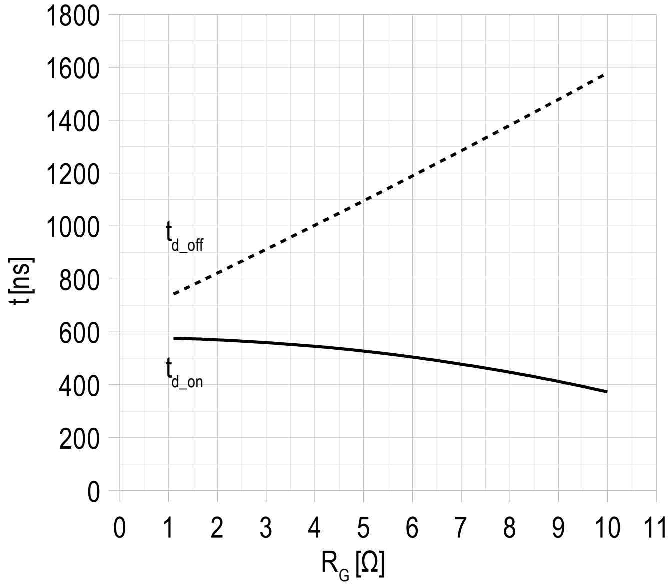
V_{CE} = 920 V;
V_{GE} = ±15 V;
$I_{C\ max}$ = 300 A;
L = 56 nH;
$T_{vj\ (max)}$ = 150°C.

Chart 5 – typ. switching times vs rated current, IGBT.



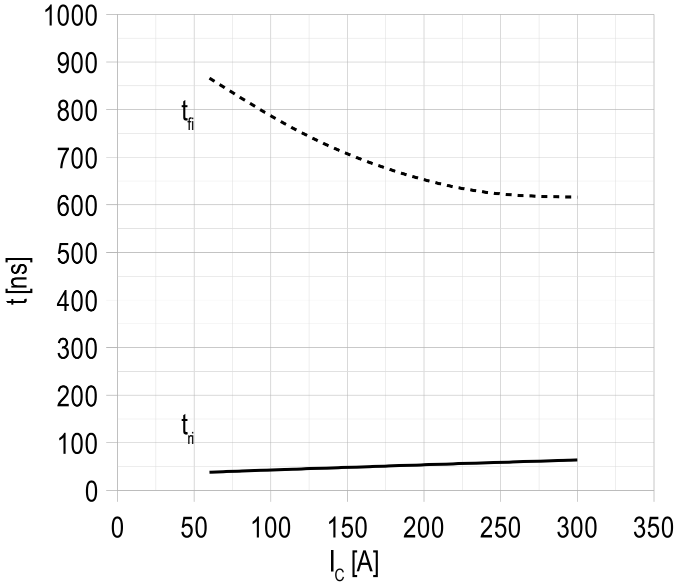
V_{CE} = 920 V;
V_{GE} = ±15 V;
R_G = 2.2 Ω;
L = 56 nH;
$T_{vj\,(max)}$ = 150°C.

Chart 6 – typ. switching times vs gate resistance, IGBT.



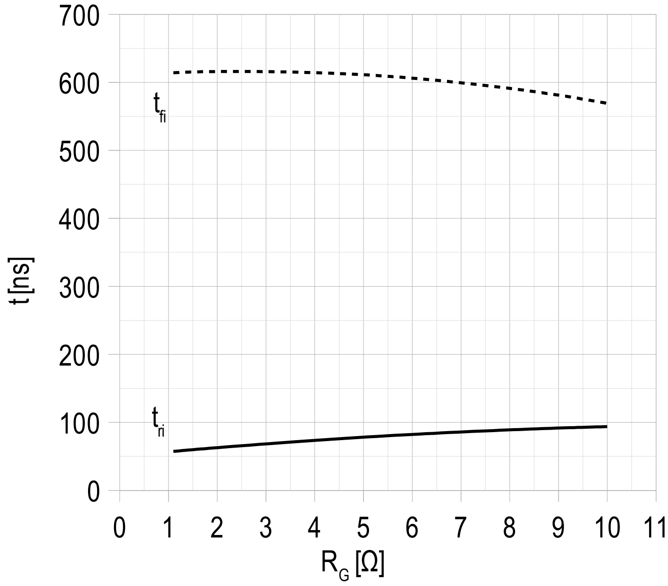
V_{CE} = 920 V;
V_{GE} = ±15 V;
$I_{C\,max}$ = 300 A;
L = 56 nH;
$T_{vj\,(max)}$ = 150°C.

Chart 7 – typ. switching times vs rated current, IGBT.



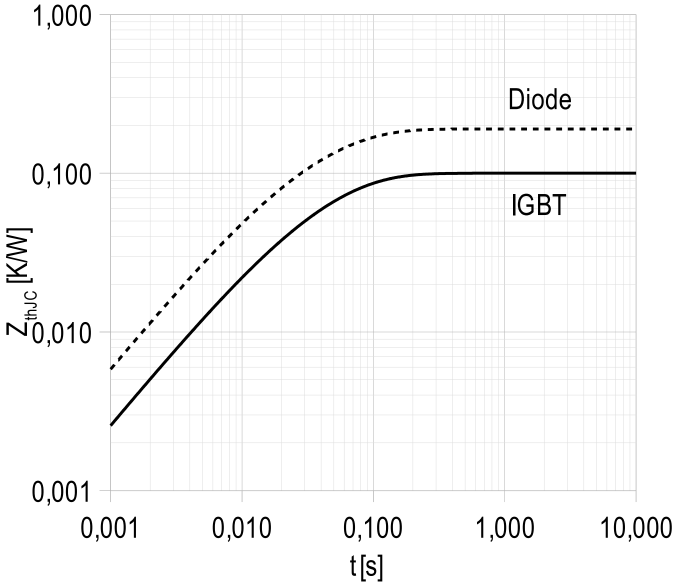
V_{CE} = 920 V;
V_{GE} = ±15 V;
R_G = 2.2 Ω;
L = 56 nH;
$T_{vj\,(max)}$ = 150°C.

Chart 8 – typ. switching times vs gate resistance, IGBT.



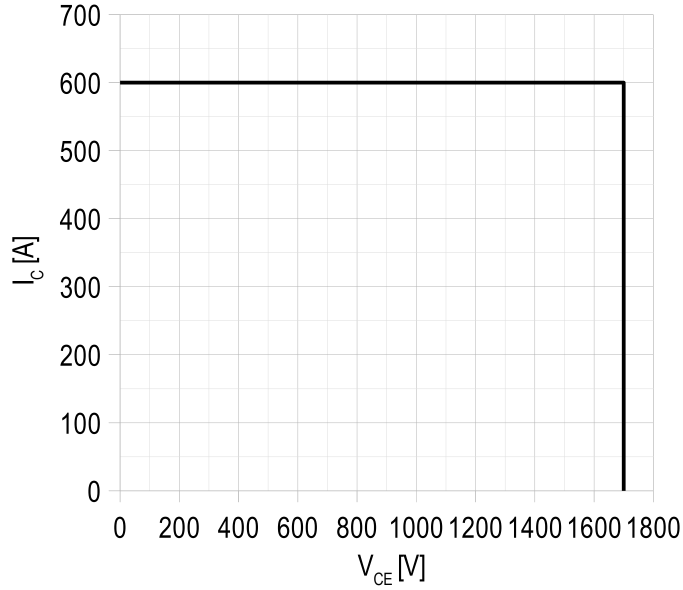
V_{CE} = 920 V;
V_{GE} = ±15 V;
$I_{C\,max}$ = 300 A;
L = 56 nH;
$T_{vj\,(max)}$ = 150°C.

Chart 9 – max. transient thermal impedance .



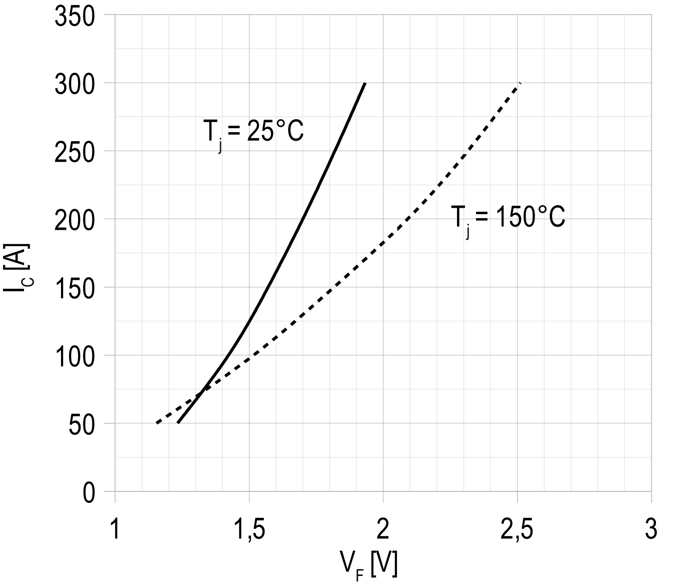
Single pulse;
V_{GE} = +15 V.

Chart 10 – RBSOA.



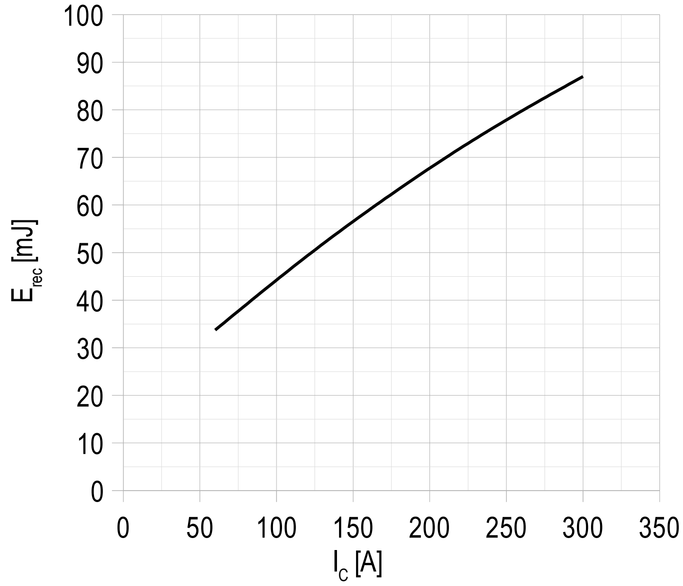
$V_{CE\ max}$ = 1700 V;
V_{GE} = ±15 V;
$I_{C\ max}$ = 2*$I_{C\ nom}$;
R_G = 2.2 Ω;
L = 56 nH.

Chart 11 – typ. output characteristic, FRD.



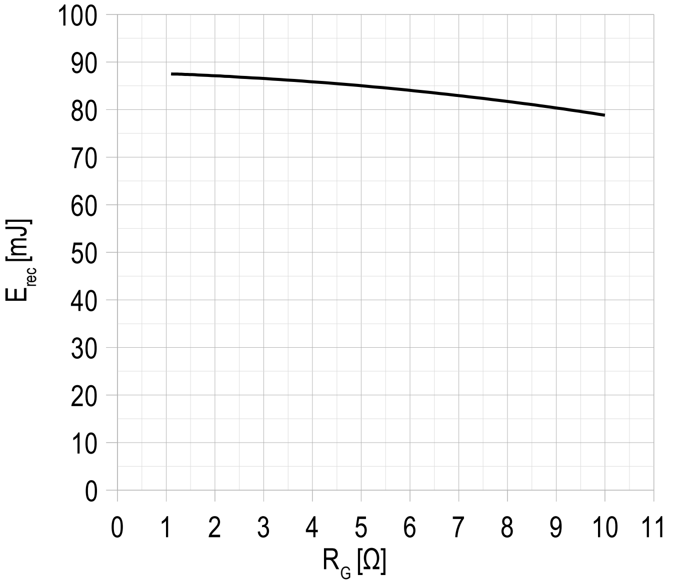
V_{GE} = 0 V.

Chart 12 – typ. switching losses vs rated current, FRD.



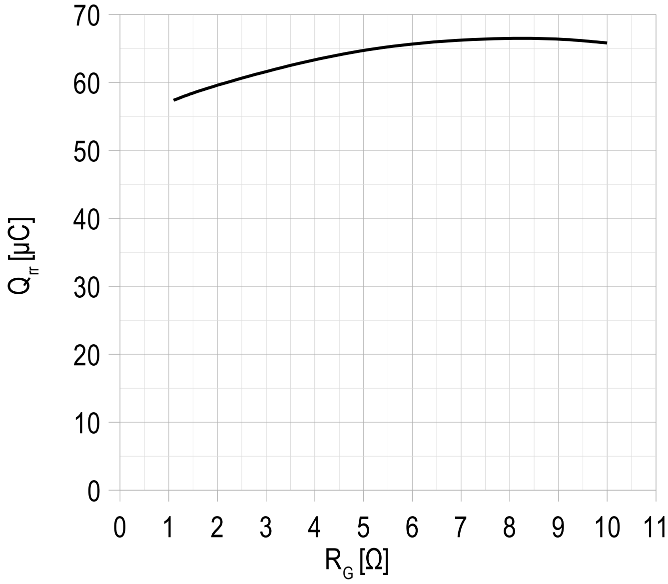
V_{GE} = ±15 V;
V_{CE} = 920 V;
L = 56 nH;
$R_{G\ on}$ = 2.2 Ω;
$T_{vj\ (max)}$ = 150°C.

Chart 13 – typ. switching losses vs gate resistance, FRD.



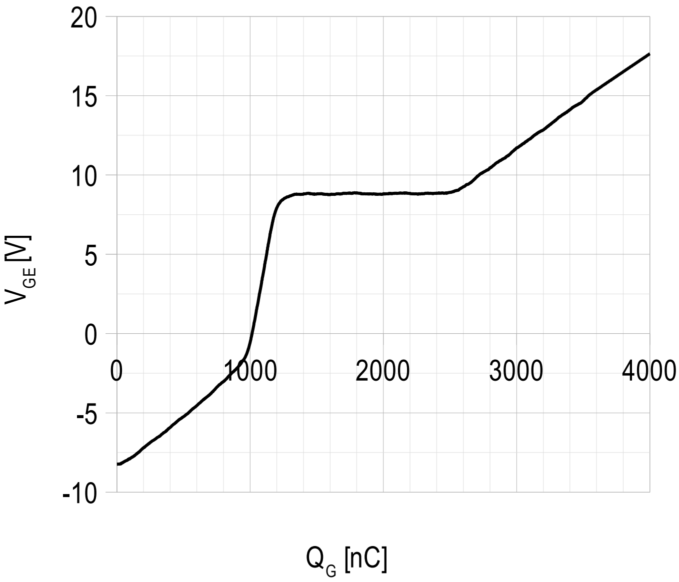
V_{GE} = ±15 V;
V_{CE} = 920 V;
$I_{C\ max}$ = 300 A;
L = 56 nH;
$T_{vj\ (max)}$ = 150°C.

Chart 14 – typ. reverse recovered charge vs gate resistance, FRD.



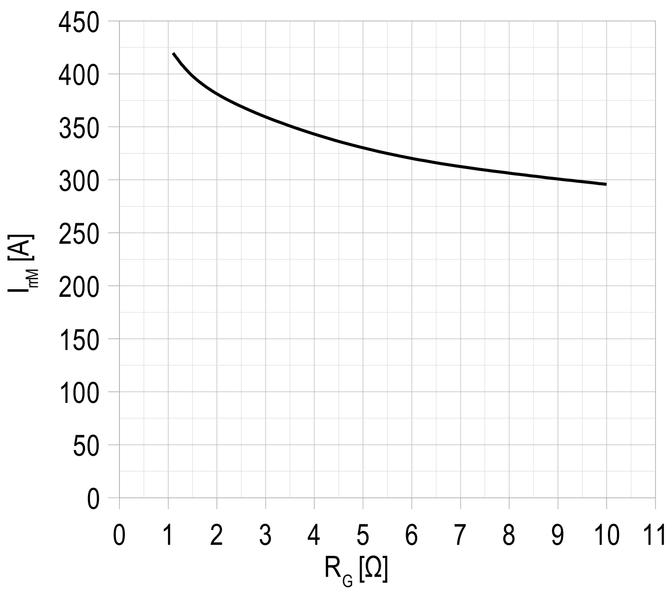
V_{GE} = ±15 V;
V_{CE} = 920 V;
$I_{C\ max}$ = 300 A;
L = 56 nH;
$T_{vj\ (max)}$ = 150°C.

Chart 15 – typ. gate charge characteristic.



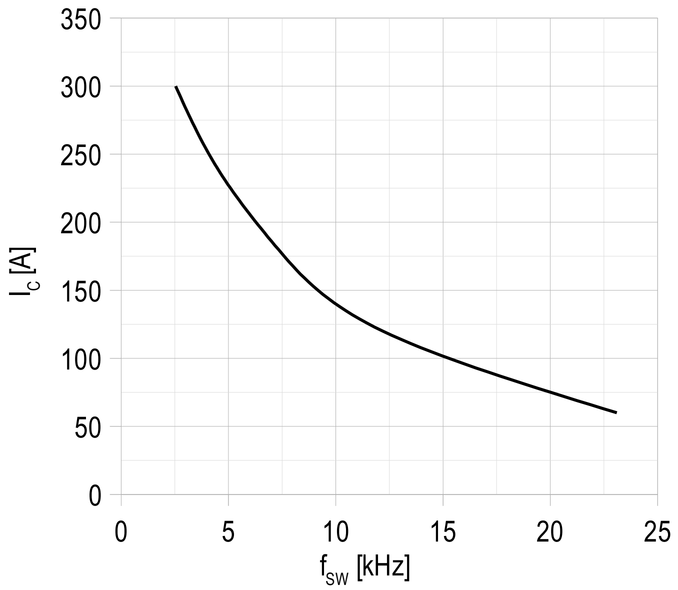
I_C = 300 A;
V_{CE} = 920 V;
V_{GE} = - 8÷15 V.

Chart 16 – typ. reverse recovery current vs gate resistance FRD.



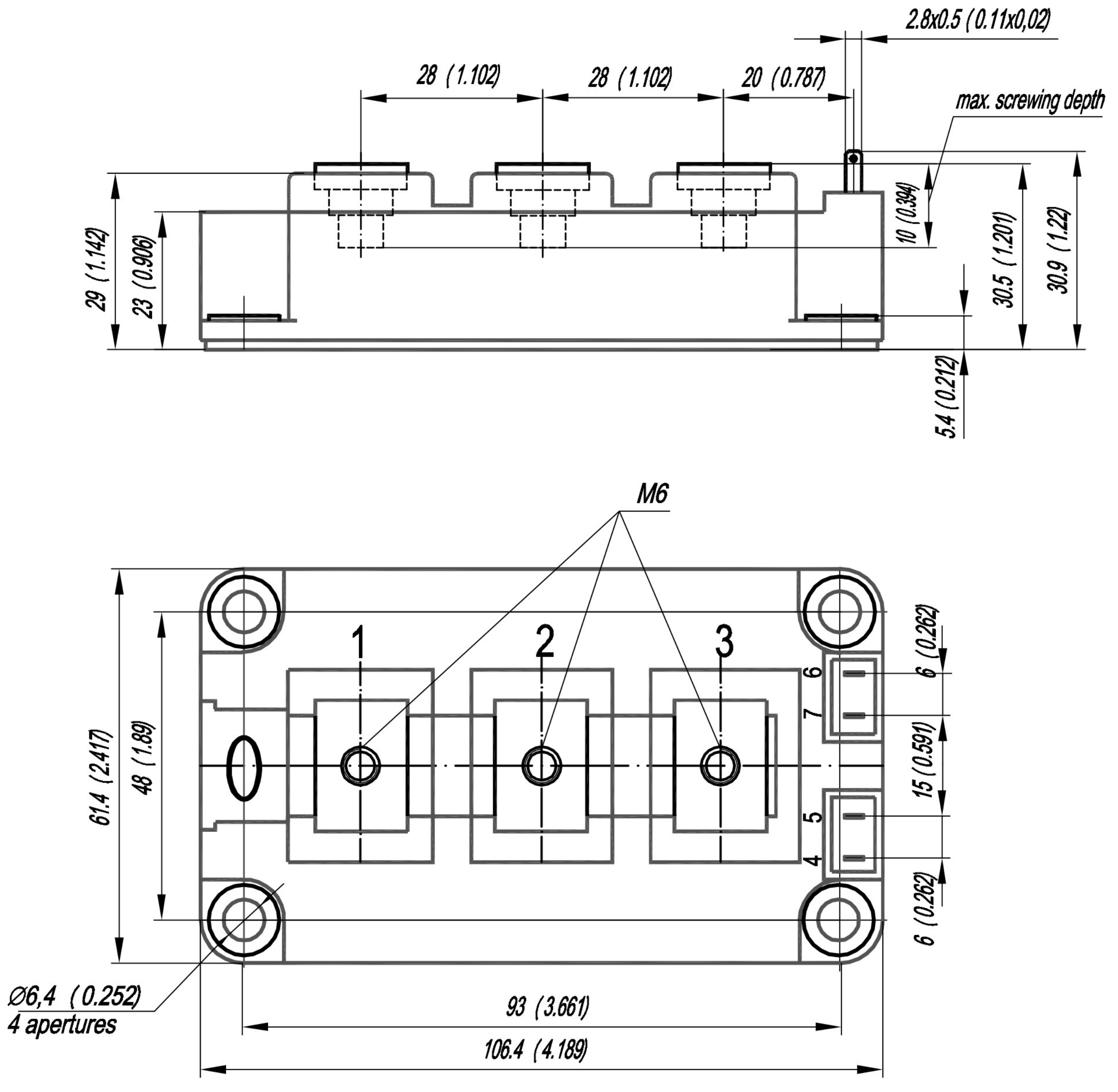
V_{CE} = 920 V;
V_{GE} = ±15 V;
L = 56 nH;
$T_{vj\ (max)}$ = 150°C.

Chart 17 – max. rated current vs frequency.



Duty cycle 50%;
V_{CE} = 920 V;
T_c = 80 °C;
$T_{vj\ (max)}$ = 175 °C.

Overall dimensions: Package type – AA



Part numbering guide

MIAA	-	HB	17	AA	-	300	N	
MIAA								IGBT module package type: AA
		HB						2 switches as Half-Bridge
		HC						1 switch as High-Side chopper
		LC						1 switch as Low-Side chopper
			17					Voltage rating (V_{CES}/100)
				AA				IGBT+FRD chipset modification
						300		Current Rating
							N	Climatic version: normal climate