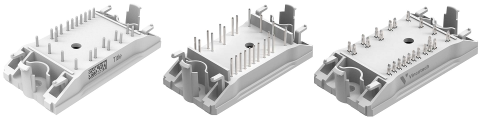
flow PIM 0 3rd gen — 1200 V / 15 A

Features
- 2 Clips housing in 12 and 17mm height
- Trench Fieldstop Technology IGBT4
- Enhanced Rectifier
- Optional w/o BRC

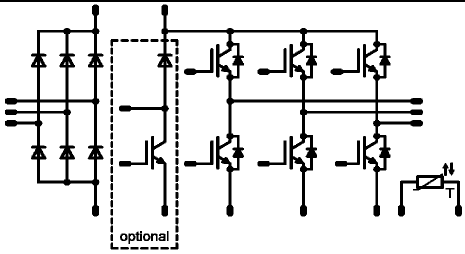
flow PIM 0 3rd gen



12mm Solder pins | 17mm Solder pins | 12mm Press-fit pins

Target Applications
- Industrial Drives
- Embedded Generation

Schematic



Types
- V23990-P840-A58-PM
- V23990-P840-A59-PM
- V23990-P840-C58-PM
- V23990-P840-C59-PM
- V23990-P840-A58Y-PM

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Rectifier Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
DC forward current	I_{FAV}	$T_j = T_{jmax}$	T_s = 80 °C	34	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms	T_j = 150 °C	270	A
I^2t-value	I^2t	t_p = 10 ms	T_j = 150 °C	365	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	39	W
Maximum Junction Temperature	T_{jmax}			150	°C
Inverter IGBT					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	18	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		45	A
Turn off safe operating area		V_{CE} ≤ 1200V, $T_j \le T_{op}$ max		30	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	52	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		10 800	μs V
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter FWD					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	20	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		30	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	38	W
Maximum Junction Temperature	T_{jmax}			175	°C
Brake IGBT					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	12	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		24	A
Turn off safe operating area		V_{CE} ≤ 1200V, $T_j \le T_{op}$ max		16	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	40	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j ≤ 150 °C V_{GE} = 15 V		10 800	μs V
Maximum Junction Temperature	T_{jmax}			175	°C
Brake FWD					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	10	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		15	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	22	W
Maximum Junction Temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{op}		-40…+(T_{jmax} - 25)	°C
Insulation Properties				
Insulation voltage	V_{is}	t = 2 s DC Test Voltage	4000	V
Creepage distance		Solder pins	min 12,7	mm
Clearance		Solder pins	min 12,7	mm
Creepage distance		Press-fit pins	min 12,7	mm
Clearance		Press-fit pins	9,48	mm
Comparative tracking index	CTI		>200	

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Value Min	Value Typ	Value Max	Unit
Rectifier Diode										
Forward voltage	V_F				30	25 125		1,19 1,17	1,8	V
Threshold voltage (for power loss calc. only)	V_{to}				30	25 125		0,91 0,79		V
Slope resistance (for power loss calc. only)	r_t				30	25 125		8 11		mΩ
Reverse current	I_r			1500		25			0,1	mA
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						1,80		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,54		K/W
Inverter IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0005	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}				15	25 125	1,6	1,94 2,26	2,15	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25			0,05	mA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	600	15	25 125		60 60		ns
Rise time	t_r					25 125		15 19		
Turn-off delay time	$t_{d(off)}$					25 125		197 239		
Fall time	t_f					25 125		79 106		
Turn-on energy loss	E_{on}					25 125		0,88 1,25		mWs
Turn-off energy loss	E_{off}					25 125		0,88 1,24		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		1000		pF
Output capacitance	C_{oss}							100		
Reverse transfer capacitance	C_{rss}							56		
Gate charge	Q_G		±15		15	25		93		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						1,83		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,56		K/W
Inverter FWD										
Diode forward voltage	V_F				10	25 125	1,35	1,90 1,91	2,1	V
Peak reverse recovery current	I_{RRM}	R_{gon} = 16 Ω	±15	600		25 125		13,3 16,1		A
Reverse recovery time	t_{rr}					25 125		282 433		ns
Reverse recovered charge	Q_{rr}					25 125		1,59 2,75		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		129 109		A/μs
Reverse recovered energy	E_{rec}					25 125		0,65 1,16		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						2,52		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						2,18		K/W

Characteristic Values

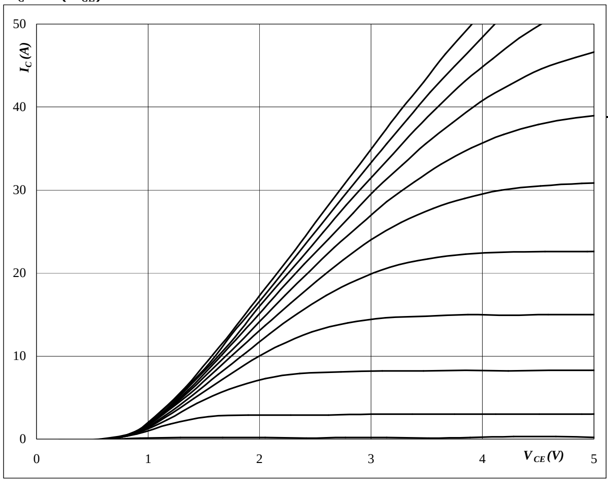
Parameter	Symbol		V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Value Min	Typ	Max	Unit
Brake IGBT										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0003	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}				8	25 125	1,6	1,87 2,22	2,1	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		25			0,05	mA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$					25 125		71 72		ns
Rise time	t_r					25 125		20 24		
Turn-off delay time	$t_{d(off)}$	$R_{goff} = 32\ \Omega$ $R_{gon} = 32\ \Omega$	±15	600	8	25 125		181 228		
Fall time	t_f					25 125		78 104		
Turn-on energy loss	E_{on}					25 125		0,50 0,71		mWs
Turn-off energy loss	E_{off}					25 125		0,43 0,62		
Input capacitance	C_{ies}							490		pF
Output capacitance	C_{oss}	f = 1 MHz	0	25		25		50		
Reverse transfer capacitance	C_{rss}							30		
Gate charge	Q_G		±15		8	25		50		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						2,36		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						2,03		K/W
Brake FWD										
Diode forward voltage	V_F				7,5	25 125	0,8	1,67 1,61	2,2	V
Reverse leakage current	I_r			1200		25			250	µA
Peak reverse recovery current	I_{RRM}					25 125		8,68 9,87		A
Reverse recovery time	t_{rr}					25 125		258 427		ns
Reverse recovered charge	Q_{rr}	$R_{gon} = 32\ \Omega$ $R_{gon} = 32\ \Omega$	±15	600		25 125		0,90 0,90		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		78 73		A/µs
Reverse recovery energy	E_{rec}					25 125		0,35 0,69		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50um λ = 1 W/mK						3,15		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						2,74		K/W
Thermistor										
Rated resistance	R					25		22000		Ω
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-5		5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3940		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		4000		K
Vincotech NTC Reference									A	

Output Inverter

Figure 1 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



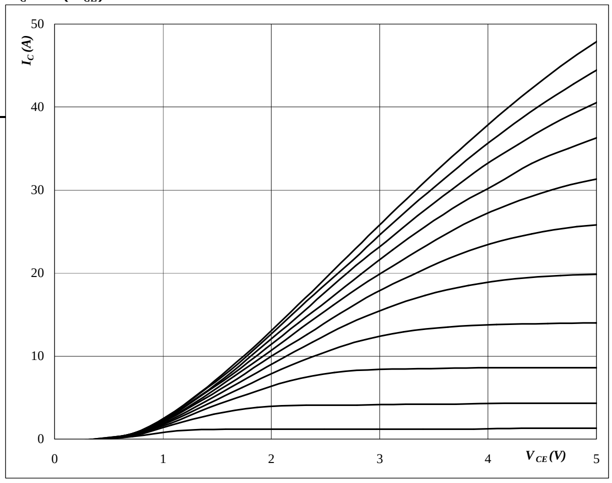
At

t_p =	250	µs
T_j =	25	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 2 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



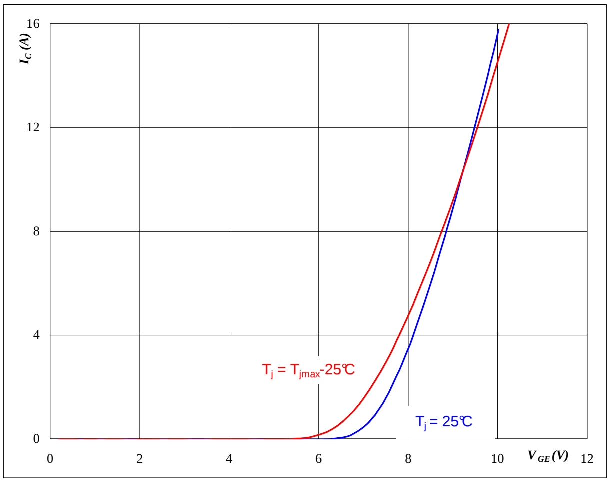
At

t_p =	250	µs
T_j =	125	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 3 Output inverter IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



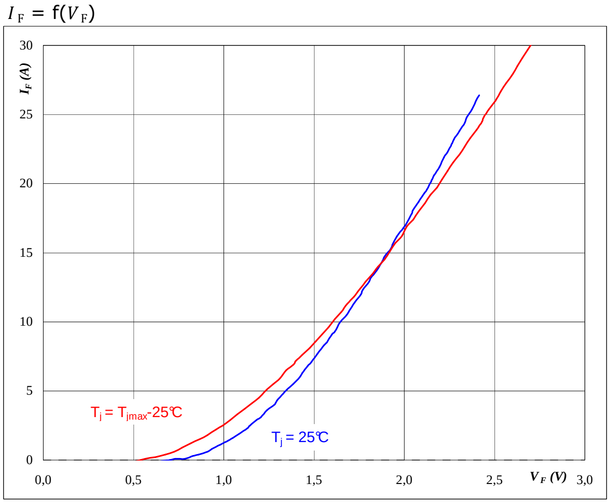
At

t_p =	250	µs
V_{CE} =	10	V

Figure 4 Output inverter FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

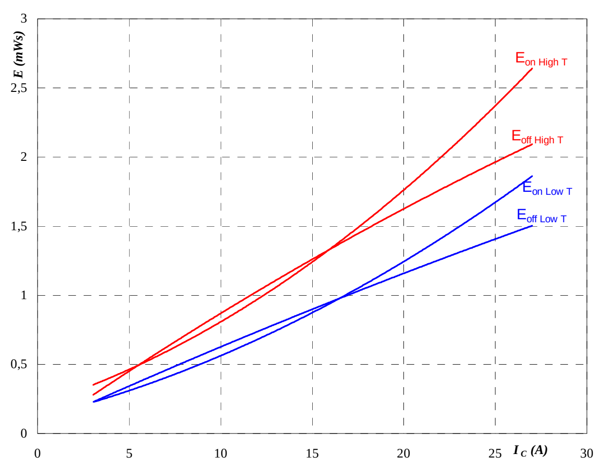
t_p =	250	µs

Output Inverter

Figure 5 Output inverter IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



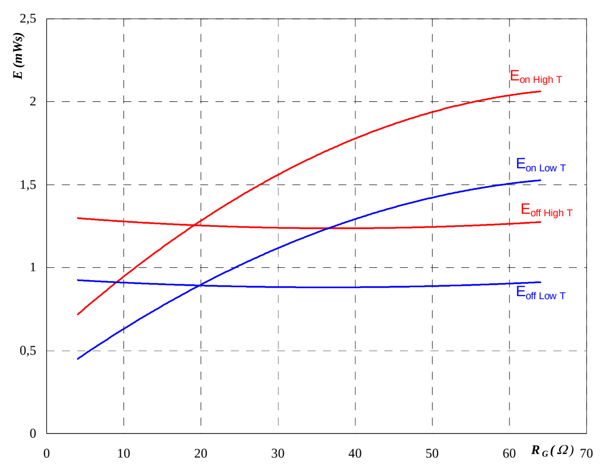
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Figure 6 Output inverter IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



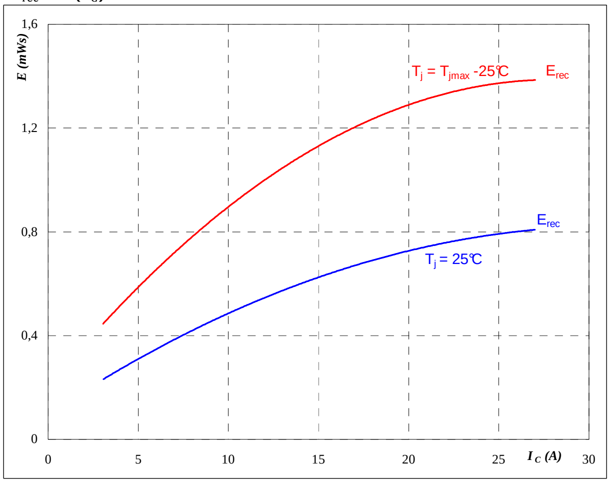
With an inductive load at

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

Figure 7 Output inverter FWD

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



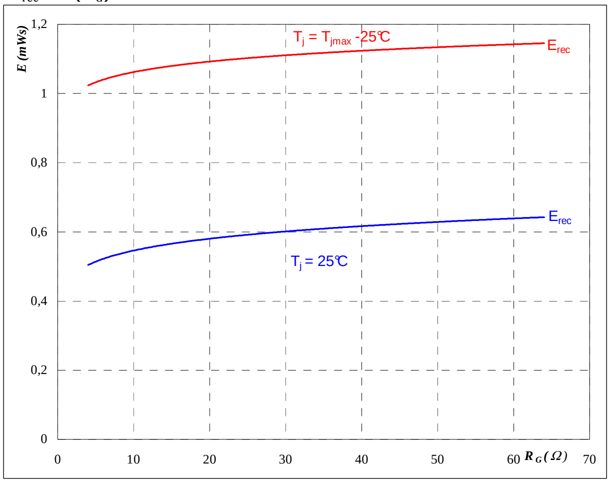
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

Figure 8 Output inverter FWD

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

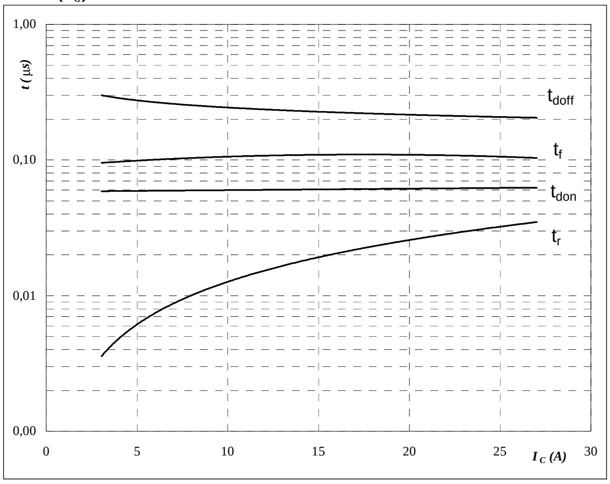
T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	15	A

Output Inverter

Figure 9 Output inverter IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



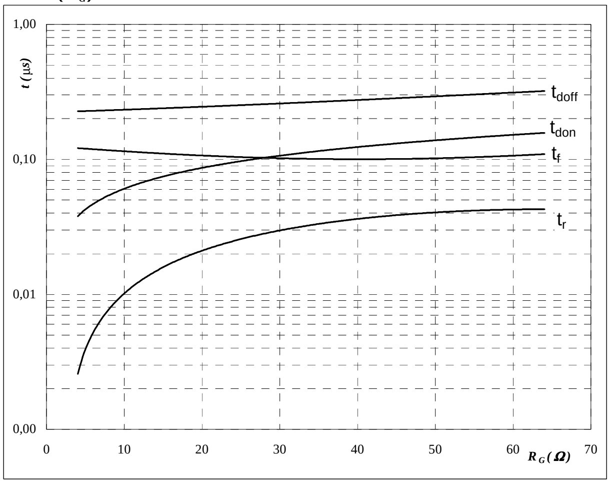
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Figure 10 Output inverter IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



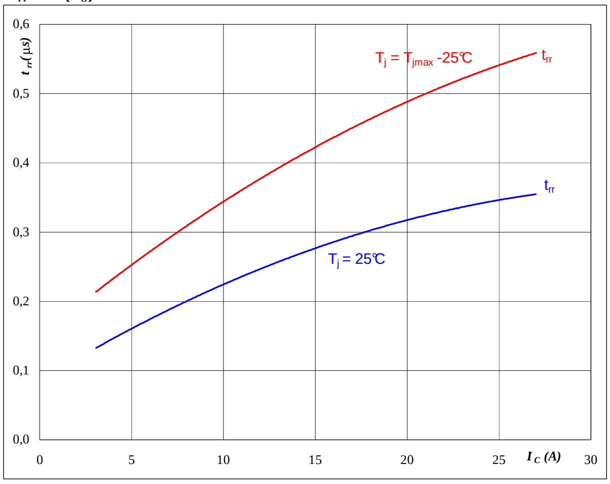
With an inductive load at

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

Figure 11 Output inverter FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



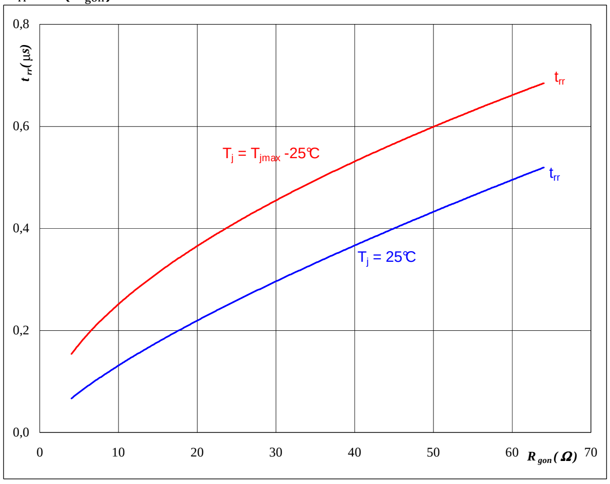
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

Figure 12 Output inverter FWD

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

$t_{rr} = f(R_{gon})$



At

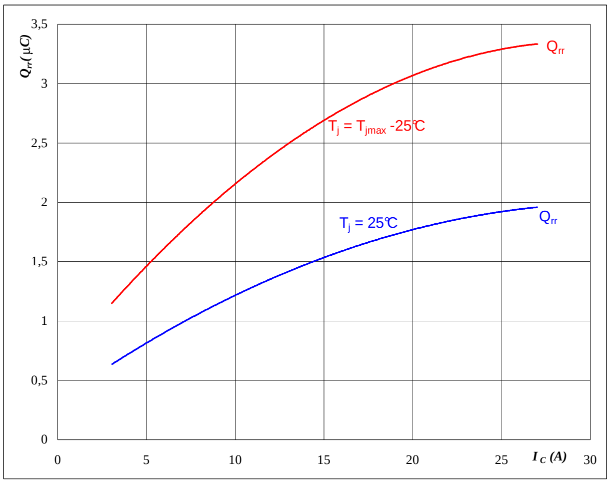
T_j =	25/125	°C
V_R =	600	V
I_F =	15	A
V_{GE} =	±15	V

Output Inverter

Figure 13 Output inverter FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



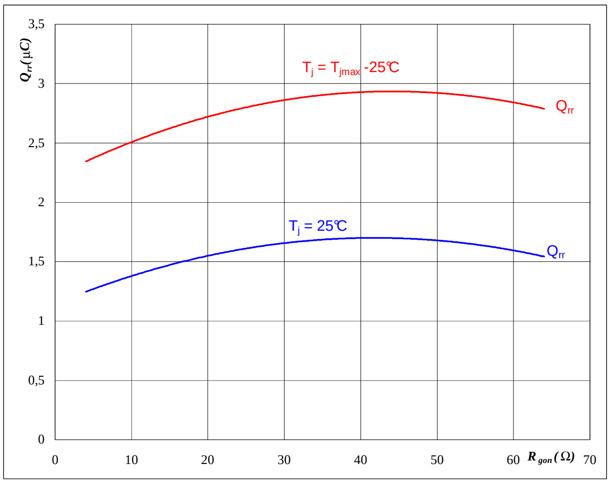
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

Figure 14 Output inverter FWD

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

$Q_{rr} = f(R_{gon})$



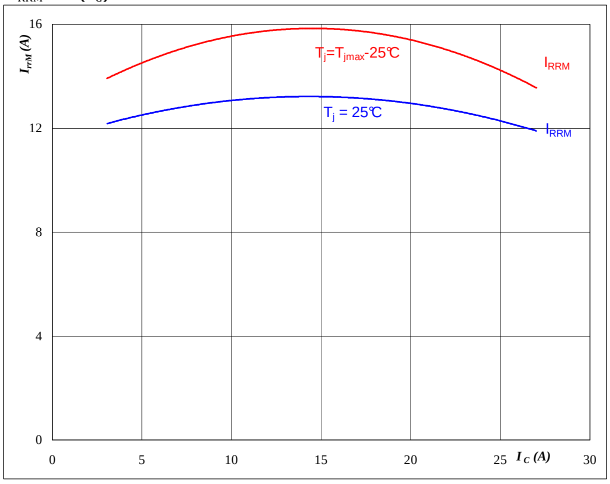
At

T_j =	25/125	°C
V_R =	600	V
I_F =	15	A
V_{GE} =	±15	V

Figure 15 Output inverter FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



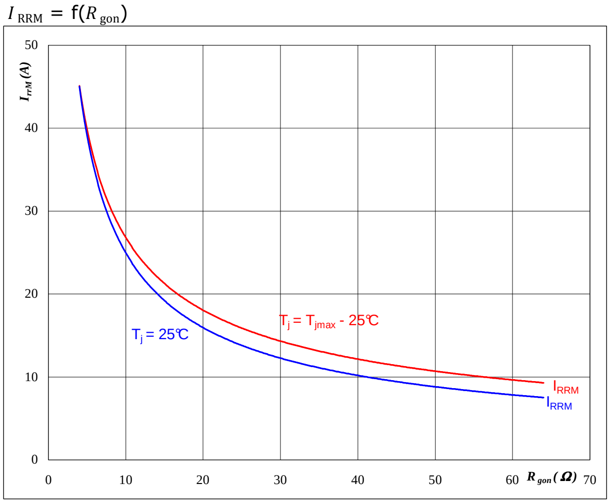
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

Figure 16 Output inverter FWD

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

$I_{RRM} = f(R_{gon})$



At

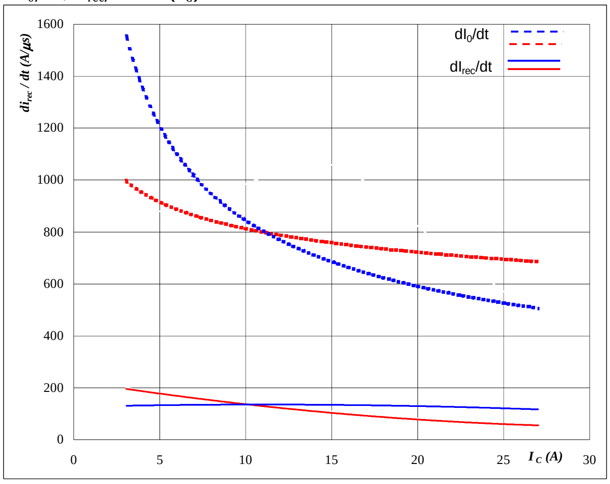
T_j =	25/125	°C
V_R =	600	V
I_F =	15	A
V_{GE} =	±15	V

Output Inverter

Figure 17 Output inverter FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current

$dI_0/dt, dI_{rec}/dt = f(I_C)$



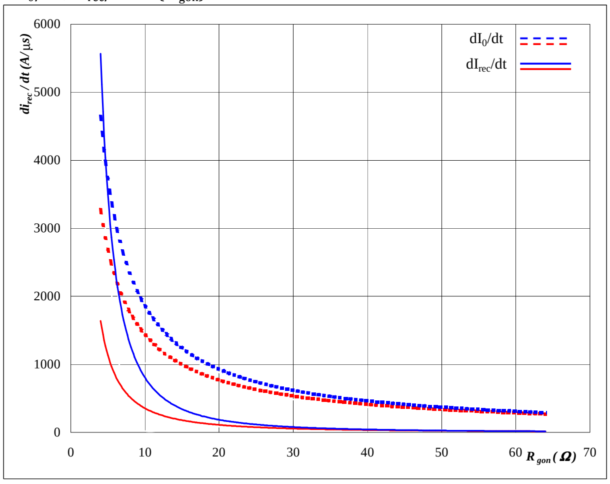
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

Figure 18 Output inverter FWD

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

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



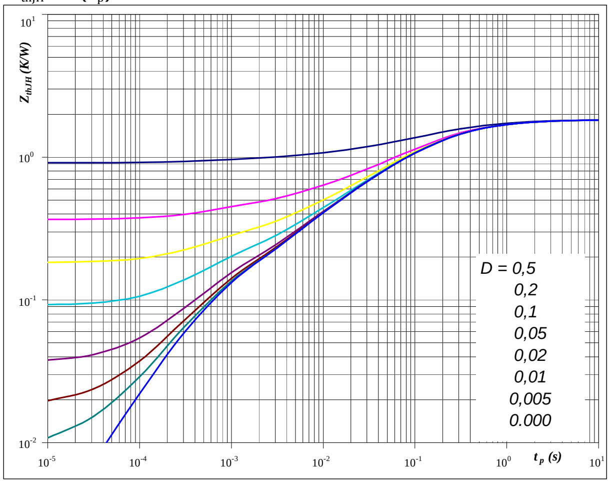
At

T_j =	25/125	°C
V_R =	600	V
I_F =	15	A
V_{GE} =	±15	V

Figure 19 Output inverter IGBT

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

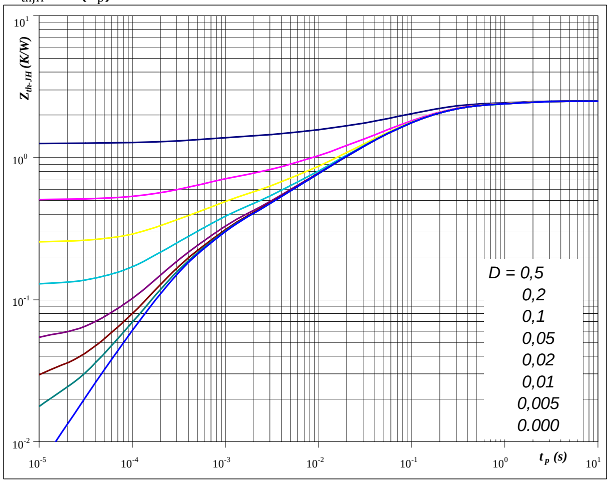
D = t_p / T

R_{thJH} = 1,83 K/W R_{thJH} = 1,56 K/W

Figure 20 Output inverter FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D = t_p / T

R_{thJH} = 2,52 K/W R_{thJH} = 2,18 K/W

IGBT thermal model values

Thermal grease		Phase change material	
R (K/W)	Tau (s)	R (K/W)	Tau (s)
0,06	5,6E+00	0,05	5,6E+00
0,28	8,7E-01	0,24	8,7E-01
0,77	1,7E-01	0,66	1,7E-01
0,42	3,4E-02	0,36	3,4E-02
0,19	6,2E-03	0,16	6,2E-03
0,10	5,5E-04	0,09	5,5E-04

FWD thermal model values

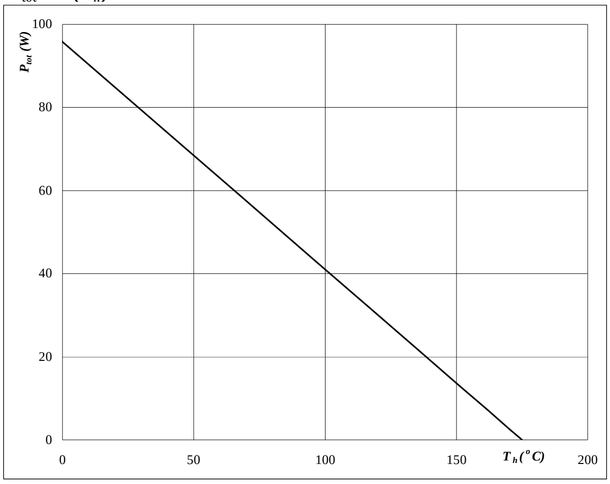
Thermal grease		Phase change material	
R (K/W)	Tau (s)	R (K/W)	Tau (s)
0,05	9,6E+00	0,04	9,6E+00
0,26	8,2E-01	0,22	8,2E-01
1,04	1,2E-01	0,90	1,2E-01
0,69	2,6E-02	0,60	2,6E-02
0,27	3,4E-03	0,23	3,4E-03
0,21	3,8E-04	0,19	3,8E-04

Output Inverter

Figure 21 Output inverter IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

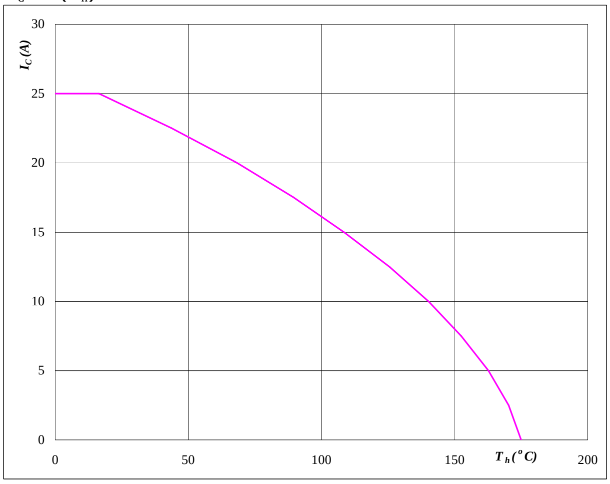


At
T_j = 175 °C

Figure 22 Output inverter IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$

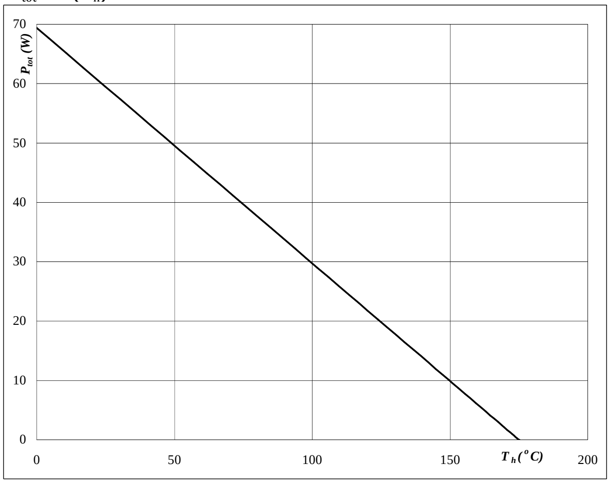


At
T_j = 175 °C
V_{GE} = 15 V

Figure 23 Output inverter FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

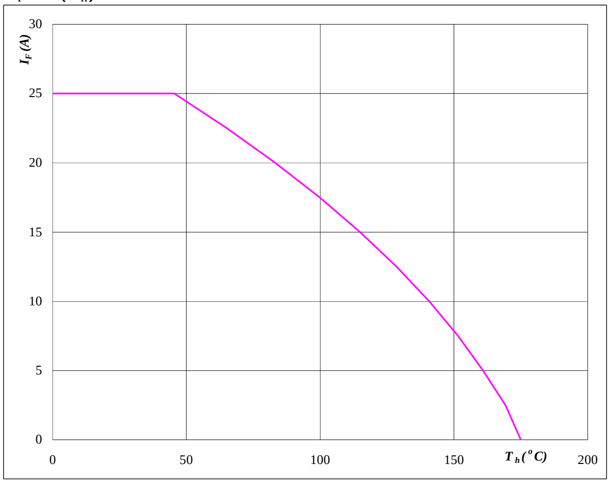


At
T_j = 175 °C

Figure 24 Output inverter FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



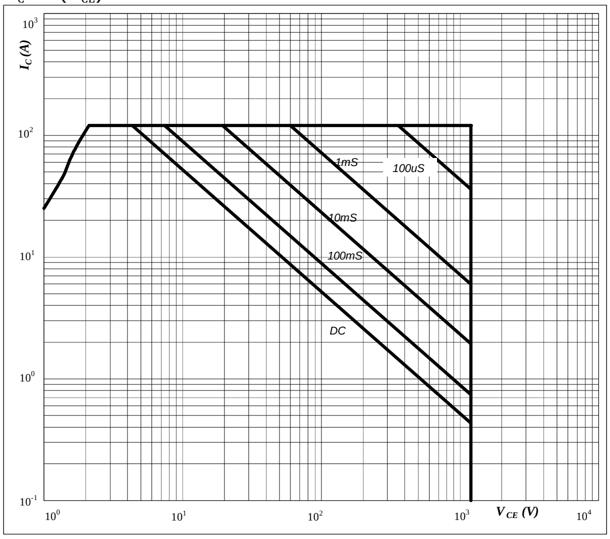
At
T_j = 175 °C

Output Inverter

Figure 25	Output inverter IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



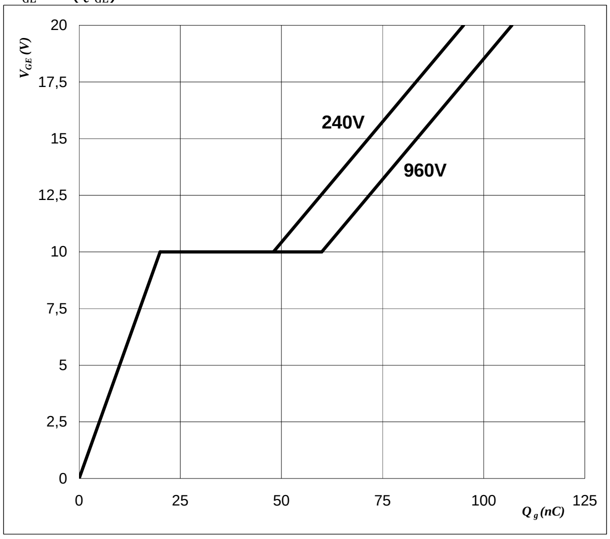
At

D =	single pulse	
T_h =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	ºC

Figure 26	Output inverter IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_{GE})$



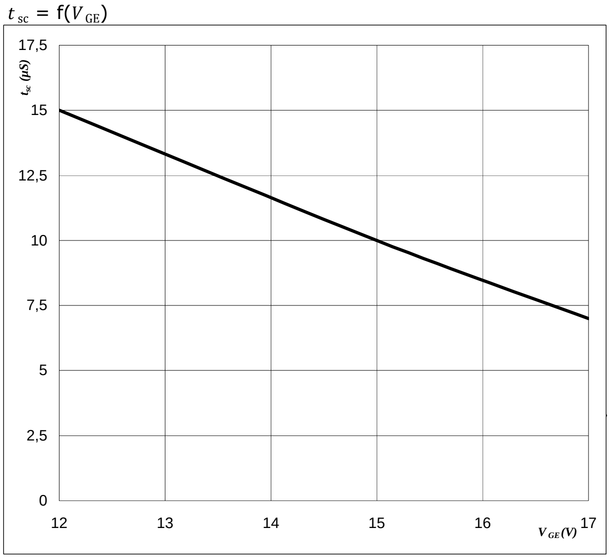
At

I_C =	15	A

Figure 27	Output inverter IGBT

Short circuit withstand time as a function of gate-emitter voltage

$t_{sc} = f(V_{GE})$



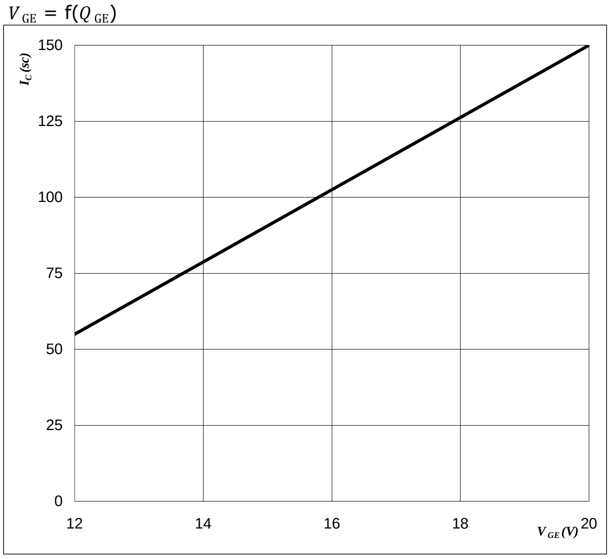
At

V_{CE} =	1200	V
T_j ≤	175	ºC

Figure 28	Output inverter IGBT

Typical short circuit collector current as a function of gate-emitter voltage

$V_{GE} = f(Q_{GE})$



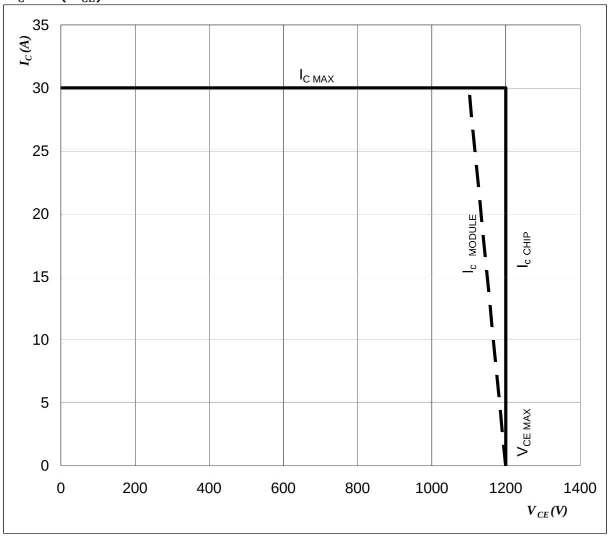
At

V_{CE} ≤	1200	V
T_j =	175	ºC

Figure 29 IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j = T_{jmax}-25 ºC

Uccminus=Uccplus

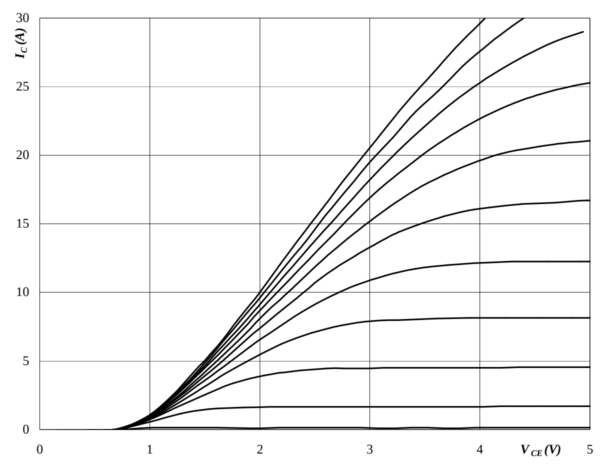
Switching mode : 3 level switching

Brake

Figure 1 Brake IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

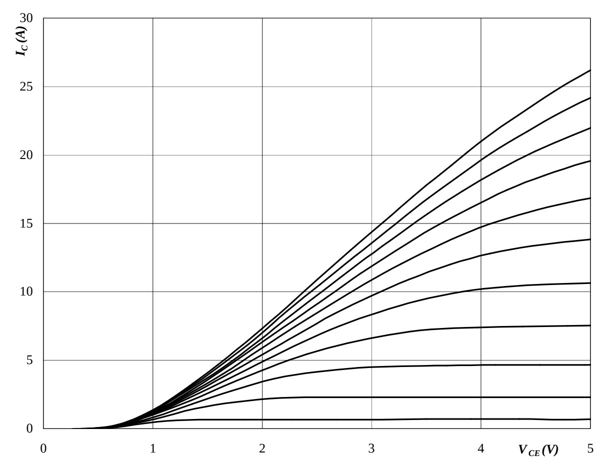
T_j = 25 °C

V_{GE} from 7 V to 17 V in steps of 1 V

Figure 2 Brake IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

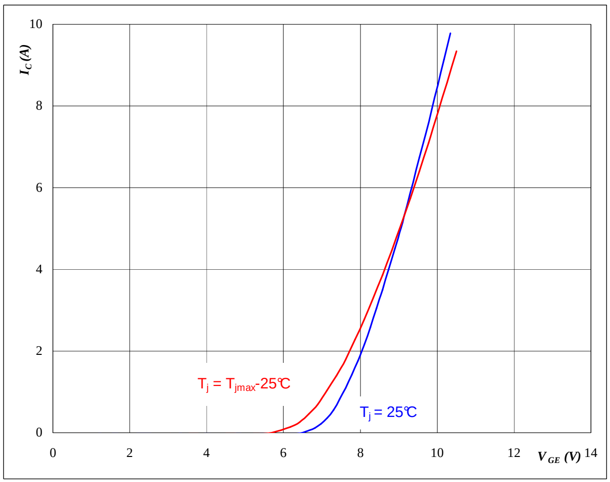
T_j = 125 °C

V_{GE} from 7 V to 17 V in steps of 1 V

Figure 3 Brake IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



At

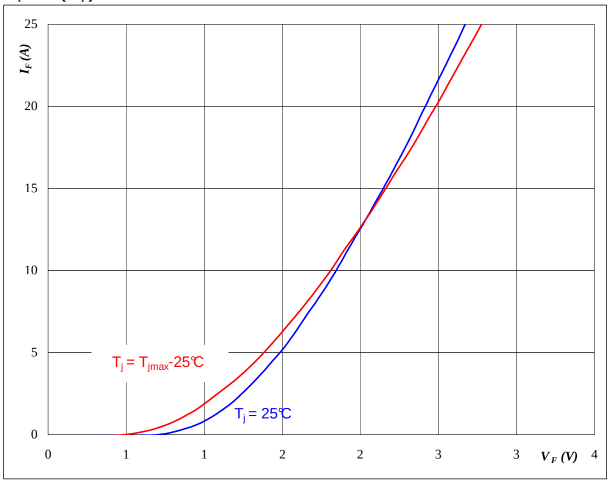
t_p = 250 µs

V_{CE} = 10 V

Figure 4 Brake FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

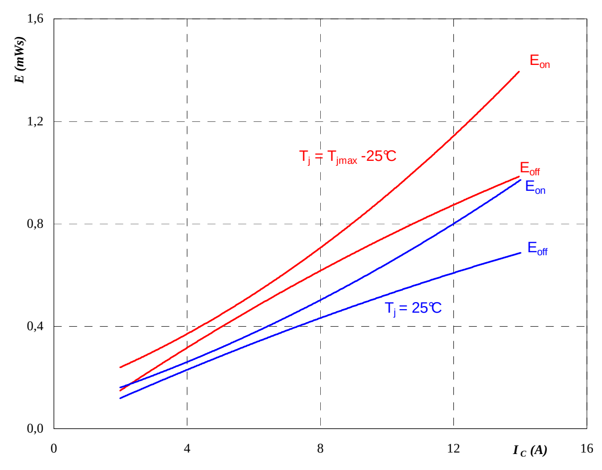
t_p = 250 µs

Brake

Figure 5 Brake IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



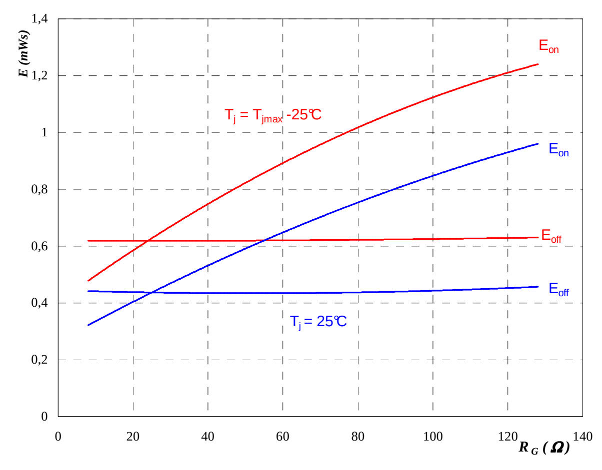
With an inductive load at

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

Figure 6 Brake IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



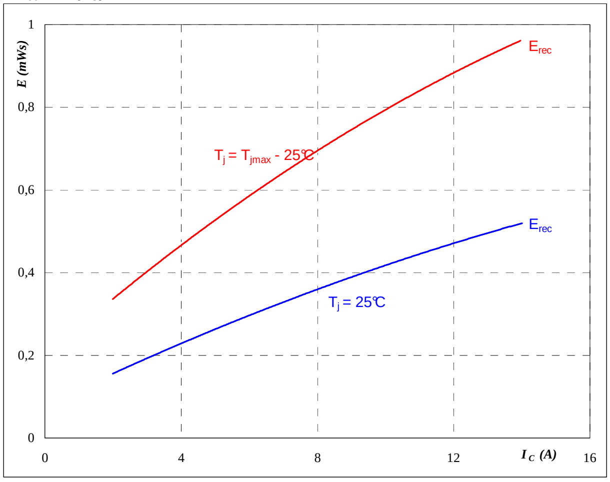
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	8	A

Figure 7 Brake FWD

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



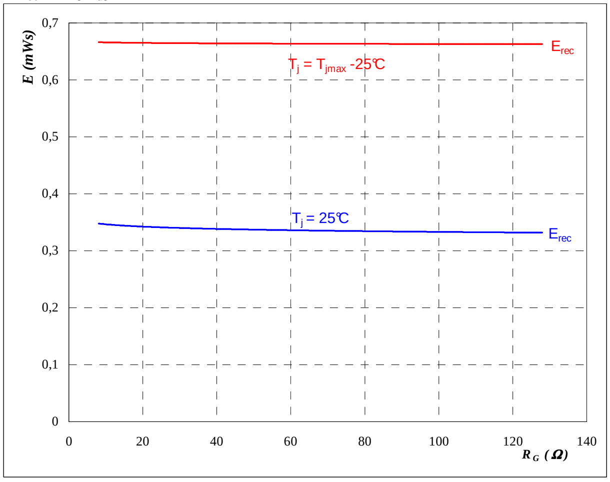
With an inductive load at

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

Figure 8 Brake FWD

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

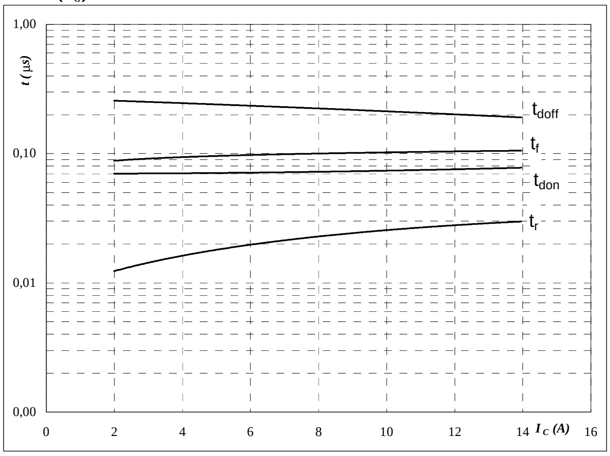
T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	8	A

Brake

Figure 9 Brake IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



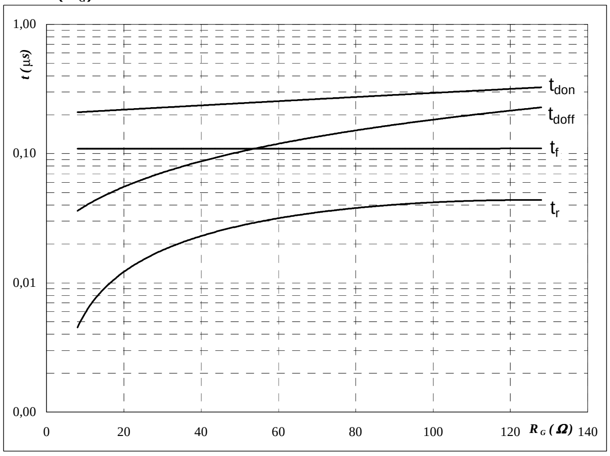
With an inductive load at

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

Figure 10 Brake IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



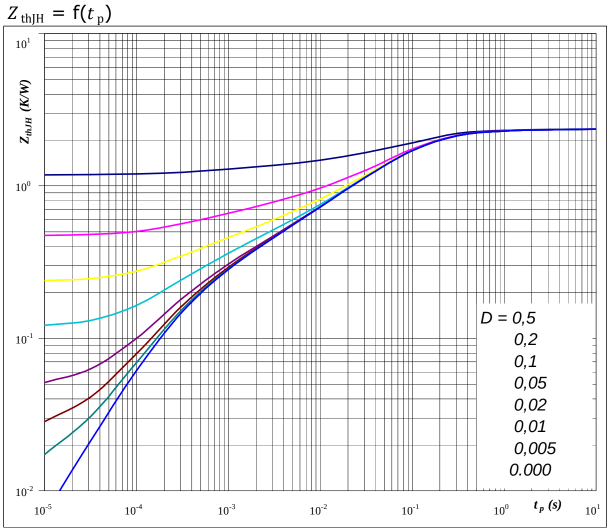
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	8	A

Figure 11 Brake IGBT

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



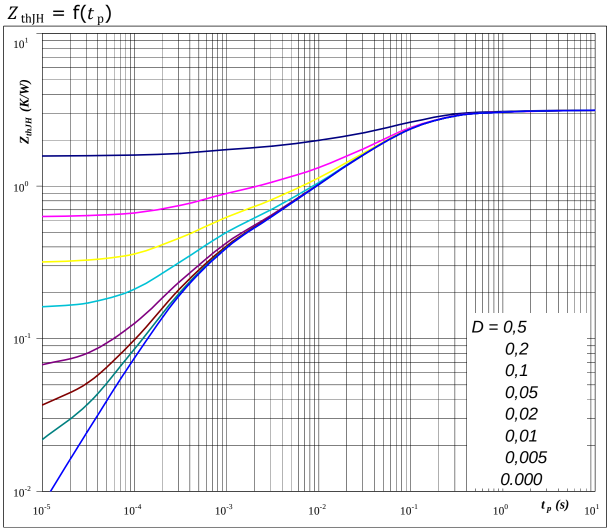
At $D = t_p / T$

Thermal grease			Phase change material		
R_{thJH} =	2,357	K/W	R_{thJH} =	2,03	K/W

Figure 12 Brake FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At $D = t_p / T$

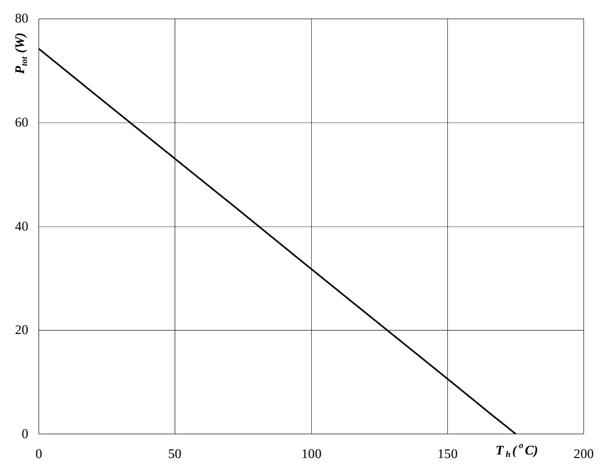
Thermal grease			Phase change material		
R_{thJH} =	3,15	K/W	R_{thJH} =	2,74	K/W

Brake

Figure 13 Brake IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



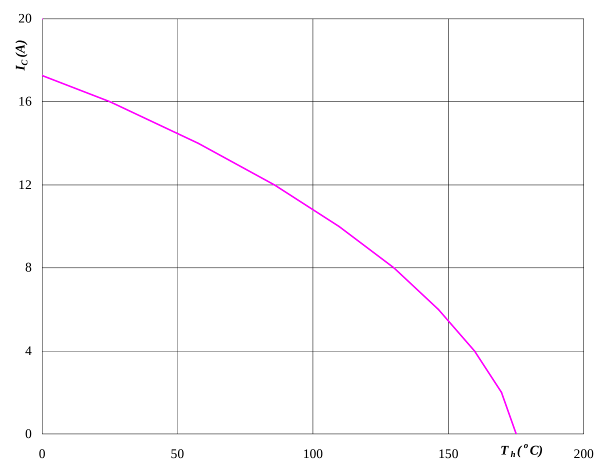
At

T_j = 175 ºC

Figure 14 Brake IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

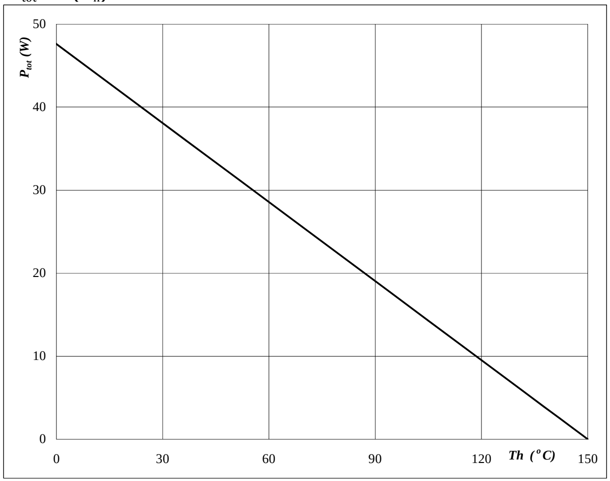
T_j = 175 ºC

V_{GE} = 15 V

Figure 15 Brake FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



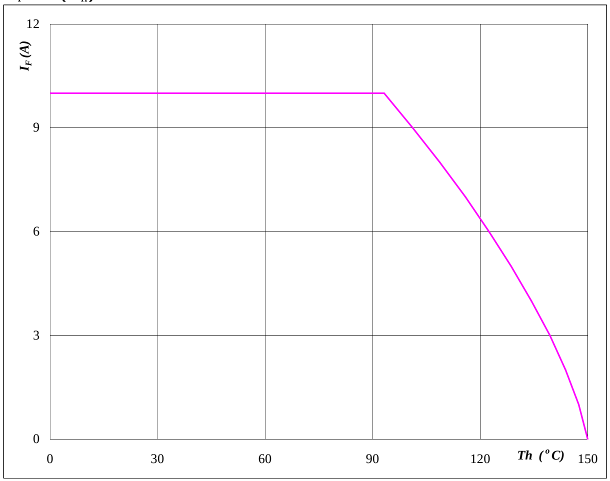
At

T_j = 150 ºC

Figure 16 Brake FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

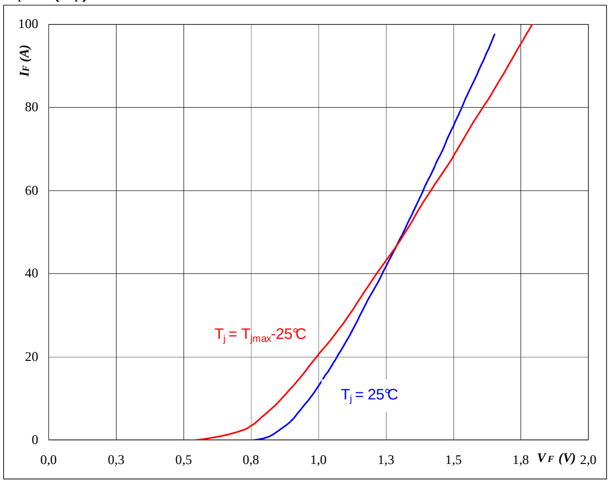
T_j = 150 ºC

Input Rectifier Bridge

Figure 1 Rectifier diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



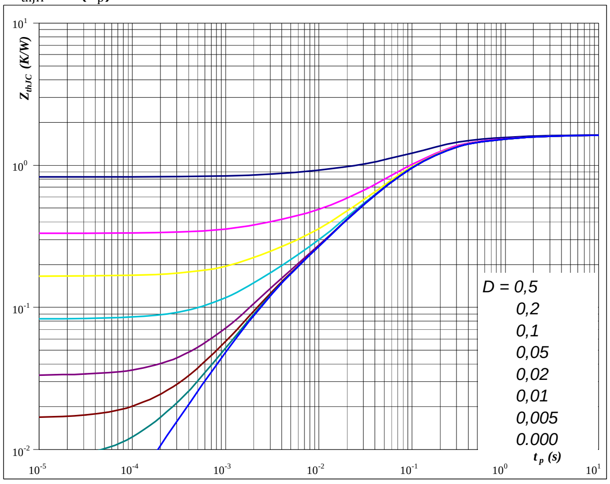
At

t_p = 250 µs

Figure 2 Rectifier diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



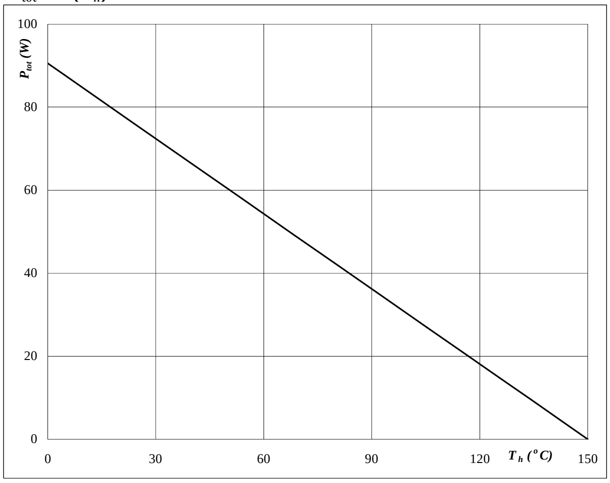
At $D = t_p / T$

Thermal grease			Phase change material		
D =	t_p / T		D =	t_p / T	
R_{thJH} =	1,80	K/W	R_{thJH} =	1,54	K/W

Figure 3 Rectifier diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



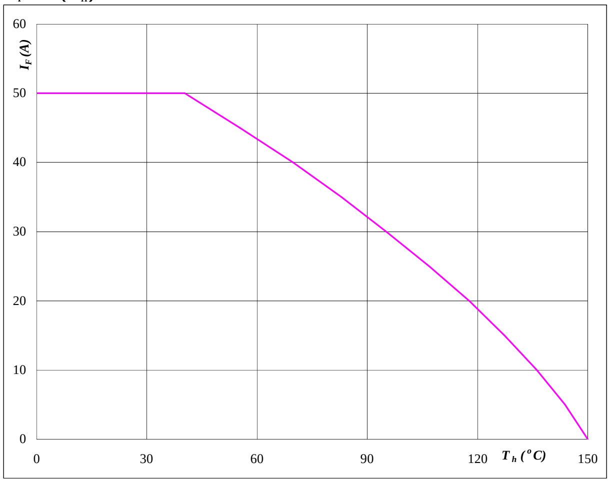
At

T_j = 150 ºC

Figure 4 Rectifier diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

T_j = 150 ºC

Thermistor

Figure 1 Thermistor

Typical NTC characteristic as a function of temperature

$R_T = f(T)$

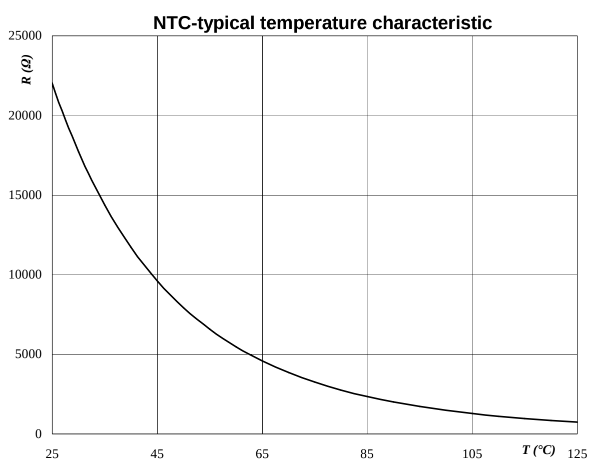


Figure 2 Thermistor

Typical NTC resistance values

$$R(T) = R_{25} \cdot e^{\left(B_{25/100} \cdot \left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right)} \quad [\Omega]$$

T [°C]	R_{nom} [Ω]	R_{min} [Ω]	R_{max} [Ω]	△R/R [±%]
-55	2089434,5	1506495,4	2672373,6	27,9
0	71804,2	59724,4	83884	16,8
10	43780,4	37094,4	50466,5	15,3
20	27484,6	23684,6	31284,7	13,8
25	22000	19109,3	24890,7	13,1
30	17723,3	15512,2	19934,4	12,5
60	5467,9	4980,6	5955,1	8,9
70	3848,6	3546	4151,1	7,9
80	2757,7	2568,2	2947,1	6,9
90	2008,9	1889,7	2128,2	5,9
100	**1486,1**	**1411,8**	**1560,4**	**5**
150	400,2	364,8	435,7	8,8

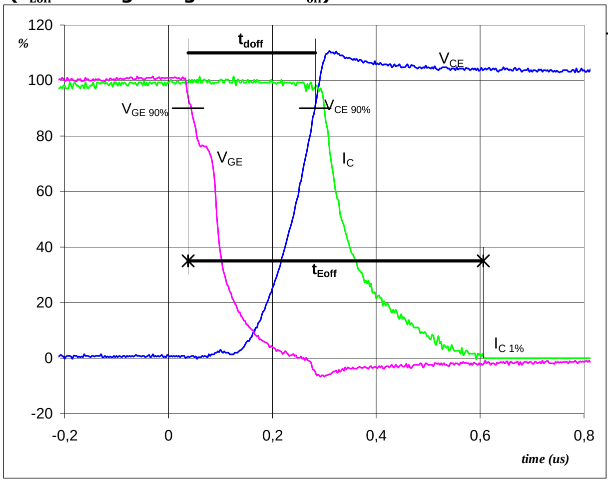
Switching Definitions Output Inverter

General conditions

T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

Figure 1 Output inverter IGBT

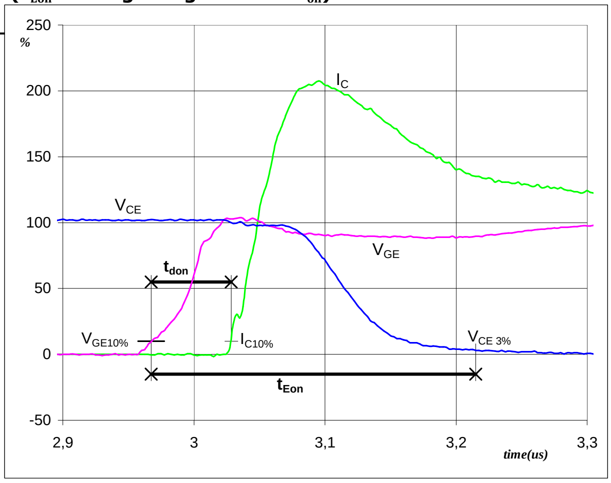
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	15	A
t_{doff} =	0,24	μs
t_{Eoff} =	0,57	μs

Figure 2 Output inverter IGBT

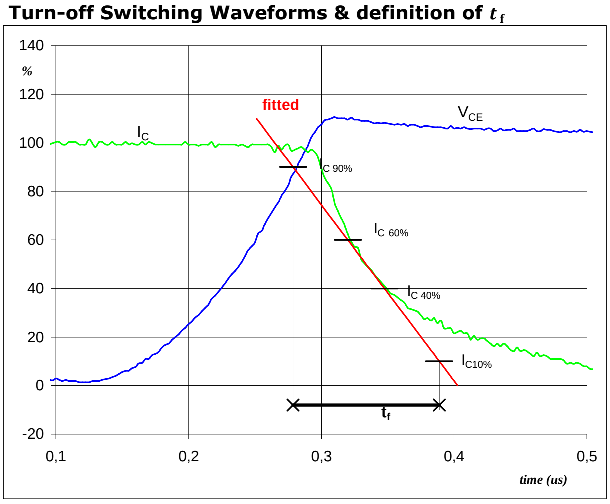
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	15	A
t_{don} =	0,06	μs
t_{Eon} =	0,25	μs

Figure 3 Output inverter IGBT

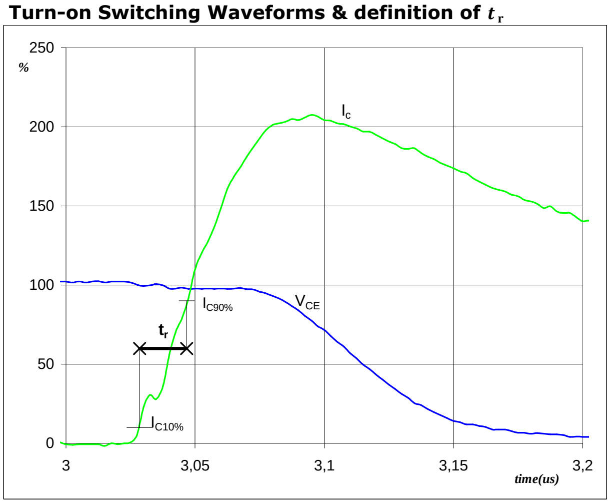
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	15	A
t_f =	0,11	μs

Figure 4 Output inverter IGBT

Turn-on Switching Waveforms & definition of t_r

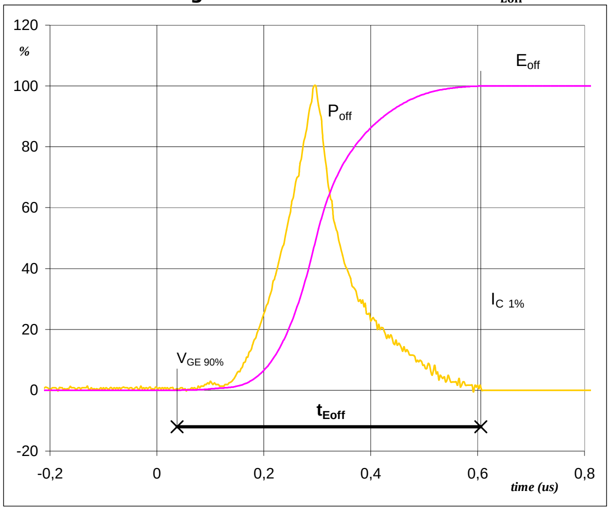


V_C (100%) =	600	V
I_C (100%) =	15	A
t_r =	0,02	μs

Switching Definitions Output Inverter

Figure 5	Output inverter IGBT

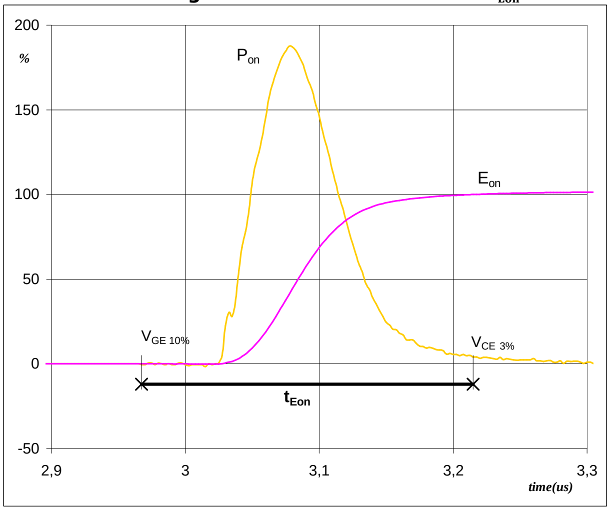
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	9,00	kW
E_{off} (100%) =	1,24	mJ
t_{Eoff} =	0,57	μs

Figure 6	Output inverter IGBT

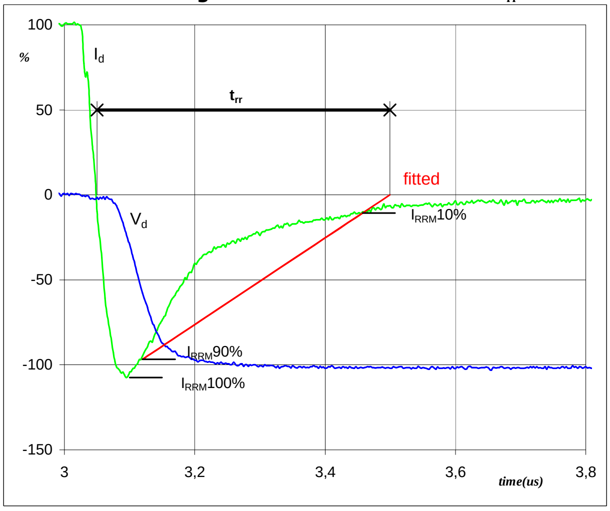
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	9,00	kW
E_{on} (100%) =	1,25	mJ
t_{Eon} =	0,25	μs

Figure 7	Output inverter FWD

Turn-off Switching Waveforms & definition of t_{rr}

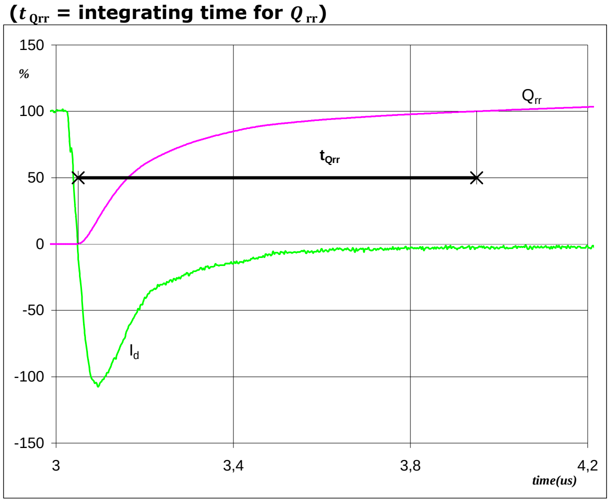


V_d (100%) =	600	V
I_d (100%) =	15	A
I_{RRM} (100%) =	-16	A
t_{rr} =	0,43	μs

Switching Definitions Output Inverter

Figure 8 Output inverter FWD

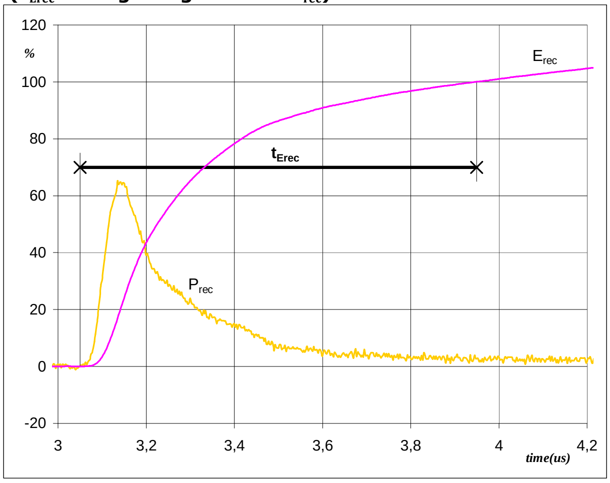
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	15	A
Q_{rr} (100%) =	2,75	µC
t_{Qrr} =	0,90	µs

Figure 9 Output inverter FWD

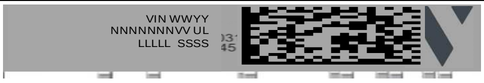
Turn-on Switching Waveforms & definition of t_{Erec}
(t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	9,00	kW
E_{rec} (100%) =	1,16	mJ
t_{Erec} =	0,90	µs

Ordering Code & Marking

Version	Ordering Code
without thermal paste 12mm housing with Solder pins	V23990-P840-A58-PM
without thermal paste 17mm housing with Solder pins	V23990-P840-A59-PM
without thermal paste 12mm housing with Solder pins	V23990-P840-C58-PM
without thermal paste 17mm housing with Solder pins	V23990-P840-C59-PM
with thermal paste 12mm housing with Press-fit pins	V23990-P840-A58Y-/3/-PM

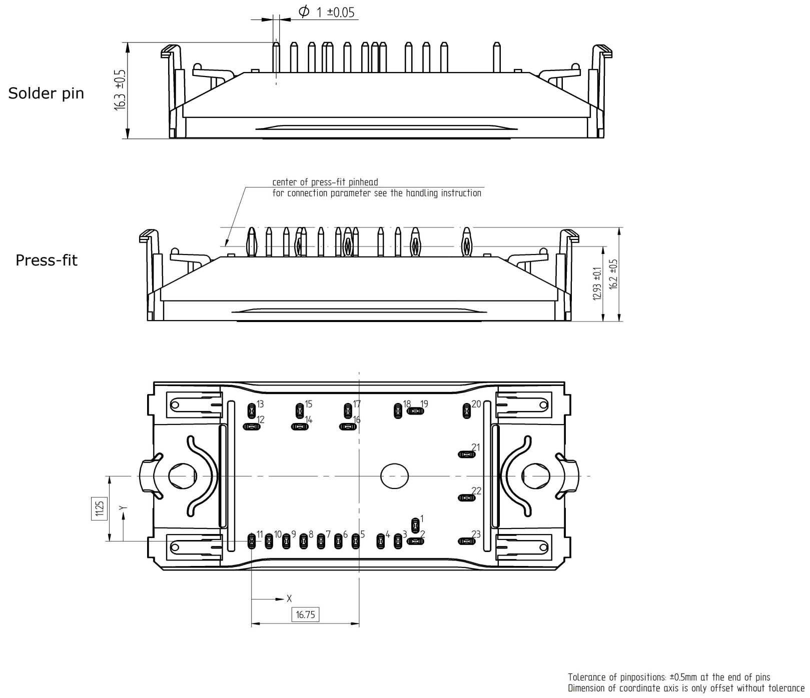


Text	VIN	Date code	Name&Ver	UL	Lot	Serial
	VIN	WWYY	NNNNNNNVV	UL	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

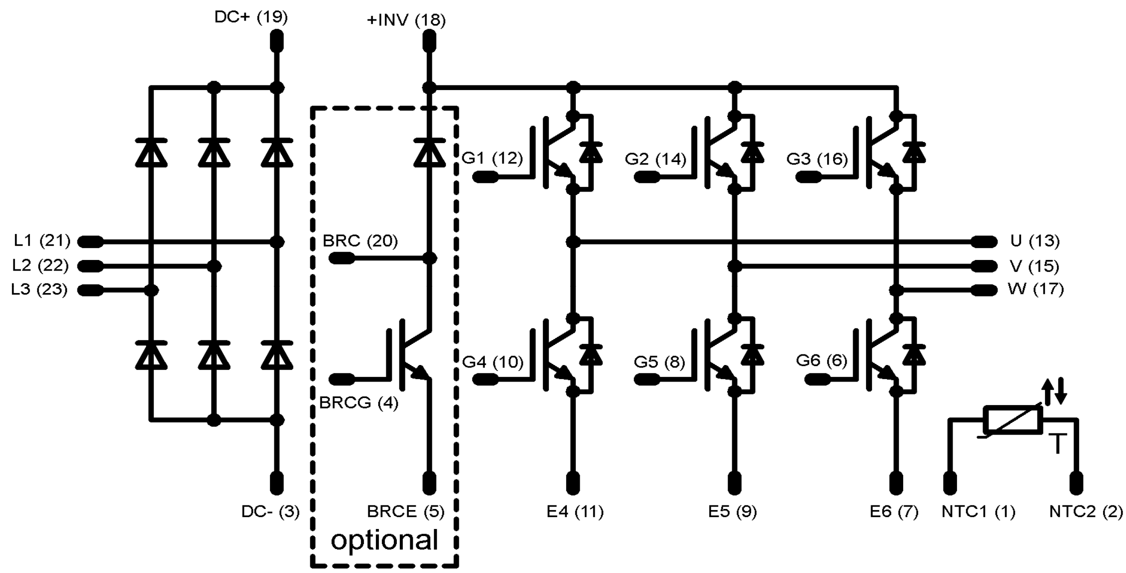
Outline

Pin	X	Y	Function
1	25,5	2,7	NTC1
2	25,5	0	NTC2
3	22,8	0	-DC
4	20,1	0	BRCG
5	16,2	0	BRCE
6	13,5	0	G6
7	10,8	0	E6
8	8,1	0	G5
9	5,4	0	E5
10	2,7	0	G4
11	0	0	E4
12	0	19,8	G1
13	0	22,5	U
14	7,5	19,8	G2
15	7,5	22,5	V
16	15	19,8	G3
17	15	22,5	W
18	22,8	22,5	+INV
19	25,5	22,5	+DC
20	33,5	22,5	BRC+
21	33,5	15	L1
22	33,5	7,5	L2
23	33,5	0	L3

Pin table [mm]



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	1200 V	15 A	Inverter IGBT	
D1,D2,D3,D4,D5,D6	FWD	1200 V	15 A	Inverter FWD	
T7	IGBT	1200 V	8 A	Brake IGBT	
D7	FWD	1200 V	7,5 A	Brake FWD	
D8,D9,D10,D11,D12,D13	FWD	1600 V	30 A	Rectifier	
NTC	Thermistor			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	**135**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 packages see 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
V23990-P840-x5x-PM-D7-14	15 Feb. 2017		

DISCLAIMER

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As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.