80-M112PMA015M702-K200A72
datasheet

| MiniSKiiP PIM 1 | 1200 V / 15 A |

Topology features

- Converter+Brake+Inverter
- Tandem diode
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current
- Switching optimized for EMC

Housing features

- Base isolation: Al_2O_3
- Easy assembly in one mounting step
- Flexible PCB design w/o pin holes
- Rugged solderless spring contacts

Target applications

- Industrial Drives

Types

- 80-M112PMA015M702-K200A72

MiniSKiiP® 1 16 mm housing
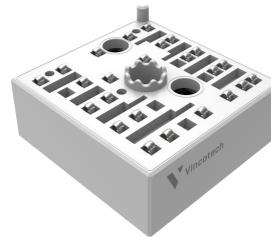
Schematic
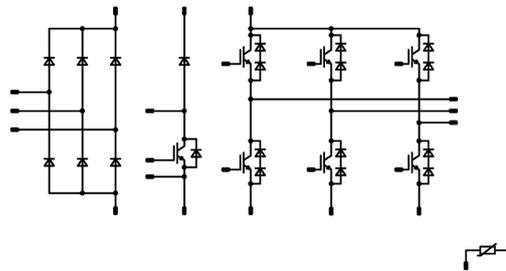
Vincotech

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Inverter Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	$T_s <= 80$ °C	30 [1]	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80$ °C	79	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15$ V, $V_{CC} = 800$ V	$T_j = 150$ °C	9,5	µs
Maximum junction temperature	T_{jmax}			175	°C

[1] limited by I_{CRM}

Parameter	Symbol	Conditions		Value	Unit
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			1300	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	$T_s = 80$ °C	17	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80$ °C	60	W
Maximum junction temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Brake Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	$T_s <= 80$ °C	30 [2]	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80$ °C	79	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15$ V, $V_{CC} = 800$ V	$T_j = 150$ °C	9,5	µs
Maximum junction temperature	T_{jmax}			175	°C

[2] limited by I_{CRM}

Vincotech

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Brake Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	$T_s <= 80$ °C	30 [3]	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80$ °C	61	W
Maximum junction temperature	T_{jmax}			175	°C

[3] limited by I_{FRM}

Parameter	Symbol	Conditions		Value	Unit
Brake Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	$T_s <= 80$ °C	10 [4]	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		10	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80$ °C	41	W
Maximum junction temperature	T_{jmax}			175	°C

[4] limited by I_{FRM}

Parameter	Symbol	Conditions		Value	Unit
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	$T_s = 80$ °C	46	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10$ ms	$T_j = 150$ °C	270	A
Surge current capability	I^2t			370	A^{2}s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80$ °C	60	W
Maximum junction temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40...+125	°C
Operation temperature under switching condition	T_{jop}		-40...+(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC Test Voltage* t_p = 2 s	5500	V
Isolation voltage	V_{isol}	AC Voltage t_p = 1 min	2500	V
Creepage distance		With std lid For more informations see handling instructions	6,3	mm
Clearance		With std lid For more informations see handling instructions	6,3	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production

Vincotech

Characteristic Values

Parameter	Symbol	Conditions				Values			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Min	Typ	Max	

Inverter Switch

Static

Parameter	Symbol	V_{GE}/V_{GS} [V]	V_{CE}/V_{DS}/V_{F} [V]	I_{C}/I_{D}/I_{F} [A]	T_{j} [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$		10	0,0015	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}	15		15	25 / 125 / 150		1,7 / 1,95 / 2,01	2,1[5]	V
Collector-emitter cut-off current	I_{CES}	0	1200		25			60	µA
Gate-emitter leakage current	I_{GES}	20	0		25			200	nA
Internal gate resistance	r_{g}						None		Ω
Input capacitance	C_{ies}						2900		pF
Output capacitance	C_{oes}	0	10		25		120		pF
Reverse transfer capacitance	C_{res}						34		pF
Gate charge	Q_{g}	V_{CC} = 600 V / 0/15		15	25		110		nC

Thermal

Parameter	Symbol	Conditions				Min	Typ	Max	Unit
Thermal resistance junction to sink[6]	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)					1,2		K/W

Dynamic

Parameter	Symbol	V_{GE}/V_{GS} [V]	V_{CE}/V_{DS}/V_{F} [V]	I_{C}/I_{D}/I_{F} [A]	T_{j} [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$				25 / 125 / 150		196,34 / 191,56 / 190,31		ns
Rise time	t_{r}				25 / 125 / 150		62,05 / 65,71 / 66,68		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 32 Ω, R_{goff} = 32 Ω, ±15	600	15	25 / 125 / 150		182,42 / 208,62 / 215,03		ns
Fall time	t_{f}				25 / 125 / 150		96,43 / 124,47 / 126,55		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,266 µC, Q_{rFWD}=0,583 µC, Q_{rFWD}=0,673 µC			25 / 125 / 150		0,94 / 1,27 / 1,34		mWs
Turn-off energy (per pulse)	E_{off}				25 / 125 / 150		1,05 / 1,44 / 1,52		mWs

Vincotech

Characteristic Values

Parameter	Symbol	Conditions				Values			Unit
		V_{GE} **[V]** V_{GS} **[V]**	V_{CE} **[V]** V_{DS} **[V]** V_{F} **[V]**	I_{C} **[A]** I_{D} **[A]** I_{F} **[A]**	T_{j} **[°C]**	**Min**	**Typ**	**Max**	

Inverter Diode

Static

Forward voltage	V_{F}			10	25 125 150		3,08 2,91 2,83	3,86[5]	V
Reverse leakage current	I_{R}	V_{r} = 1300 V			25			0,64	µA

Thermal

Thermal resistance junction to sink[6]	$R_{th(j\text{-}s)}$	λ_{paste} = 2,5 W/mK (HPTP)					1,59		K/W

Dynamic

Peak recovery current	I_{RM}	di/dt=193 A/µs di/dt=187 A/µs di/dt=169 A/µs	±15	600	15	25 125 150		3,91 5,75 6,03		A
Reverse recovery time	t_{rr}					25 125 150		97,87 158,68 177,53		ns
Recovered charge	Q_{r}					25 125 150		0,266 0,583 0,673		µC
Reverse recovered energy	E_{rec}					25 125 150		0,084 0,188 0,22		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		112,43 59 52,54		A/µs

Vincotech

Characteristic Values

Parameter	Symbol	Conditions				Values			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Min	Typ	Max	

Brake Switch

Static

Parameter	Symbol	V_{GE}/V_{GS} [V]	$V_{CE}/V_{DS}/V_{F}$ [V]	$I_C/I_D/I_F$ [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$		10	0,0015	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}	15		15	25 / 125 / 150		1,7 / 1,95 / 2,01	2,1[5]	V
Collector-emitter cut-off current	I_{CES}	0	1200		25			60	µA
Gate-emitter leakage current	I_{GES}	20	0		25			200	nA
Internal gate resistance	r_g						None		Ω
Input capacitance	C_{ies}						2900		pF
Output capacitance	C_{oes}	0	10		25		120		pF
Reverse transfer capacitance	C_{res}						34		pF
Gate charge	Q_g	V_{CC} = 600 V · 0/15		15	25		110		nC

Thermal

Parameter	Symbol	Conditions				Min	Typ	Max	Unit
Thermal resistance junction to sink[6]	$R_{th(j\text{-}s)}$	λ_{paste} = 2,5 W/mK (HPTP)					1,2		K/W

Dynamic

Parameter	Symbol	V_{GE}/V_{GS} [V]	$V_{CE}/V_{DS}/V_{F}$ [V]	$I_C/I_D/I_F$ [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$				25 / 125 / 150		96,72 / 89,85 / 88,25		ns
Rise time	t_r				25 / 125 / 150		57,6 / 61,9 / 62,67		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 32 Ω R_{goff} = 32 Ω · 0/15	700	15	25 / 125 / 150		285,74 / 321,39 / 329,34		ns
Fall time	t_f				25 / 125 / 150		110,4 / 141,54 / 142,62		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,21 µC Q_{rFWD}=2 µC Q_{rFWD}=2,23 µC			25 / 125 / 150		1,8 / 2,29 / 2,43		mWs
Turn-off energy (per pulse)	E_{off}				25 / 125 / 150		1,22 / 1,69 / 1,82		mWs

Characteristic Values

Parameter	Symbol	Conditions				Values			Unit
		V_{GE} **[V]** V_{GS} **[V]**	V_{CE} **[V]** V_{DS} **[V]** V_{F} **[V]**	I_{C} **[A]** I_{D} **[A]** I_{F} **[A]**	T_{j} **[°C]**	**Min**	**Typ**	**Max**	
Brake Diode									
Static									
Forward voltage	V_F			15	25 125 150		1,63 1,74 1,73	1,9[5]	V
Reverse leakage current	I_R	V_r = 1200 V			25			30	µA
Thermal									
Thermal resistance junction to sink[6]	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)					1,55		K/W
Dynamic									
Peak recovery current	I_{RM}	di/dt=231 A/µs di/dt=202 A/µs di/dt=166 A/µs	0/15	700	15	25 125 150		9,32 10,62 11,01		A
Reverse recovery time	t_{rr}					25 125 150		228,66 354,63 389,27		ns
Recovered charge	Q_r					25 125 150		1,21 2 2,23		µC
Reverse recovered energy	E_{rec}					25 125 150		0,445 0,811 0,934		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		83,16 53,38 49,08		A/µs

Characteristic Values

Parameter	Symbol	Conditions				Values			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	

Brake Sw. Protection Diode

Static

Parameter	Symbol	Conditions				Values			Unit
Forward voltage	V_F			5	25 125 150		1,57 1,66 1,65	2,1[5]	V
Reverse leakage current	I_R	V_r = 1200 V			25			20	µA

Thermal

Parameter	Symbol	Conditions				Values			Unit
Thermal resistance junction to sink[6]	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)					2,31		K/W

Rectifier Diode

Static

Parameter	Symbol	Conditions				Values			Unit
Forward voltage	V_F			28	25 125		1,15 1,1	1,5[5]	V
Reverse leakage current	I_R	V_r = 1600 V			25 150			100 1000	µA

Thermal

Parameter	Symbol	Conditions				Values			Unit
Thermal resistance junction to sink[6]	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)					1,18		K/W

Vincotech

Characteristic Values

Parameter	Symbol	Conditions				Values			Unit
		V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Min	Typ	Max	

Thermistor

Static

Parameter	Symbol	Conditions				Values			Unit
Rated resistance	R				25		1		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 1670 Ω			100	-2		2	%
Maximum Current	I_{max}						3		mA
Power dissipation constant	d				25		0,76		mW/K
A-value	A						$7{,}635 \times 10^{-3}$		1/K
B-value	B						$1{,}73 \times 10^{-5}$		1/K²
Vincotech Thermistor Reference								E	

[5] Value at chip level

[6] Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1.	IGBT

Typical output characteristics

I_C = f(V_{CE})

t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2.	IGBT

Typical output characteristics

I_C = f(V_{CE})

V_{GE}:
7 V
8 V
9 V
10 V
11 V
12 V
13 V
14 V
15 V
16 V
17 V

t_p =	250	µs
T_j =	150	°C
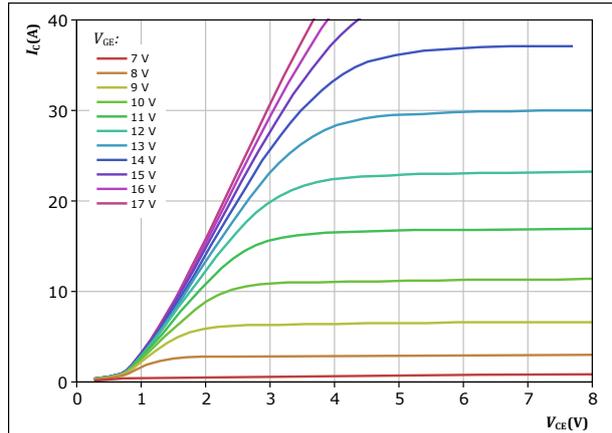
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3.	IGBT

Typical transfer characteristics

I_C = f(V_{GE})

t_p =	250	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4.	IGBT

Transient thermal impedance as a function of pulse width
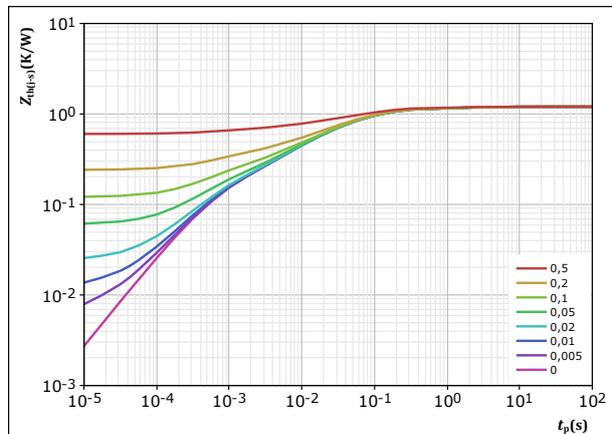
$Z_{th(j-s)}$ = f(t_p)

0,5
0,2
0,1
0,05
0,02
0,01
0,005
0

D =	t_p / T	
$R_{th(j-s)}$ =	1,203	K/W

IGBT thermal model values

R (K/W)	τ (s)
8,45E-02	1,63E+00
4,66E-01	9,37E-02
3,90E-01	2,02E-02
1,45E-01	3,96E-03
1,16E-01	5,44E-04

Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

$I_C = f(V_{CE})$
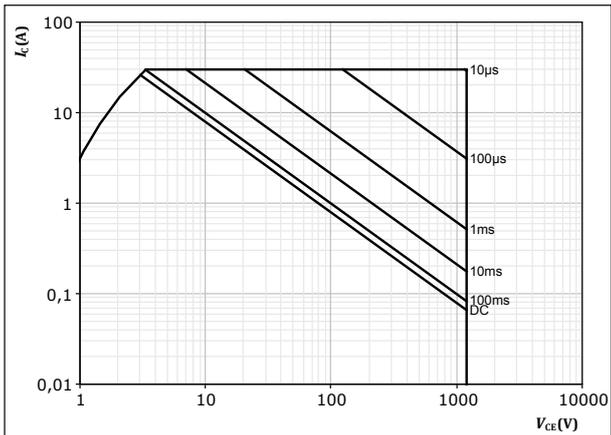
D = single pulse

T_s = 80 °C

V_{GE} = 15 V

T_j = T_{jmax}

figure 6. IGBT

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$
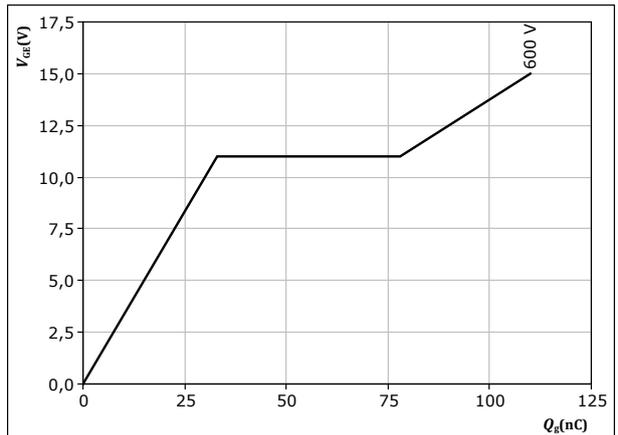
I_C = 15 A

T_j = 25 °C

Inverter Diode Characteristics

figure 7.	FWD

Typical forward characteristics

$I_F = f(V_F)$

$t_p =$ 250 μs

T_j: 25 °C / 125 °C / 150 °C
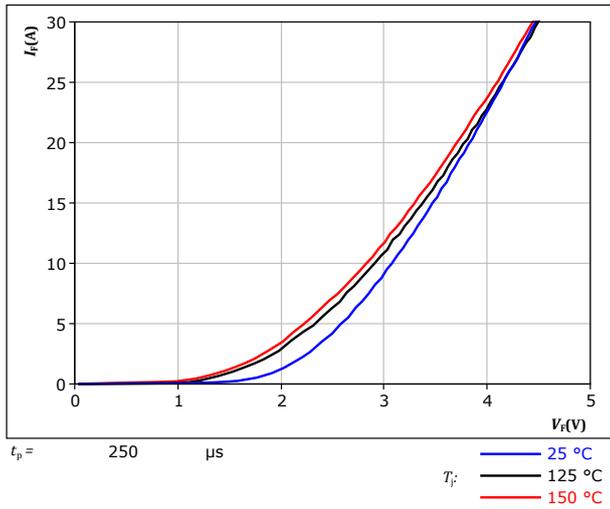
figure 8.	FWD

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$

Legend: 0,5 / 0,2 / 0,1 / 0,05 / 0,02 / 0,01 / 0,005 / 0
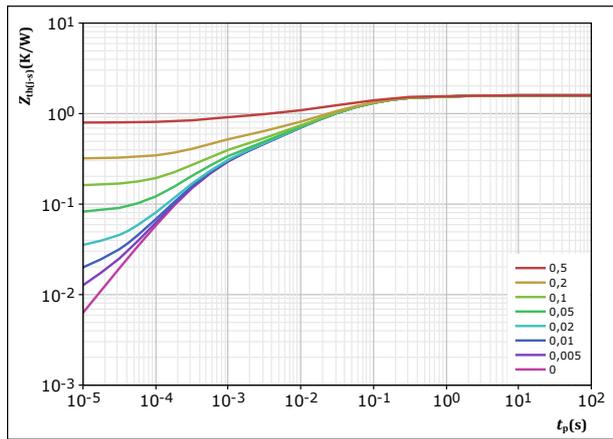
$D = t_p / T$

$R_{th(j-s)} =$ 1,589 K/W

FWD thermal model values

R (K/W)	τ (s)
1,05E-01	1,32E+00
5,49E-01	8,89E-02
5,00E-01	1,79E-02
2,20E-01	2,75E-03
2,16E-01	4,13E-04

Brake Switch Characteristics

figure 9. IGBT

Typical output characteristics
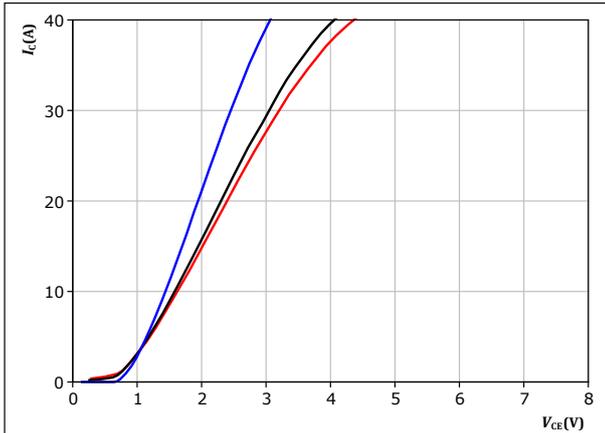
I_C = f(V_{CE})

t_p =	250	µs		
V_{GE} =	15	V	T_j:	25 °C
				125 °C
				150 °C

figure 10. IGBT

Typical output characteristics

I_C = f(V_{CE})

t_p =	250	µs
T_j =	150	°C
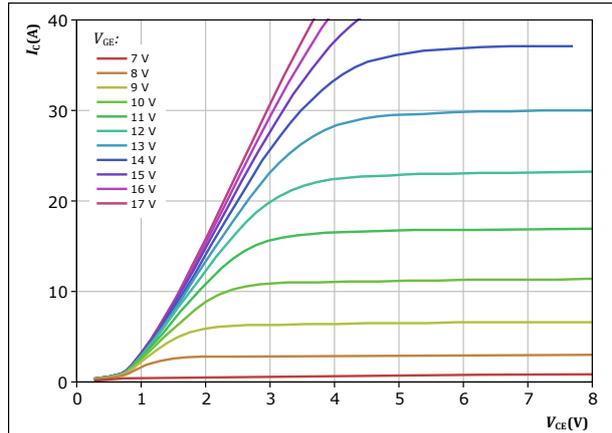
V_{GE} from 7 V to 17 V in steps of 1 V

figure 11. IGBT

Typical transfer characteristics

I_C = f(V_{GE})
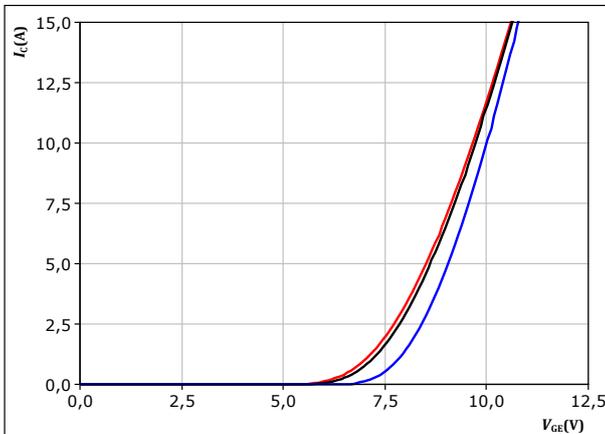
t_p =	250	µs		
V_{CE} =	10	V	T_j:	25 °C
				125 °C
				150 °C

figure 12. IGBT

Transient thermal impedance as a function of pulse width
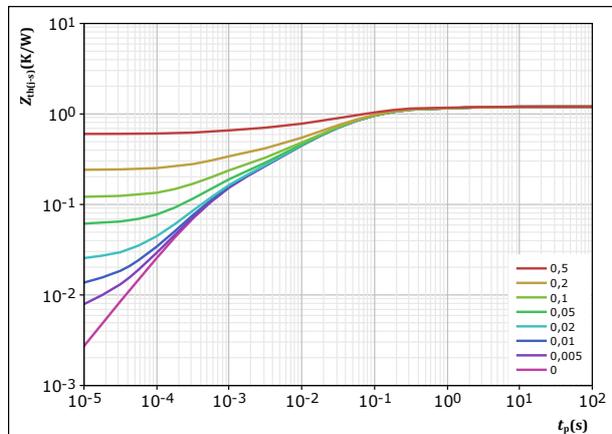
$Z_{th(j-s)}$ = f(t_p)

D = t_p / T
$R_{th(j-s)}$ = 1,203 K/W

IGBT thermal model values

R (K/W)	τ (s)
8,45E-02	1,63E+00
4,66E-01	9,37E-02
3,90E-01	2,02E-02
1,45E-01	3,96E-03
1,16E-01	5,44E-04

Brake Switch Characteristics

figure 13. **IGBT**

Safe operating area

$I_C = f(V_{CE})$
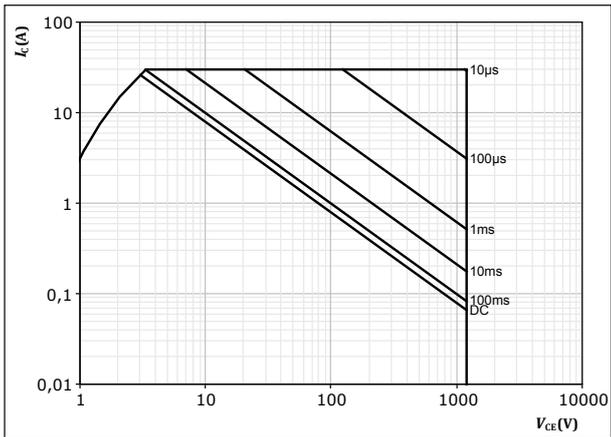
D = single pulse

$T_s =$	80	°C
$V_{GE} =$	15	V
$T_j =$	T_{jmax}	

figure 14. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$
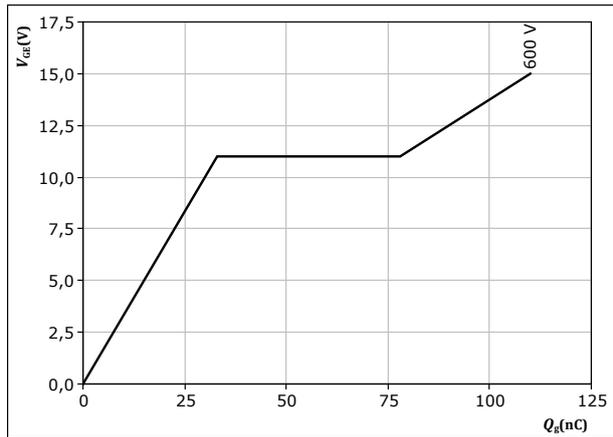
$I_C =$	15	A
$T_j =$	25	°C

Brake Diode Characteristics

figure 15. **FWD**

Typical forward characteristics

$I_F = f(V_F)$

t_p = 250 µs

T_j:
- 25 °C
- 125 °C
- 150 °C
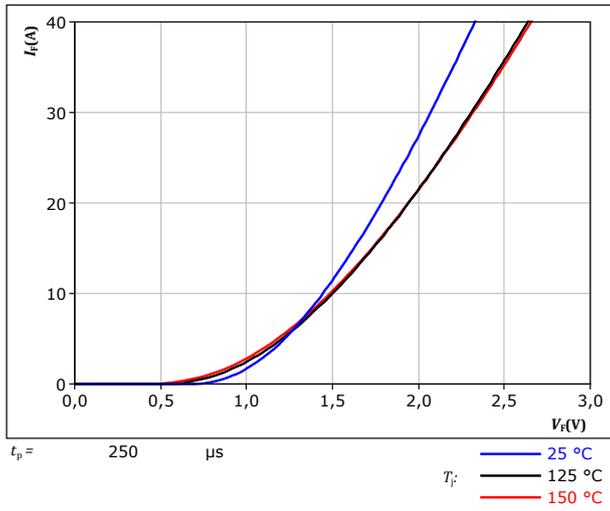
figure 16. **FWD**

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$
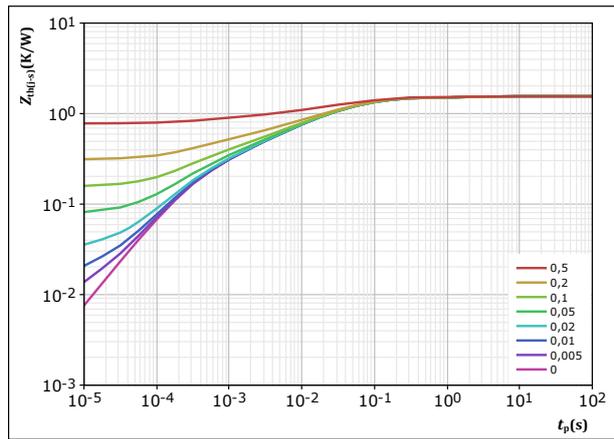
$D = t_p / T$

$R_{th(j-s)} = 1,553$ K/W

FWD thermal model values

R (K/W)	τ (s)
8,50E-02	1,79E+00
5,68E-01	6,89E-02
4,67E-01	1,30E-02
2,46E-01	2,26E-03
1,87E-01	3,04E-04

Brake Sw. Protection Diode Characteristics

figure 17.	FWD

Typical forward characteristics

$I_F = f(V_F)$

$t_p =$ 250 μs

T_j:
- 25 °C
- 125 °C
- 150 °C
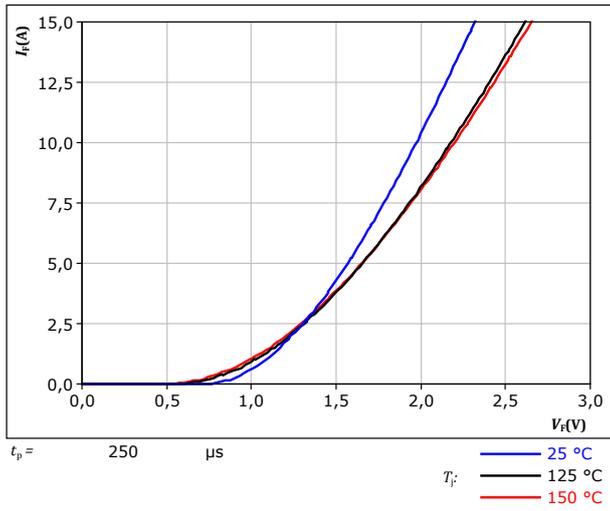
figure 18.	FWD

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$
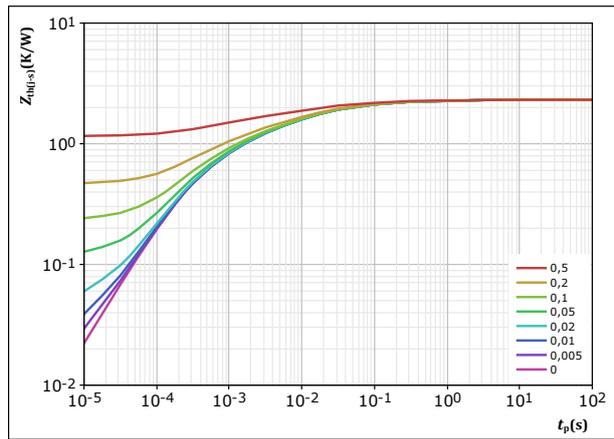
$D = t_p / T$

$R_{th(j-s)} =$ 2,313 K/W

FWD thermal model values

R (K/W)	τ (s)
1,03E-01	1,46E+00
4,16E-01	7,07E-02
7,17E-01	9,80E-03
6,03E-01	1,47E-03
4,75E-01	2,69E-04

Rectifier Diode Characteristics

figure 19.	Rectifier

Typical forward characteristics

$I_F = f(V_F)$

$t_p =$	250	µs

T_j: — 25 °C — 125 °C
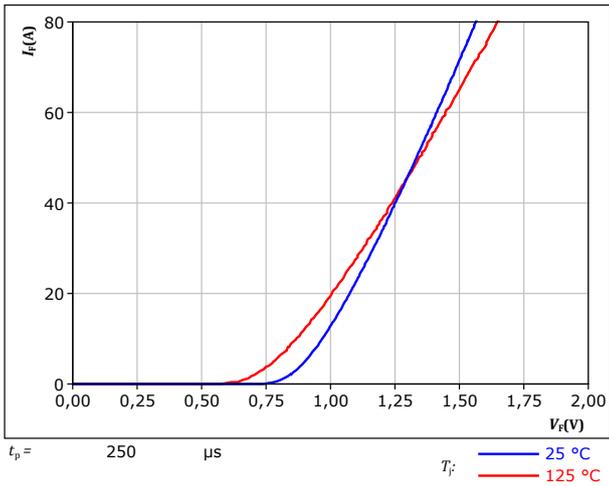
figure 20.	Rectifier

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$

0,5
0,2
0,1
0,05
0,02
0,01
0,005
0
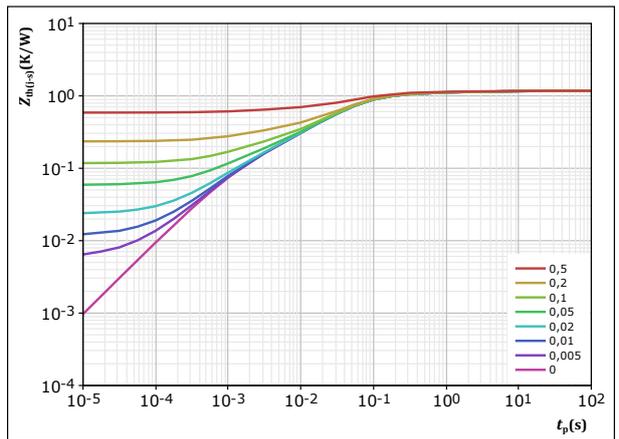
$D = \quad t_p / T$

$R_{th(j-s)} = \quad 1{,}175 \quad K/W$

Rectifier thermal model values

R (K/W)	τ (s)
4,37E-02	8,76E+00
8,20E-02	7,46E-01
2,18E-01	1,33E-01
6,30E-01	4,45E-02
1,17E-01	8,66E-03
7,88E-02	1,33E-03
5,43E-03	6,42E-04

Thermistor Characteristics

figure 21.	Thermistor

Typical PTC characteristic as function of temperature

$R_\mathrm{T} = \mathrm{f}(T)$
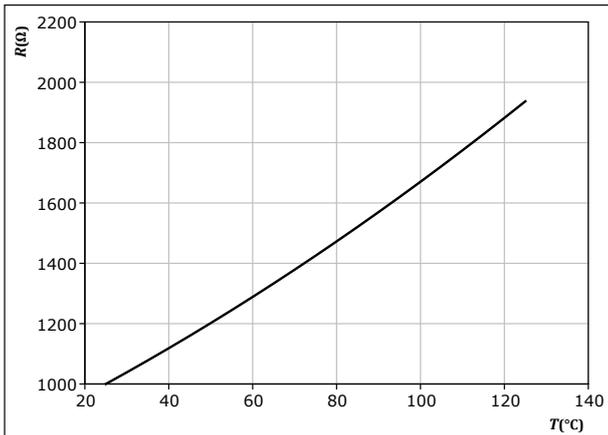
Inverter Switching Characteristics

figure 22.	IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$
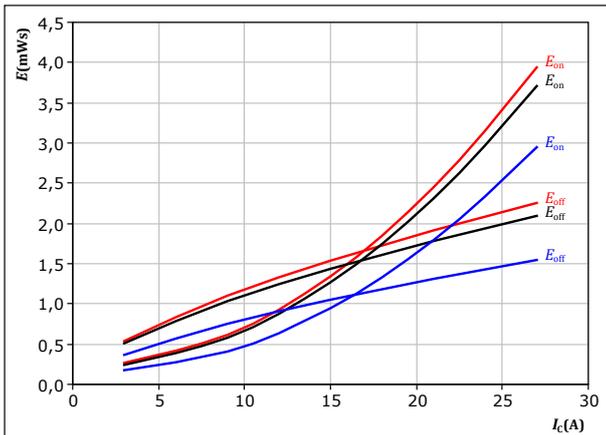
With an inductive load at

				T_j:	25 °C
V_{CE} =	600	V			125 °C
V_{GE} =	±15	V			150 °C
R_{gon} =	32	Ω			
R_{goff} =	32	Ω			

figure 23.	IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$E = f(R_g)$
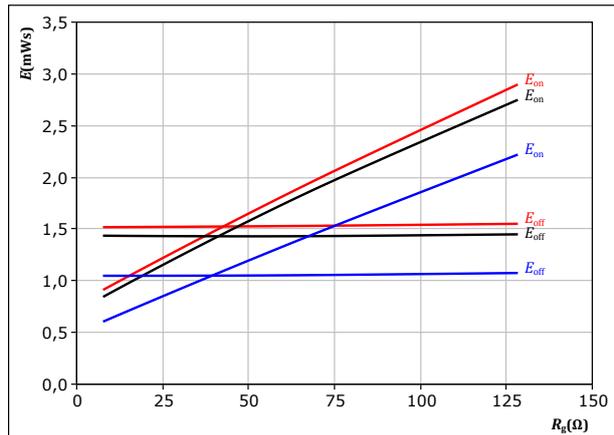
With an inductive load at

				T_j:	25 °C
V_{CE} =	600	V			125 °C
V_{GE} =	±15	V			150 °C
I_C =	15	A			

figure 24.	FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$

With an inductive load at

				T_j:	25 °C
V_{CE} =	600	V			125 °C
V_{GE} =	±15	V			150 °C
R_{gon} =	32	Ω			

figure 25.	FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

$E_{rec} = f(R_g)$

With an inductive load at

				T_j:	25 °C
V_{CE} =	600	V			125 °C
V_{GE} =	±15	V			150 °C
I_C =	15	A			

Inverter Switching Characteristics

figure 26.	IGBT

Typical switching times as a function of collector current

$t = f(I_C)$
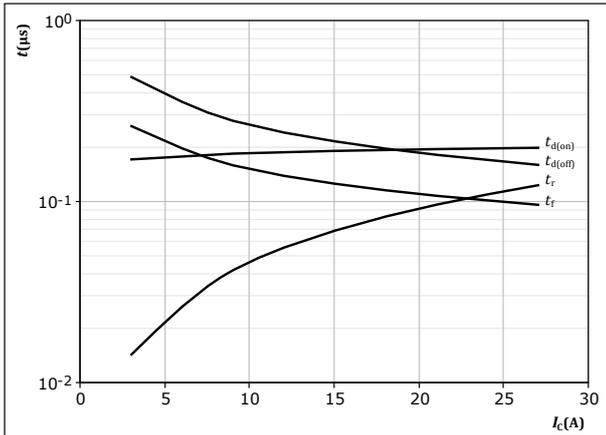
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω
R_{goff} =	32	Ω

figure 27.	IGBT

Typical switching times as a function of IGBT turn on gate resistor

$t = f(R_g)$
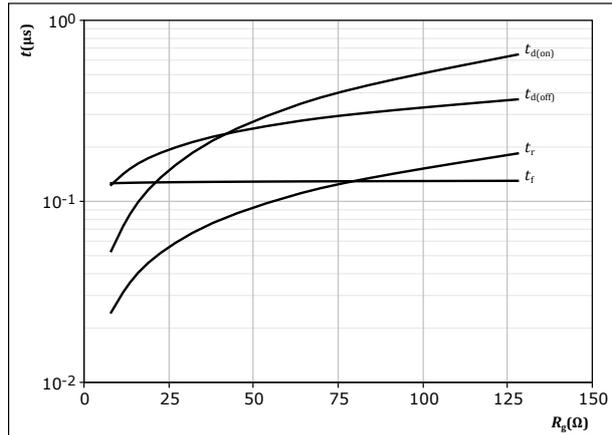
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	15	A

figure 28.	FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$
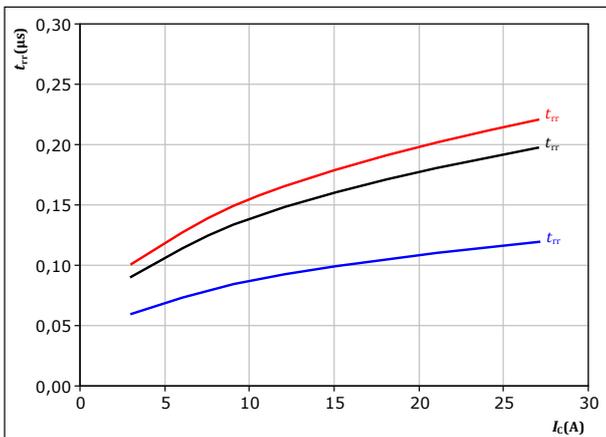
With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

T_j: 25 °C / 125 °C / 150 °C

figure 29.	FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

$t_{rr} = f(R_{gon})$
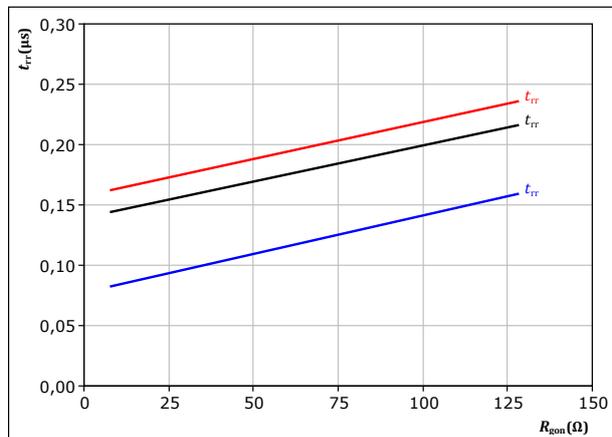
With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	15	A

T_j: 25 °C / 125 °C / 150 °C

Inverter Switching Characteristics

figure 30.	FWD

Typical recovered charge as a function of collector current
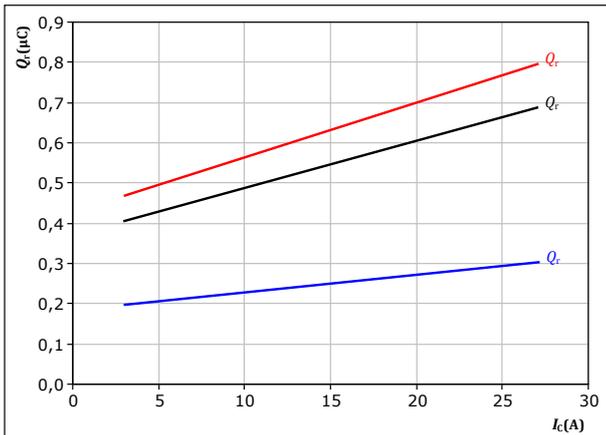
$Q_r = f(I_c)$

With an inductive load at

V_{CE} =	600	V	T_j:	—	25 °C
V_{GE} =	±15	V		—	125 °C
R_{gon} =	32	Ω		—	150 °C

figure 31.	FWD

Typical recovered charge as a function of IGBT turn on gate resistor
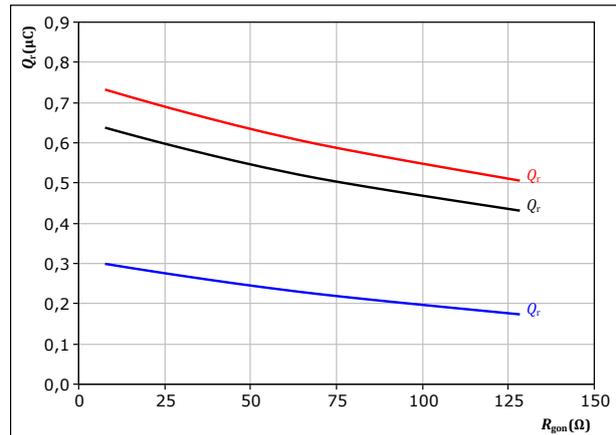
$Q_r = f(R_{gon})$

With an inductive load at

V_{CE} =	600	V	T_j:	—	25 °C
V_{GE} =	±15	V		—	125 °C
I_C =	15	A		—	150 °C

figure 32.	FWD

Typical peak reverse recovery current as a function of collector current
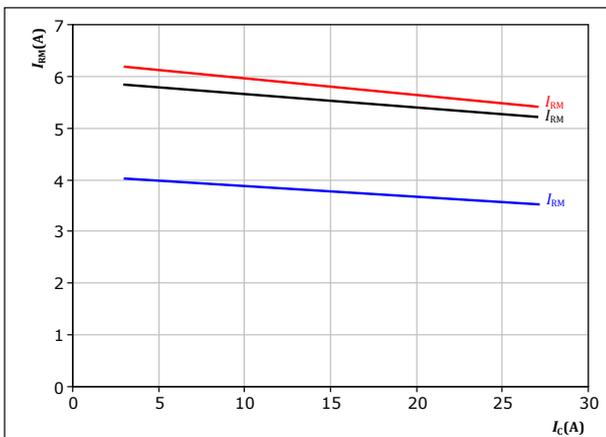
$I_{RM} = f(I_c)$

With an inductive load at

V_{CE} =	600	V	T_j:	—	25 °C
V_{GE} =	±15	V		—	125 °C
R_{gon} =	32	Ω		—	150 °C

figure 33.	FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$I_{RM} = f(R_{gon})$
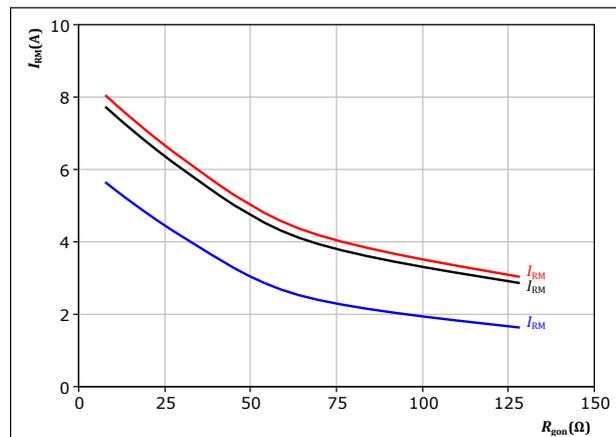
With an inductive load at

V_{CE} =	600	V	T_j:	—	25 °C
V_{GE} =	±15	V		—	125 °C
I_C =	15	A		—	150 °C

Inverter Switching Characteristics

figure 34. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
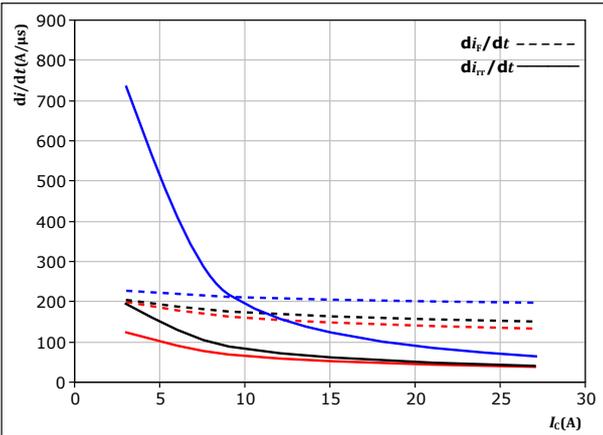
di_F/dt, di_{rr}/dt = f(I_C)

With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

T_j: — 25 °C — 125 °C — 150 °C

figure 35. FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor

di_F/dt, di_{rr}/dt = f(R_{gon})
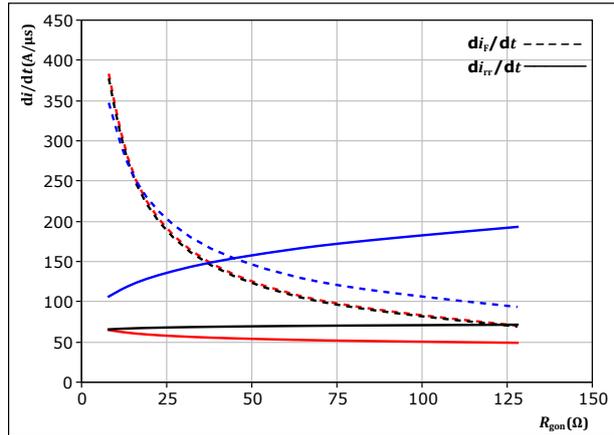
With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	15	A

T_j: — 25 °C — 125 °C — 150 °C

figure 36. IGBT

Reverse bias safe operating area

I_C = f(V_{CE})

At
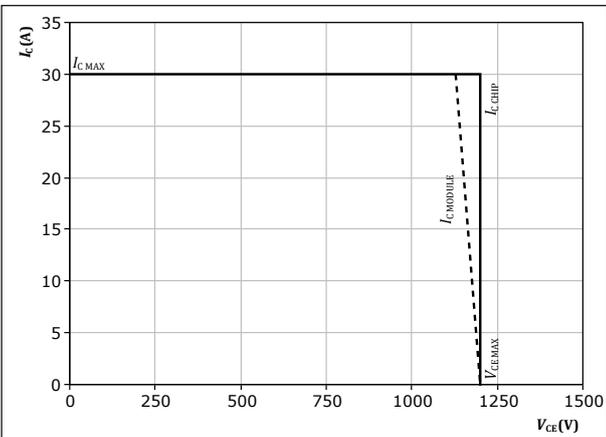
T_j =	150	°C
R_{gon} =	32	Ω
R_{goff} =	32	Ω

Brake Switching Characteristics

figure 37.	IGBT

Typical switching energy losses as a function of collector current
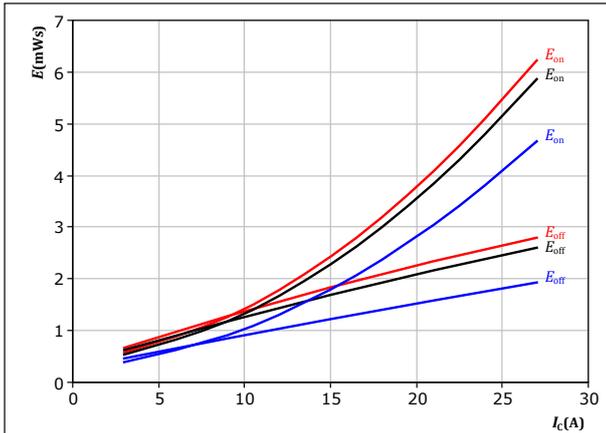
$E = f(I_C)$

With an inductive load at

				T_j:	25 °C
V_{CE} =	700	V			125 °C
V_{GE} =	0/15	V			150 °C
R_{gon} =	32	Ω			
R_{goff} =	32	Ω			

figure 38.	IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$E = f(R_g)$
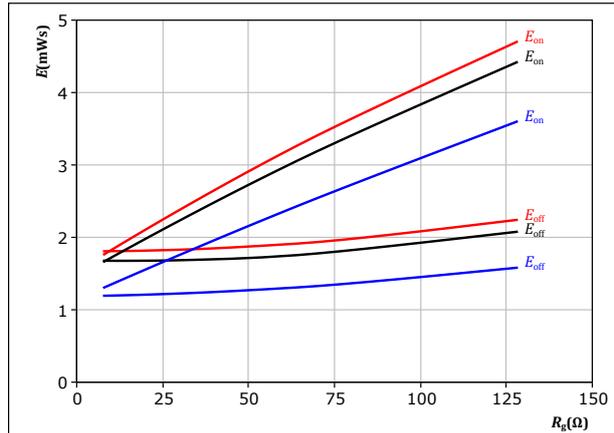
With an inductive load at

				T_j:	25 °C
V_{CE} =	700	V			125 °C
V_{GE} =	0/15	V			150 °C
I_C =	15	A			

figure 39.	FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$

With an inductive load at

				T_j:	25 °C
V_{CE} =	700	V			125 °C
V_{GE} =	0/15	V			150 °C
R_{gon} =	32	Ω			

figure 40.	FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

$E_{rec} = f(R_g)$

With an inductive load at

				T_j:	25 °C
V_{CE} =	700	V			125 °C
V_{GE} =	0/15	V			150 °C
I_C =	15	A			

Brake Switching Characteristics

figure 41. — **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$
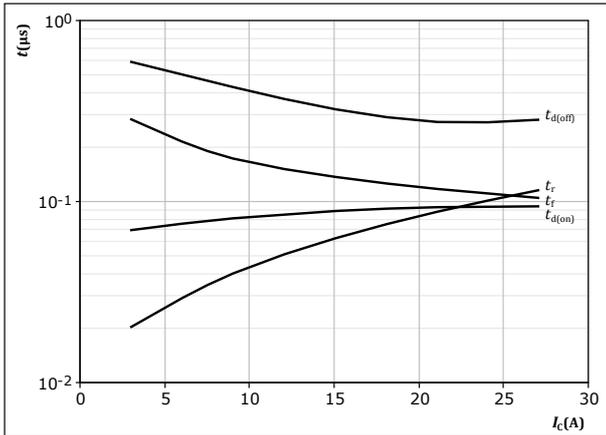
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	32	Ω
R_{goff} =	32	Ω

figure 42. — **IGBT**

Typical switching times as a function of IGBT turn on gate resistor

$t = f(R_g)$
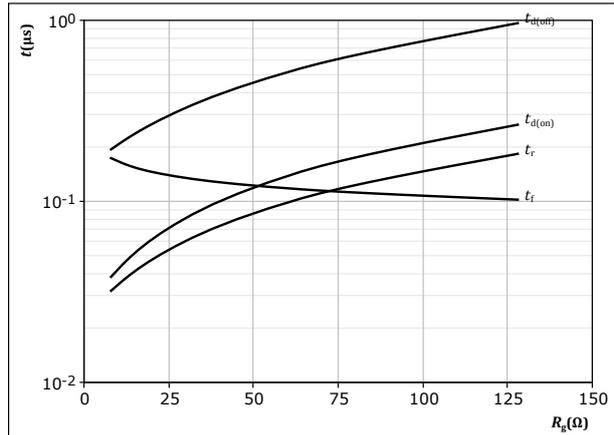
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	15	A

figure 43. — **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$
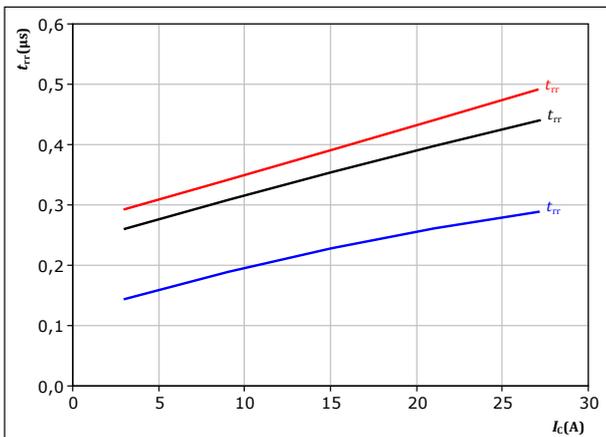
With an inductive load at

V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	32	Ω

T_j:
- 25 °C
- 125 °C
- 150 °C

figure 44. — **FWD**

Typical reverse recovery time as a function of IGBT turn on gate resistor

$t_{rr} = f(R_{gon})$
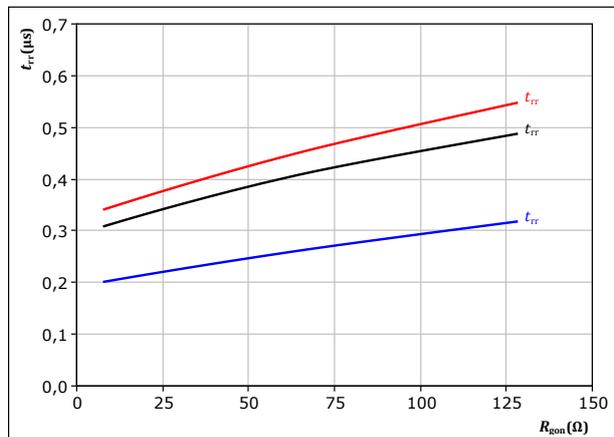
With an inductive load at

V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	15	A

T_j:
- 25 °C
- 125 °C
- 150 °C

Brake Switching Characteristics

figure 45. **FWD**

Typical recovered charge as a function of collector current
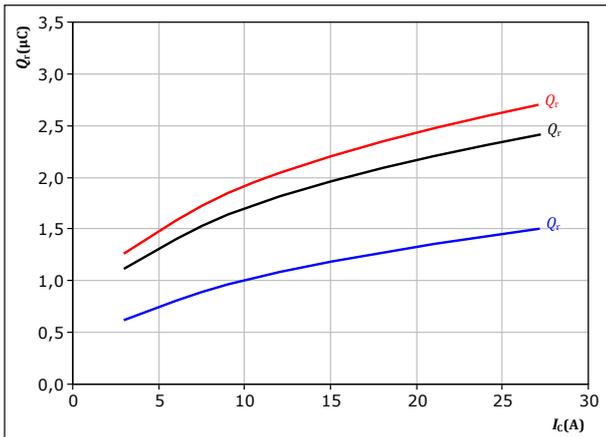
Q_r = f(I_C)

With an inductive load at

V_{CE} =	700	V		25 °C
V_{GE} =	0/15	V	T_j:	125 °C
R_{gon} =	32	Ω		150 °C

figure 46. **FWD**

Typical recovered charge as a function of IGBT turn on gate resistor
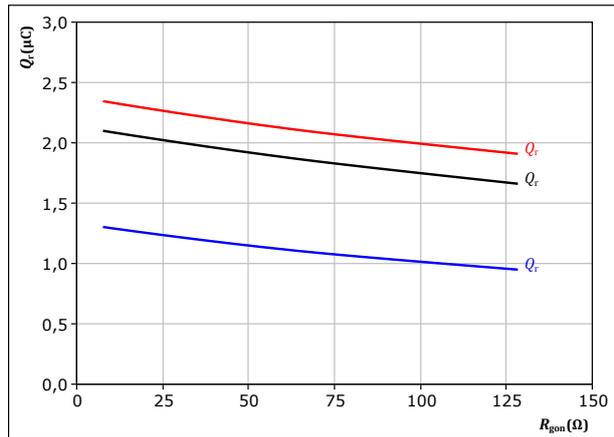
Q_r = f(R_{gon})

With an inductive load at

V_{CE} =	700	V		25 °C
V_{GE} =	0/15	V	T_j:	125 °C
I_C =	15	A		150 °C

figure 47. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)

With an inductive load at

V_{CE} =	700	V		25 °C
V_{GE} =	0/15	V	T_j:	125 °C
R_{gon} =	32	Ω		150 °C

figure 48. **FWD**

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

I_{RM} = f(R_{gon})

With an inductive load at

V_{CE} =	700	V		25 °C
V_{GE} =	0/15	V	T_j:	125 °C
I_C =	15	A		150 °C
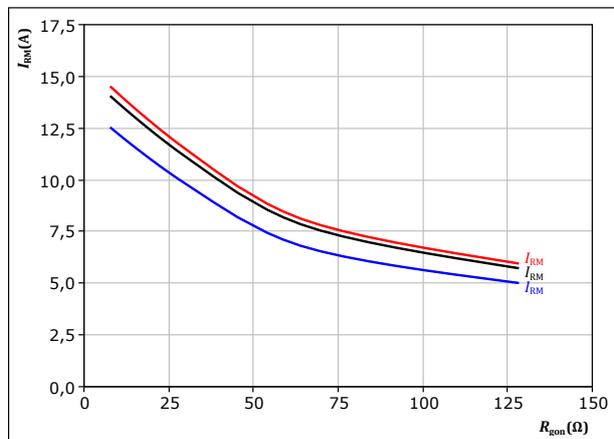
Brake Switching Characteristics

figure 49.	FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
$\mathrm{d}i_F/\mathrm{d}t,\ \mathrm{d}i_{rr}/\mathrm{d}t = \mathrm{f}(\,I_C)$
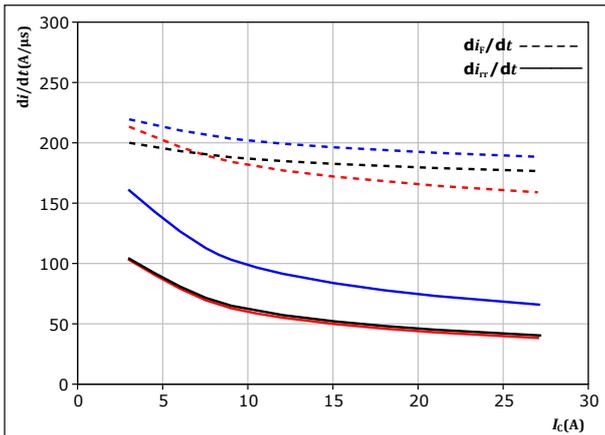
With an inductive load at

V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	32	Ω

T_j:
- 25 °C
- 125 °C
- 150 °C

figure 50.	FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor
$\mathrm{d}i_F/\mathrm{d}t,\ \mathrm{d}i_{rr}/\mathrm{d}t = \mathrm{f}(\,R_{gon})$
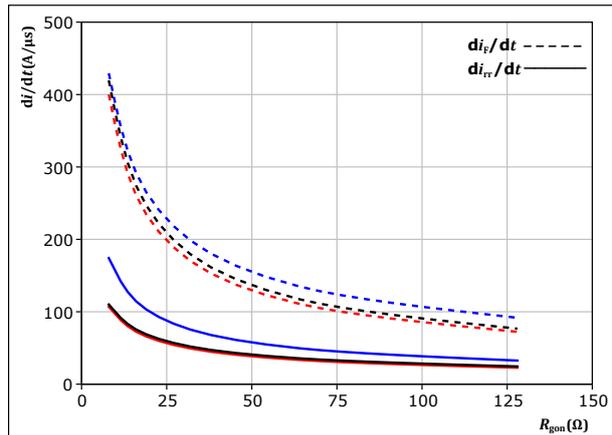
With an inductive load at

V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	15	A

T_j:
- 25 °C
- 125 °C
- 150 °C

figure 51.	IGBT

Reverse bias safe operating area
$I_C = \mathrm{f}(\,V_{CE})$

At
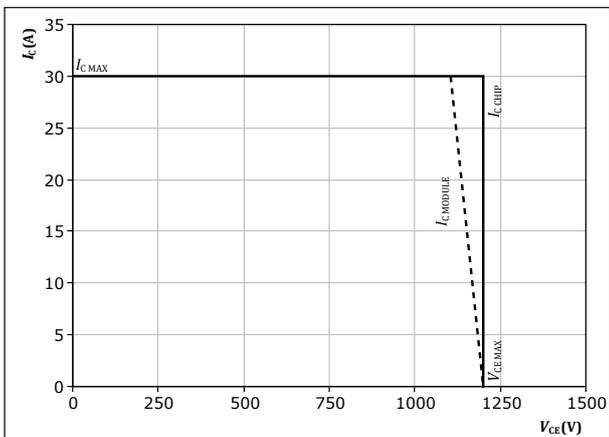
T_j =	150	°C
R_{gon} =	32	Ω
R_{goff} =	32	Ω

Switching Definitions

figure 52. **IGBT**

Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{tEoff} = integrating time for E_{off})
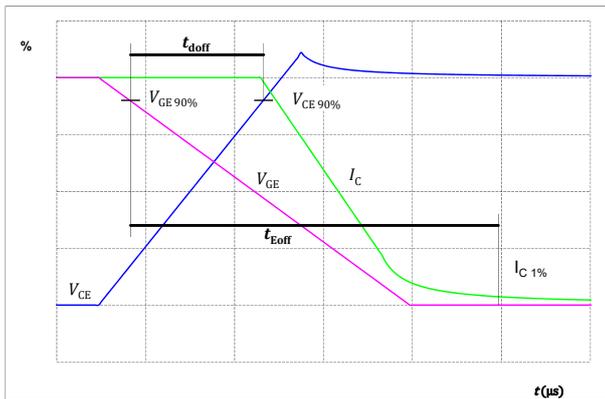
figure 53. **IGBT**

Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})
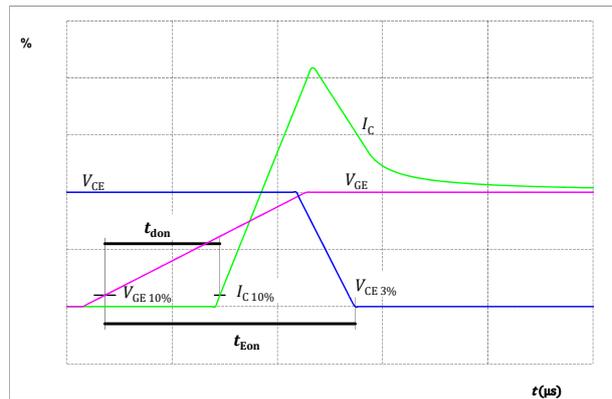
figure 54. **IGBT**

Turn-off Switching Waveforms & definition of t_f
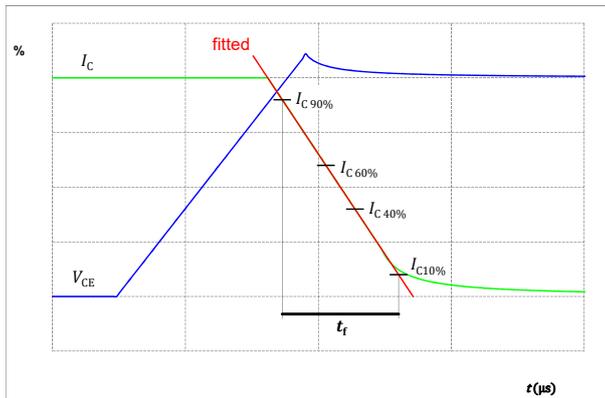
figure 55. **IGBT**

Turn-on Switching Waveforms & definition of t_r

Switching Definitions

Turn-off Switching Waveforms & definition of t_{rr}
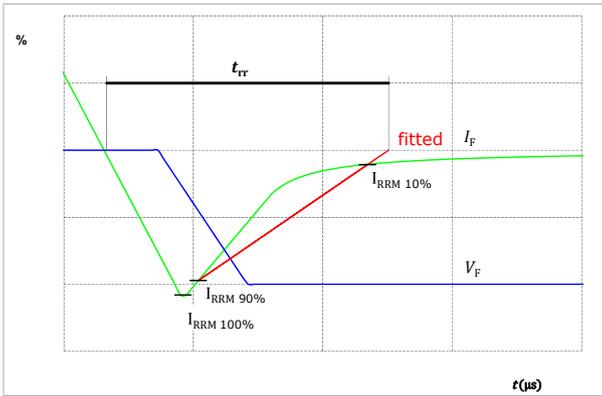
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)
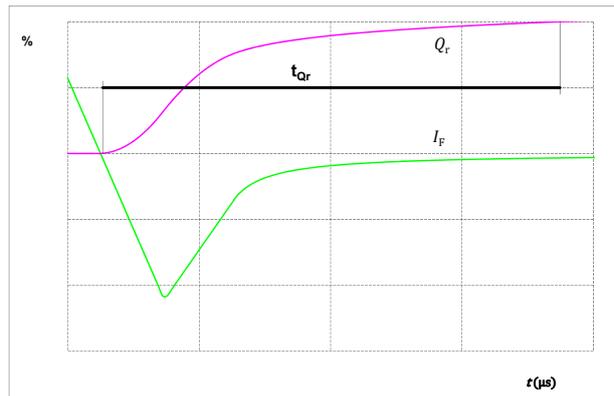
Vincotech

Ordering Code

Version	Ordering Code
With std lid (6.5mm height) + no thermal grease	80-M112PMA015M702-K200A72-/0A/
With thin lid (2.8mm height) + no thermal grease	80-M112PMA015M702-K200A72-/0B/
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M112PMA015M702-K200A72-/1A/
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M112PMA015M702-K200A72-/1B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M112PMA015M702-K200A72-/4A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M112PMA015M702-K200A72-/4B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M112PMA015M702-K200A72-/5A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M112PMA015M702-K200A72-/5B/

Marking

		Name	Date code	UL & VIN	Lot	Serial
	Text	NN-NNNNNNNNNNNNNN-TTTTTTVV	WWYY	UL VIN	LLLLL	SSSS
		Type&Ver	Lot number	Serial	Date code	
	Datamatrix	TTTTTTVV	LLLLL	SSSS	WWYY	

Outline

Pin table [mm]

Pin	X	Y	Function
1	15,93	-14,6	G16
2	15,93	-9,8	Ph3
3	not assembled		
4	15,93	-0,2	Therm1
5	15,93	7,62	Therm2
6	15,93	12,62	G15
7	15,93	15,8	DC-3
8	not assembled		
9	8,23	12,62	G13
10	8,23	15,8	DC-2
11	7,73	-14,6	G14
12	7,73	-9,8	Ph2
13	not assembled		
14	not assembled		
15	0,53	12,62	G11
16	0,53	15,8	DC-1
17	-0,47	-14,6	G12
18	-0,47	-9,8	Ph1
19	-5,47	-5	DC+Br
20	-5,47	5,35	Br
21	-7,17	12,62	G27
22	-7,17	15,8	DC-Br
23	not assembled		
24	-8,07	-9,8	DC+Inv
25	-15,02	-15,8	DC+Rect
26	-15,02	-9,8	ACIn3
27	-15,02	0	ACIn2
28	-15,02	9,8	ACIn1
29	-15,02	15,8	DC-Rect
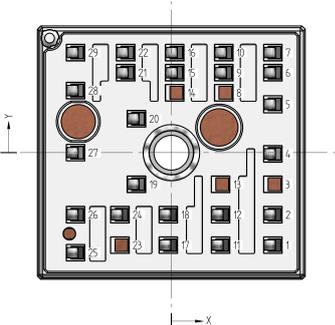
Pad positions refers to center point. For more informations on pad design please see package data

Vincotech

Pinout
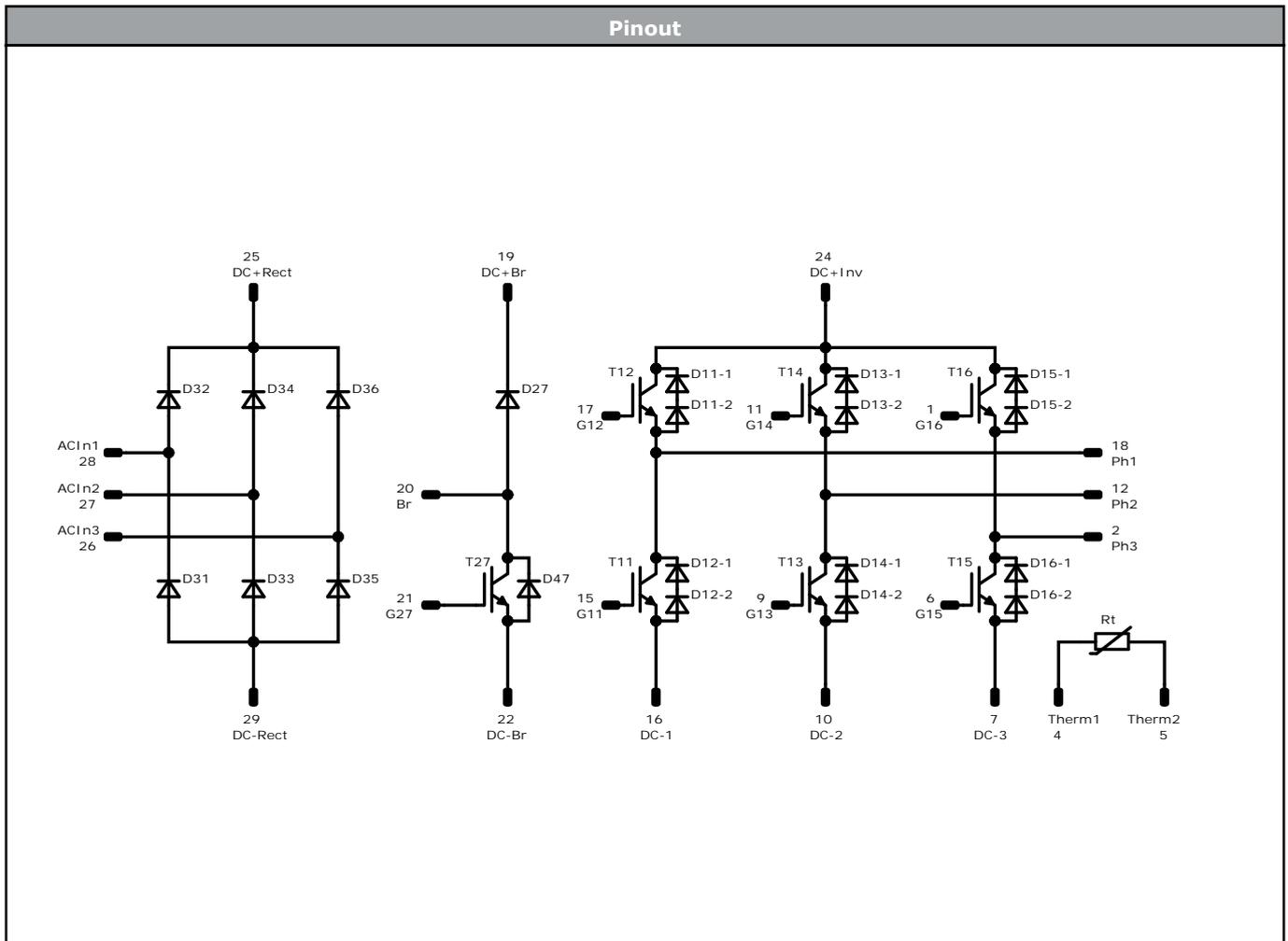
Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	15 A	Inverter Switch	
D11-1, D11-2, D12-1, D12-2, D13-1, D13-2, D14-1, D14-2, D15-1, D15-2, D16-1, D16-2	FWD	1300 V	10 A	Inverter Diode	
T27	IGBT	1200 V	15 A	Brake Switch	
D27	FWD	1200 V	15 A	Brake Diode	
D47	FWD	1200 V	5 A	Brake Sw. Protection Diode	
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	28 A	Rectifier Diode	
Rt	Thermistor			Thermistor	

80-M112PMA015M702-K200A72
datasheet

Packaging instruction					
Standard packaging quantity (SPQ) 120		>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for MiniSKiiP® 1 packages see vincotech.com website.

Package data
Package data for MiniSKiiP® 1 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
80-M112PMA015M702-K200A72-D1-14	9 Jun. 2023		