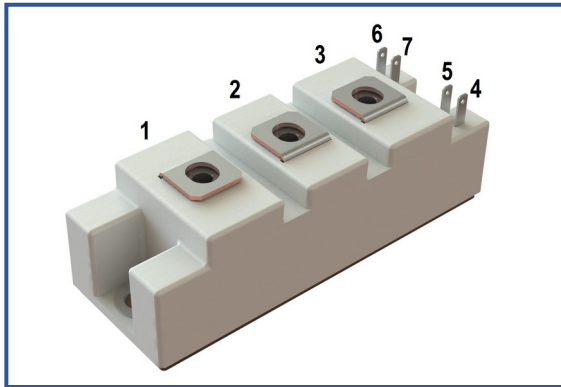


Industry standard 34mm IGBT module

1700 V 150 A


Chip features

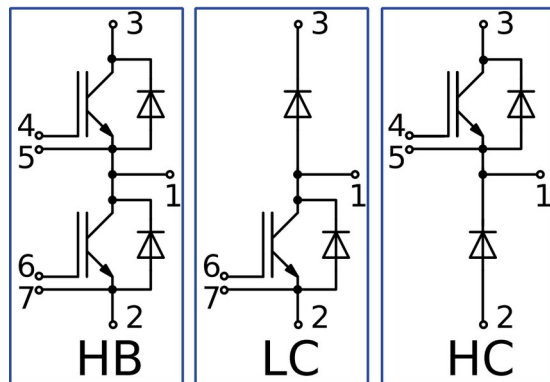
- IGBT chip
 - Trench FS
 - low $V_{CE(sat)}$ value
 - 10 μ s short circuit of 150°C
 - square RBSOA of 2xI_C
 - low EMI
- FRD chip
 - fast and soft reverse recovery
 - low voltage drop

Design features

- copper baseplate
- Al₂O₃ DBC substrate
- ultrasonically welded power terminals
- Improved thermal cycling
- RoHS compliant
- UL certified file-No. E255404

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)	$I_{C\ nom}$		150	A
Collector current (maximum continuous)	$I_{C\ 25}$	$T_{vj\ (max)} = 175^{\circ}C; T_c = 25^{\circ}C$.	228	A
	$I_{C\ 80}$	$T_{vj\ (max)} = 175^{\circ}C; T_c = 80^{\circ}C$.	150	A
Repetitive peak collector current*1	I_{CRM}	$I_{CRM} = 3 \times I_{C\ nom}; t_p = 1\ ms$.	450	A
Short-circuit duration	t_{psc}	$T_{vj} = 25^{\circ}C; V_{GE} = \pm 15\ V; V_{CE} = 1000\ V;$ $R_{G\ on} = R_{G\ off} = 2.2\ \Omega; I_{Cmax} < 1100\ A$.	10	μ s
		$T_{vj} = 150^{\circ}C; V_G = \pm 15\ V; V_{CE} = 1000V;$ $R_{G\ on} = R_{G\ off} = 2.2\ \Omega; I_{Cmax} < 900\ A$.	10	
Gate-Emitter voltage	U_{GES}		± 20	V
Junction operating temperature	$T_{vj\ (op)}$		-40...+150	°C
Inverse diode \ Freewheeling diode				
Repetitive peak reverse voltage	V_{RRM}	$V_{GE} = 0\ V$.	1700	V
Forward current (nominal)	$I_{F\ nom}$		150	A
Forward current (maximum continuous)	$I_{F\ 25}$	$T_{vj\ (max)} = 175^{\circ}C; T_c = 25^{\circ}C$.	173	A
	$I_{F\ 80}$	$T_{vj\ (max)} = 175^{\circ}C; T_c = 80^{\circ}C$.	129	A
Repetitive peak forward current*1	I_{FRM}	$I_{FRM} = 3 \times I_{F\ nom}; t_p = 1\ ms$.	450	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}	$V_{GE} = +15\text{ V}; I_C = 150\text{ A}; t_u = 1000\ \mu\text{s}.$	$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	2.11 2.76	2.14 2.81	2.27 3.00	V V	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$I_C = 6\text{ mA}; V_{CE} = V_{GE}; T_{vj} = 25^\circ\text{C}; t_u = 2\text{ ms}.$		5.35	5.65	6.39	V	
Collector-Emitter cut-off current	I_{CES}	$V_{CE} = 1700\text{ V}; t_u = 50\text{ ms}; V_{GE} = 0.$	$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	2.84 0.70	3.44 0.86	300 3.0	μA mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0; V_{GE} = \pm 20\text{ V}; T_{vj} = 25^\circ\text{C}; t_u = 30\text{ ms}.$		17.3	21.2	500	nA	
Input capacitance	C_{ies}	$V_{CE} = 10\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}; T_{vj} = 25^\circ\text{C}.$		-	7.50	-	nF	
Output capacitance	C_{oes}			-	0.40	-	nF	
Reverse transfer capacitance	C_{res}			-	0.50	-	nF	
Total gate charge	Q_G	$I_C = 150\text{ A}; V_{CE} = 920\text{ V}; V_{GE} = -8 \div 15\text{ V}.$		-	1736	1911	nC	
Internal gate resistance	R_{Gint}	$T_{vj} = 25^\circ\text{C}.$		-	10.0	-	Ω	
Turn-on delay time	$t_{d(on)}$	$V_{CE} = 920\text{ V}; V_{GE} = \pm 15\text{ V}; I_{Cmax} = 150\text{ A}; R_G = 2.2\ \Omega; L = 56\text{ nH}.$	$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	404 464	412 468	470 530	ns	
Rise time	t_{ri}		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	38.0 44.0	40.0 46.0	50.0 60.0	ns	
Turn-on energy	E_{on}		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	14.0 28.0	17.0 31.0	25.0 42.0	mJ	
Turn-off delay time	$t_{d(off)}$		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	470 580	480 590	540 680	ns	
Fall time	t_{fi}		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	536 732	572 784	650 940	ns	
Turn-off energy	E_{off}		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	30.0 42.0	32.0 45.0	40.0 55.0	mJ	
Collector-emitter threshold voltage	V_{CE0}		$V_{GE} = +15\text{ V}; T_{vj} = 150^\circ\text{C};$		1.02	1.04	1.10	V
On-State slope resistance (IGBT)	r_{CE0}		$I_{CE1} = 38\text{ A}; I_{CE2} = 150\text{ A}; t_u = 1000\ \mu\text{s}.$		11.5	11.8	12.7	m Ω
Thermal resistance junction to case	$R_{th(j-c)}$		DC; $I_{CE} = 150 \pm 10\text{ A}; I_{test} = 0.5\text{ A}; V_{GE} = +15\text{ V}.$		-	0.150	0.165	K/W
Inverse diode \ Freewheeling diode								
Forward voltage drop	V_F	$I_F = 150\text{ A}; V_{GE} = 0; t_u = 1000\ \mu\text{s}.$	$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	1.86 2.09	1.89 2.16	2.01 2.29	V V	
Reverse recovery time	t_{rr}	$V_{GE} = \pm 15\text{ V}; V_{CE} = 920\text{ V}; I_{Cmax} = 150\text{ A}; R_{Gon} = 2.2\ \Omega; L = 56\text{ nH}.$	$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	147 310	152 320	180 360	ns ns	
Repetitive peak reverse current	I_{RRM}		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	179 202	191 219	230 260	A A	
Reverse recovered charge	Q_{rr}		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	15.0 30.0	16.0 32.0	20.0 38.0	μC μC	
Reverse recovery energy	E_{rec}		$T_{vj} = 25^\circ\text{C}$ $T_{vj} = 150^\circ\text{C}$	18.0 36.0	22.0 41.0	28.0 52.0	mJ mJ	
Threshold voltage	$V_{(TO)}$		$T_{vj} = 150^\circ\text{C}; V_{GE} = 0; I_{CE1} = 38\text{ A};$		0.91	0.92	0.98	V
Forward slope resistance	r_T		$I_{CE2} = 150\text{ A}; t_u = 1000\ \mu\text{s}$		7.77	7.97	8.62	m Ω
Thermal resistance junction to case	$R_{th(jc-D)}$	DC; $I_{CE} = 120 \pm 10\text{ A}; I_{test} = 0.5\text{ A}; V_{GE} = +15\text{ V}.$		-	0.269	0.350	K/W	

Module							
Pin resistance	R_{Pxy}	$T_{vj} = 25^{\circ}\text{C}.$	R_{P12}	-	0.47	0.50	mΩ
			R_{P13}	-	0.66	0.66	
Parasitic inductance between terminals	L_{Pce}			-	27	-	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		3.00	-	5.00	N*m
Mounting torque for terminal screws	M_t	to terminals M5		1.80	2.00	2.20	N*m
Weight	W			-	153	170	g

Notes:

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

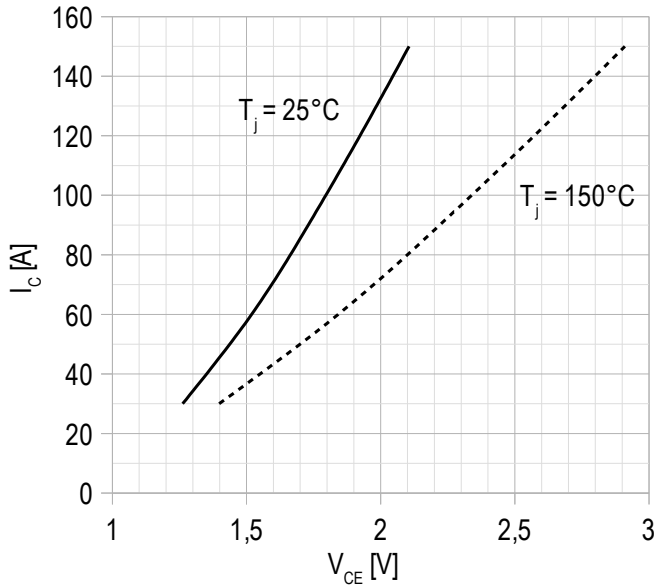
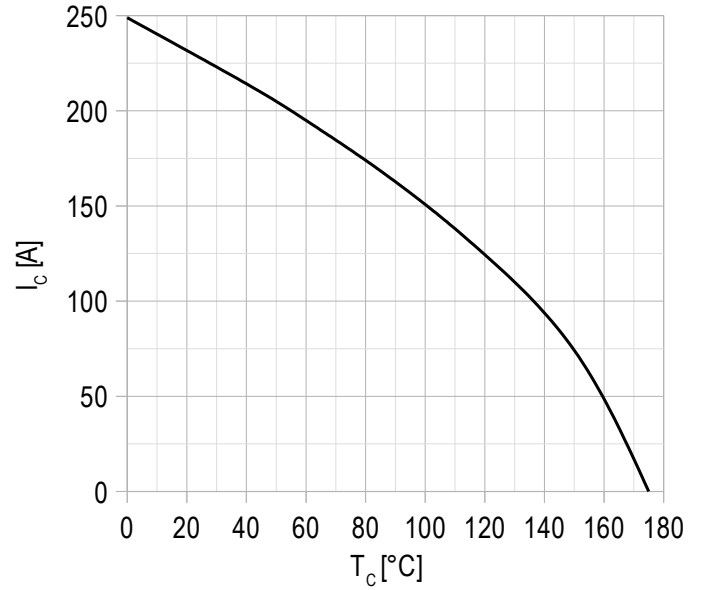
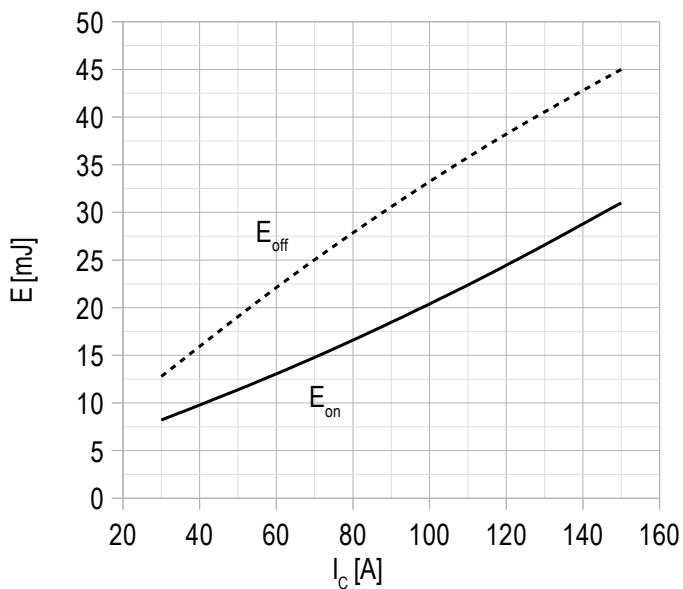
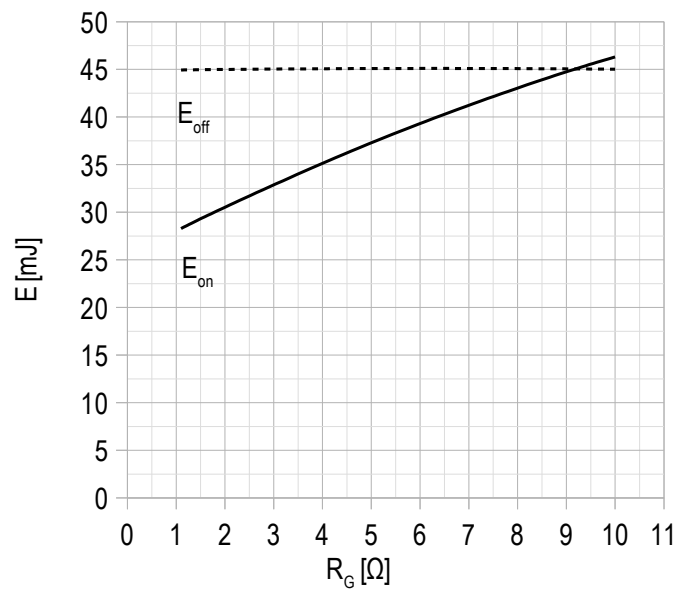
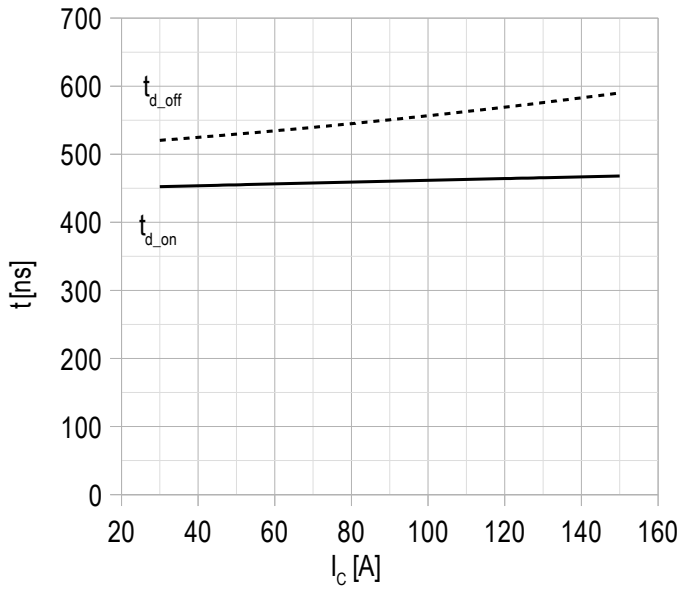
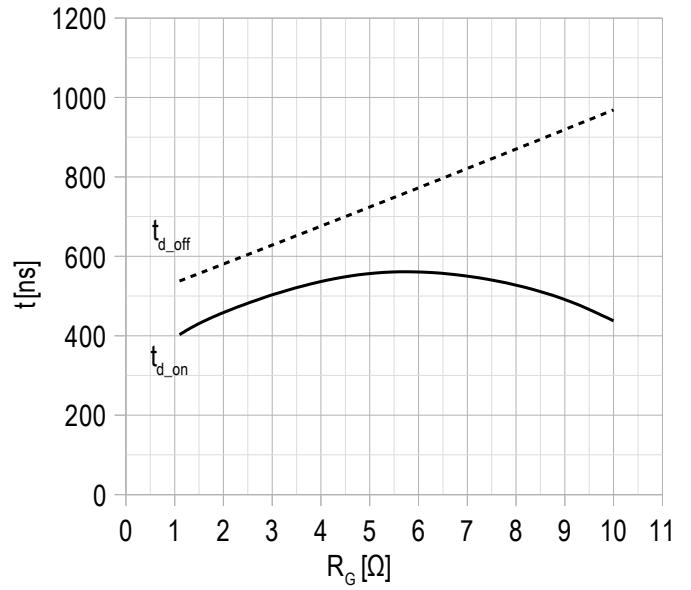
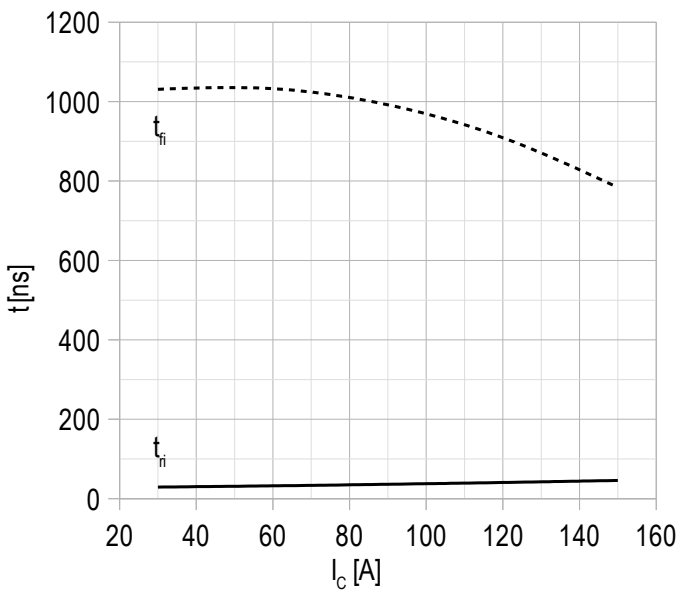
Chart 1 – typ. output characteristic, IGBT.

 $V_{GE} = +15 \text{ V.}$
Chart 2 – max. rated current vs temperature.

 DC;
 $V_{GE} = +15 \text{ V;}$
 $T_{vj(max)} = 175^\circ\text{C.}$
Chart 3 – typ. turn-on/-off energy vs rated current, IGBT.

 $V_{CE} = 920 \text{ V;}$
 $V_{GE} = \pm 15 \text{ V;}$
 $R_G = 2.2 \Omega;$
 $L = 56 \text{ nH;}$
 $T_{vj(max)} = 150^\circ\text{C.}$
Chart 4 – typ. turn-on/-off energy vs gate resistance, IGBT.

 $V_{CE} = 920 \text{ V;}$
 $V_{GE} = \pm 15 \text{ V;}$
 $I_{Cmax} = 150 \text{ A;}$
 $L = 56 \text{ nH;}$
 $T_{vj(max)} = 150^\circ\text{C.}$

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


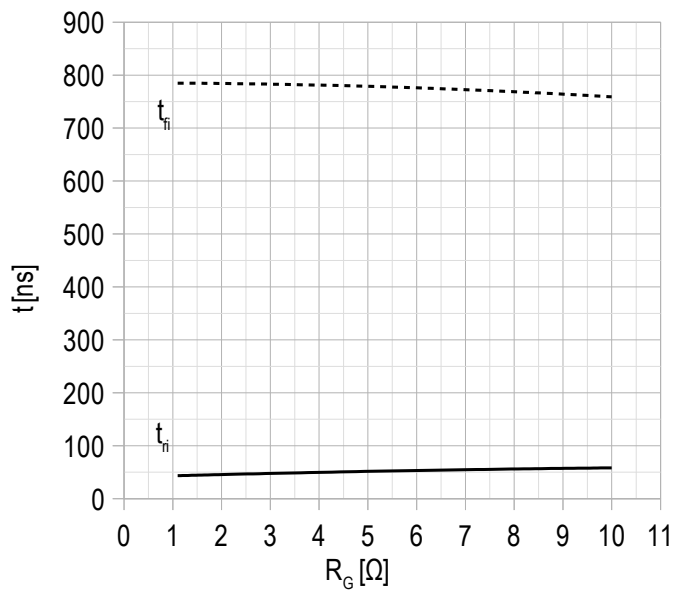
$V_{CE} = 920 \text{ V};$
 $V_{GE} = \pm 15 \text{ V};$
 $R_G = 2.2 \text{ } \Omega;$
 $L = 56 \text{ nH};$
 $T_{vj(max)} = 150^\circ\text{C}.$

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


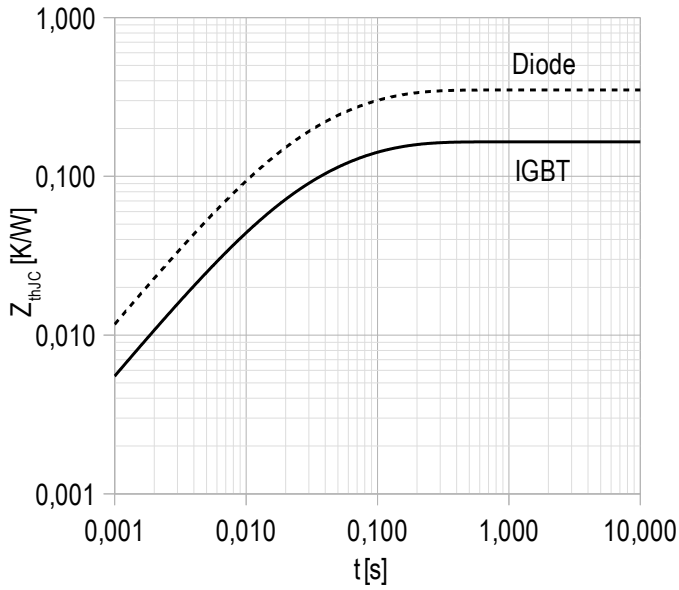
$V_{CE} = 920 \text{ V};$
 $V_{GE} = \pm 15 \text{ V};$
 $I_{Cmax} = 150 \text{ A};$
 $L = 56 \text{ nH};$
 $T_{vj(max)} = 150^\circ\text{C}.$

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


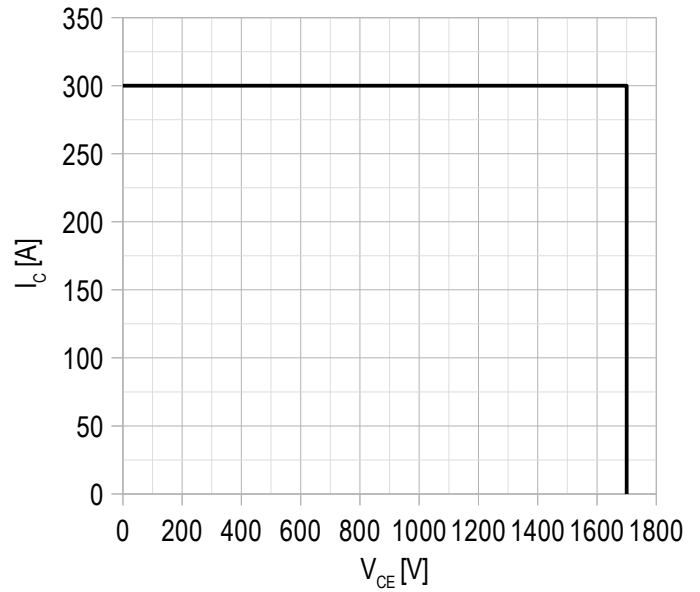
$V_{CE} = 920 \text{ V};$
 $V_{GE} = \pm 15 \text{ V};$
 $R_G = 2.2 \text{ } \Omega;$
 $L = 56 \text{ nH};$
 $T_{vj(max)} = 150^\circ\text{C}.$

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


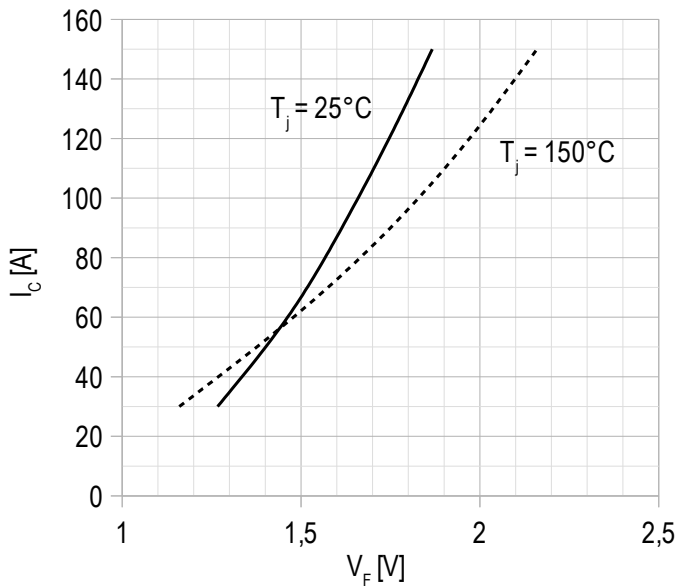
$V_{CE} = 920 \text{ V};$
 $V_{GE} = \pm 15 \text{ V};$
 $I_{Cmax} = 150 \text{ A};$
 $L = 56 \text{ nH};$
 $T_{vj(max)} = 150^\circ\text{C}.$

Chart 9 – max. transient thermal impedance.


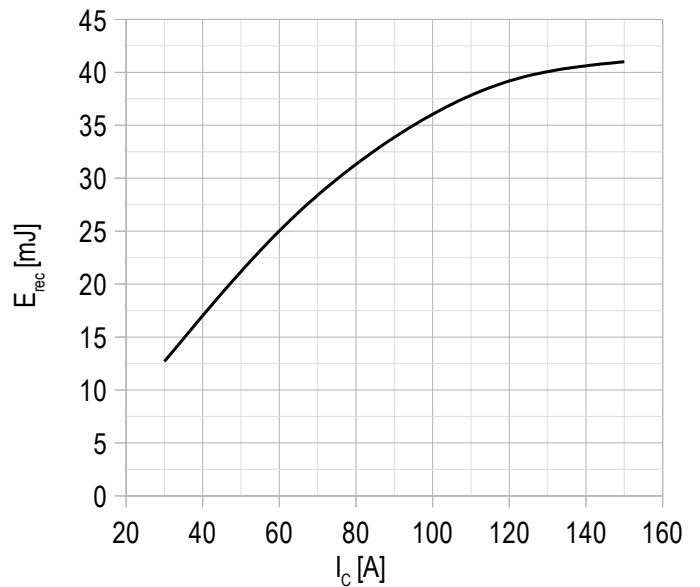
Single pulse;
 $V_{GE} = +15$ V.

Chart 10 – RBSOA.


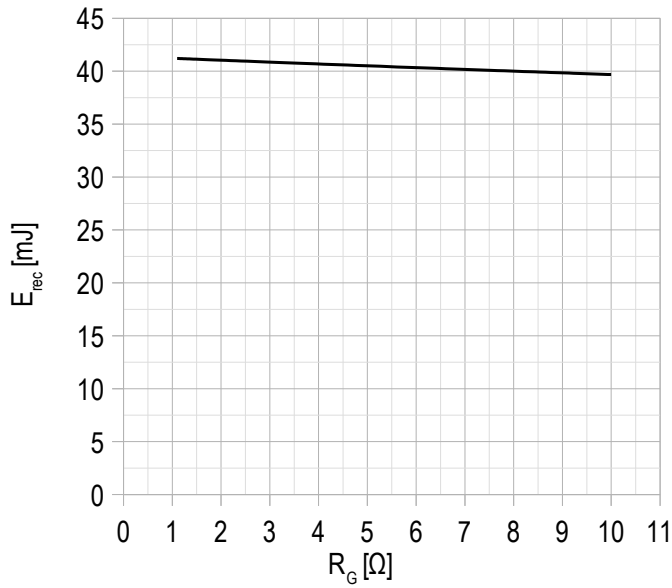
$V_{CE\ max} = 1700$ V;
 $V_{GE} = \pm 15$ V;
 $I_{C\ max} = 2 \cdot I_{C\ nom}$;
 $R_G = 2.2$ Ω ;
 $L = 56$ nH.

Chart 11 – typ. output characteristic, FRD.


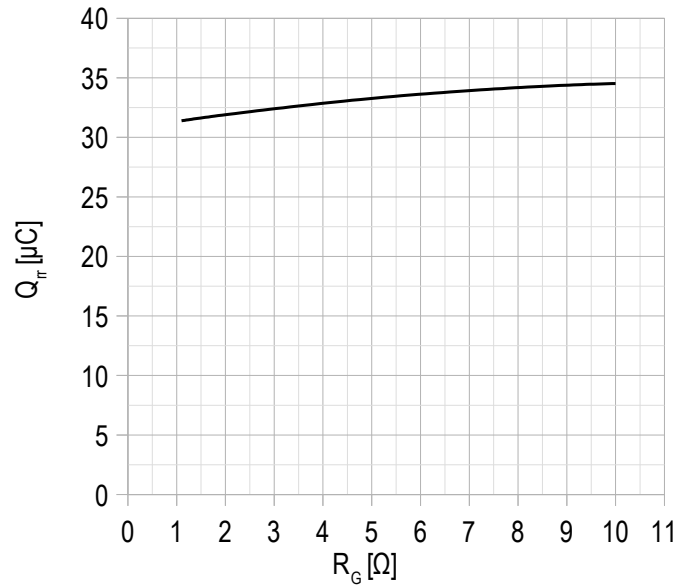
$V_{GE} = +15$ V.

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


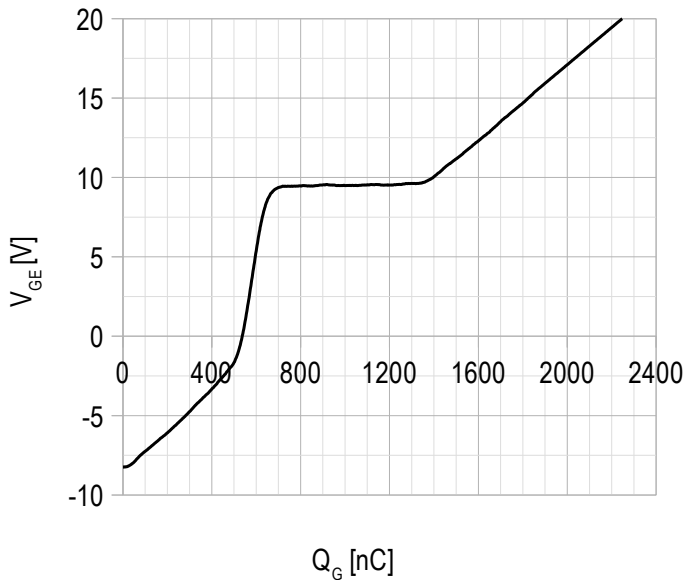
$V_{GE} = \pm 15$ V;
 $V_{CE} = 920$ V;
 $L = 56$ nH;
 $R_{G\ on} = 2.2$ Ω ;
 $T_{vj\ (max)} = 150^\circ C$.

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


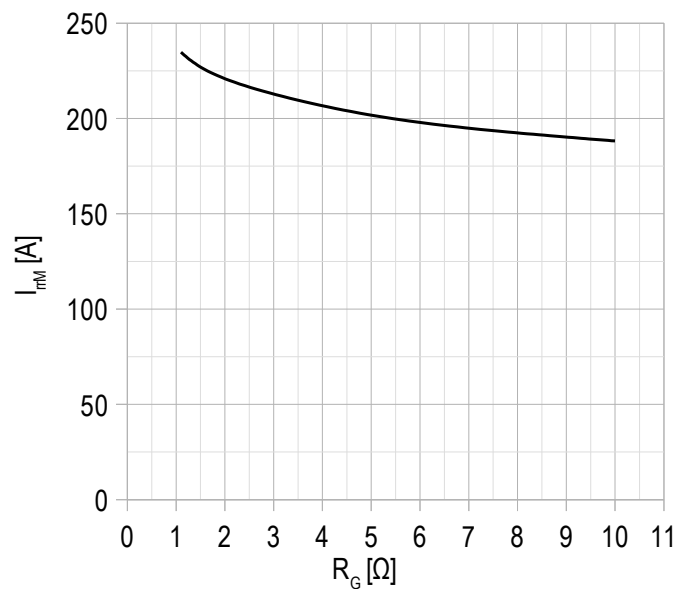
$V_{GE} = \pm 15$ V;
 $V_{CE} = 920$ V;
 $I_{C\ max} = 150$ A;
 $L = 56$ nH;
 $T_{vj\ (max)} = 150^\circ$ C.

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


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

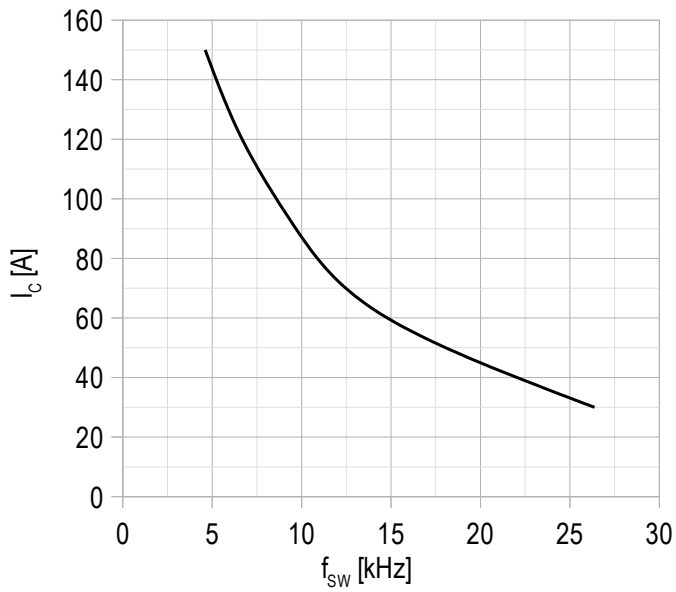
Chart 15 – typ. gate charge characteristic.


$I_C = 150$ A;
 $V_{CE} = 920$ V;
 $V_{GE} = -8 \div 15$ V.

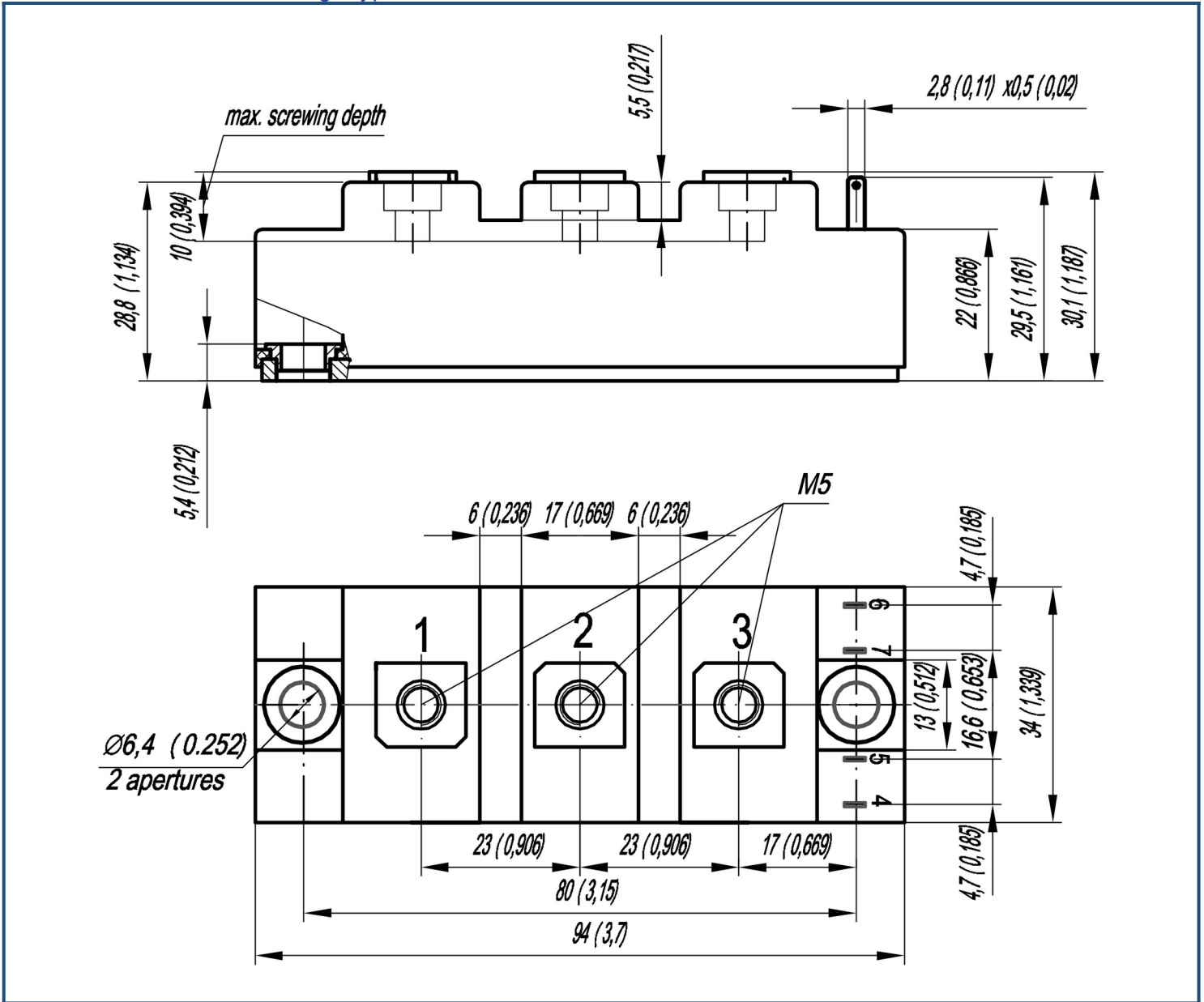
Chart 16 – typ. reverse recovery current vs gate resistance FRD.


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

Chart 17 – typ. rated current vs frequency.



Duty cycle 50%;
 $T_c = 80\text{ }^\circ\text{C}$;
 $T_{vj(max)} = 175\text{ }^\circ\text{C}$.

Overall dimensions: Package type – FA

Part numbering guide

MIFA	-	HB	17	FA	-	150	N	
MIFA								IGBT module package type: FA
		HB						2 switches as Half-Bridge
		HC						1 switch as High-Side chopper
		LC						1 switch as Low-Side chopper
			17					Voltage rating ($V_{CES}/100$)
				FA				IGBT+FRD chipset modification
						150		Current Rating
							N	Climatic version: normal climate

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