V23990-P768-A60-PM
datasheet

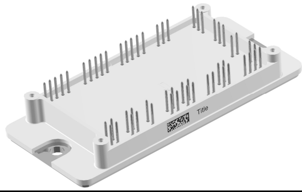
Vincotech

***flow* PIM 2** — **1200 V / 50 A**

Features

- 3~rectifier,BRC,Inverter, NTC
- Very Compact housing, easy to route
- Mitsubishi IGBT and FWD

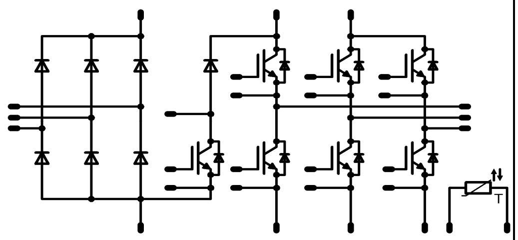
flow 2 housing



Target Applications

- Motor Drives
- Power Generation

Schematic



Types

- V23990-P768-A60-PM

Maximum Ratings

T_j=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Rectifier Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
DC forward current	I_{FAV}	$T_j=T_j max$	T_h=80℃	79	A
Surge forward current	I_{FSM}	t_p=10ms	T_j=150℃	490	A
I2t-value	I^2t			1200	A^2s
Power dissipation	P_{tot}	$T_j=T_j max$	T_h=80℃	95	W
Maximum Junction Temperature	$T_j max$			150	℃
Inverter Transistor					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j=T_j max$	T_h=80℃	54	A
Pulsed collector current	I_{Cpulse}	t_p limited by $T_j max$		100	A
Turn off safe operating area		VCE ≤ 1200V, Tj ≤ Top max		100	A
Power dissipation	P_{tot}	$T_j=T_j max$	T_h=80℃	155	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150℃ V_{GE}=15V		10 850	µs V
Maximum Junction Temperature	$T_j max$			175	℃

Maximum Ratings

T_j=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25℃		1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80℃	49	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		100	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80℃	126	W
Maximum Junction Temperature	$T_j$max			175	℃
Brake Transistor					
Collector-emitter break down voltage	V_{CE}			1200	V
DC collector current	I_C	T_j=$T_j$max	T_h=80℃	45	A
Pulsed collector current	I_{Cpuls}	t_p limited by $T_j$max		135	A
Turn off safe operating area		V_{CE} ≤ 1200V, Tj ≤ Top max		70	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80℃	137	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	T_j≤150℃ V_{GE}=15V		10 800	µs V
Maximum Junction Temperature	$T_j$max			175	℃
Brake Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80℃	16	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		20	A
Brake Inverse Diode	P_{tot}	T_j=$T_j$max	T_h=80℃	69	W
Maximum Junction Temperature	$T_j$max			175	℃
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	T_j=$T_j$max	T_h=80℃	28	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		100	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80℃	86	W
Maximum Junction Temperature	$T_j$max			175	℃

Maximum Ratings

T_j=25℃, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	℃
Operation temperature under switching condition	T_{op}			-40…+(Tjmax - 25)	℃
Insulation Properties					
Insulation voltage	V_{is}	t=2s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm
Comparative tracking index	CTI			>200	

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Input Rectifier Diode										
Forward voltage	V_F				50	Tj=25°C Tj=125°C	1	1,1 1,05	1,8	V
Threshold voltage (for power loss calc. only)	V_{to}				50	Tj=25°C Tj=125°C		0,89 0,78		V
Slope resistance (for power loss calc. only)	r_t				50	Tj=25°C Tj=125°C		4 5		mΩ
Reverse current	I_r			1500		Tj=25°C Tj=125°C			0,1	mA
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material λ=3,4W/mK						0,74		K/W
Inverter Transistor										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$		10	0,005	Tj=25°C Tj=150°C	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	Tj=25°C Tj=150°C	1,2	1,79 2,12	2,2	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		Tj=25°C Tj=150°C			150	µA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			500	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=16 Ω Rgon=16 Ω	±15	600	50	Tj=25°C Tj=150°C		106 106		ns
Rise time	t_r					Tj=25°C Tj=150°C		28 46		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		157 200		
Fall time	t_f					Tj=25°C Tj=150°C		58 89		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		2,61 5,1		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		2,49 4,08		
Input capacitance	C_{ies}	f=1MHz	0	10		Tj=25°C		3100		pF
Output capacitance	C_{oss}							340		
Reverse transfer capacitance	C_{rss}							37		
Gate charge	Q_{Gate}		15	600	50	Tj=25°C		105		nC
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material λ=3,4W/mK						0,61		K/W
Inverter Diode										
Diode forward voltage	V_F				50	Tj=25°C Tj=150°C		2,73 2,18	3,3	V
Peak reverse recovery current	I_{RRM}	Rgon=16 Ω	±15	600	50	Tj=25°C Tj=150°C		33 35		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		388 489		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=150°C		4,01 10,39		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		1018 121		A/µs
Reverse recovered energy	Erec					Tj=25°C Tj=150°C		1,84 4,97		mWs
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material λ=3,4W/mK						0,75		K/W

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Value Min	Value Typ	Value Max	Unit
Brake Transistor										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,0012	Tj=25°C Tj=150°C	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		35	Tj=25°C Tj=150°C	1,5	1,92 2,37	2,3	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		Tj=25°C Tj=150°C			250	µA
Gate-emitter leakage current	I_{GES}		20	0		Tj=25°C Tj=150°C			120	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	Rgoff=16 Ω Rgon=16 Ω	±15	600	35	Tj=25°C Tj=150°C		83 89		ns
Rise time	t_r					Tj=25°C Tj=150°C		27 27		
Turn-off delay time	$t_{d(off)}$					Tj=25°C Tj=150°C		191 269		
Fall time	t_f					Tj=25°C Tj=150°C		54 125		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=150°C		2,00 2,92		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=150°C		1,74 3,18		
Input capacitance	C_{ies}	f=1MHz	0	25		Tj=25°C		1950		pF
Output capacitance	C_{oss}							155		
Reverse transfer capacitance	C_{rss}							115		
Gate charge	Q_{Gate}		15	960	35	Tj=25°C		160		nC
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material λ=3,4W/mK						0,69		K/W
Brake Inverse Diode										
Diode forward voltage	V_F				10	Tj=25°C Tj=150°C	1,2	1,80 1,76	2,2	V
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material λ=3,4W/mK						1,38		K/W
Brake Diode										
Diode forward voltage	V_F				25	Tj=25°C Tj=150°C	1	2,24 2,36	2,9	V
Reverse leakage current	I_r			1200		Tj=25°C Tj=150°C			60	µA
Peak reverse recovery current	I_{RRM}	Rgon=16 Ω Rgon=16 Ω	±15	600	35	Tj=25°C Tj=150°C		30,8 39,2		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=150°C		146,4 423,1		ns
Reverse recovered charge	Q_{rr}					Tj=25°C Tj=150°C		2,321 4,84		µC
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=150°C		1749 917		A/µs
Reverse recovery energy	E_{rec}					Tj=25°C Tj=150°C		0,9089 1,982		mWs
Thermal resistance chip to heatsink	R_{thJH}	Phase-Change Material λ=3,4W/mK						1,1		K/W

Characteristic Values

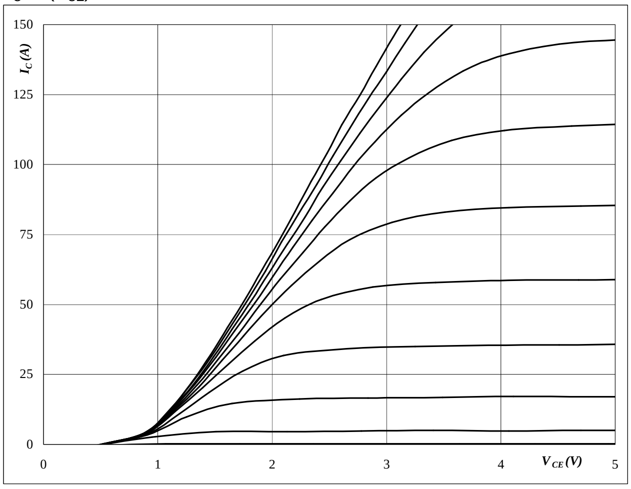
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Thermistor										
Rated resistance	R					T=25℃		21511		Ω
Deviation of R100	ΔR/R	R100=1486 Ω				T=25℃	-4,5		+4,5	%
Power dissipation	P					T=25℃		210		mW
Power dissipation constant						T=25℃		3,5		mW/K
B-value	$B_{(25/50)}$					T=25℃		3884		K
B-value	$B_{(25/100)}$					T=25℃		3964		K
Vincotech NTC Reference									F	

Output Inverter

Figure 1 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



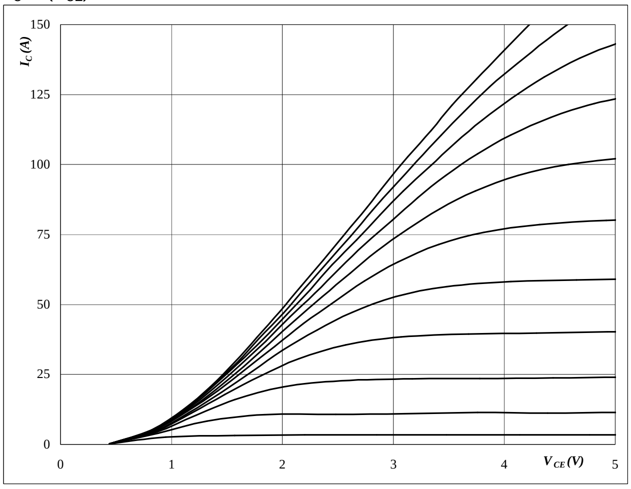
At

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

Figure 2 Output inverter IGBT

Typical output characteristics

$I_C = f(V_{CE})$



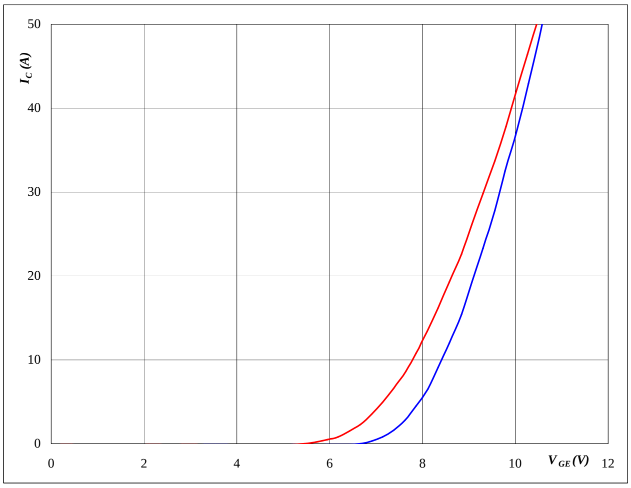
At

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

Figure 3 Output inverter IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



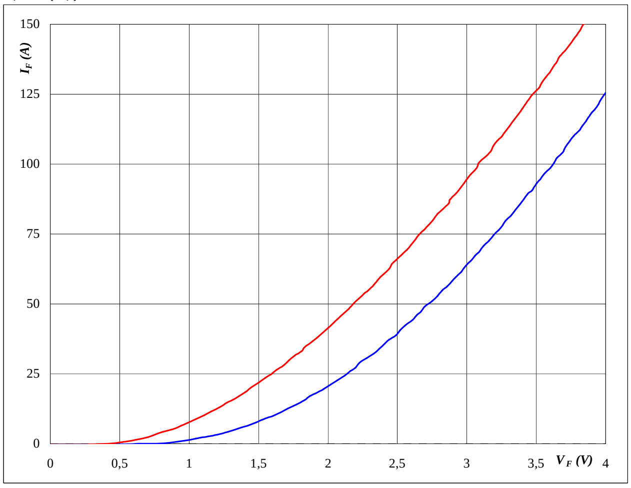
At

T_j =	25/150	℃
t_p =	250	μs
V_{CE} =	10	V

Figure 4 Output inverter FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



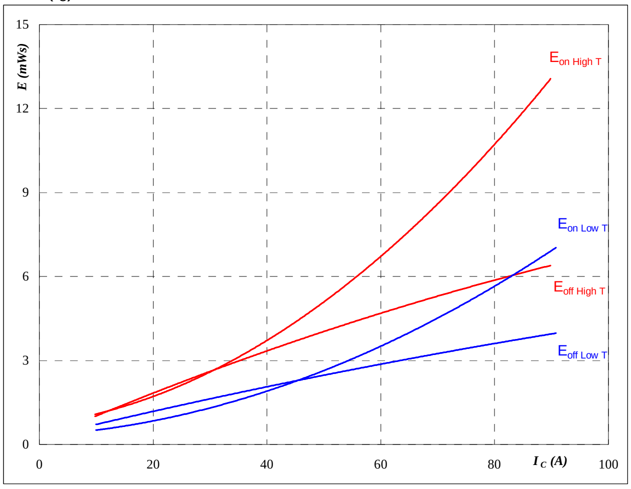
At

t_p =	250	μs

Output Inverter

Figure 5 Output inverter IGBT

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

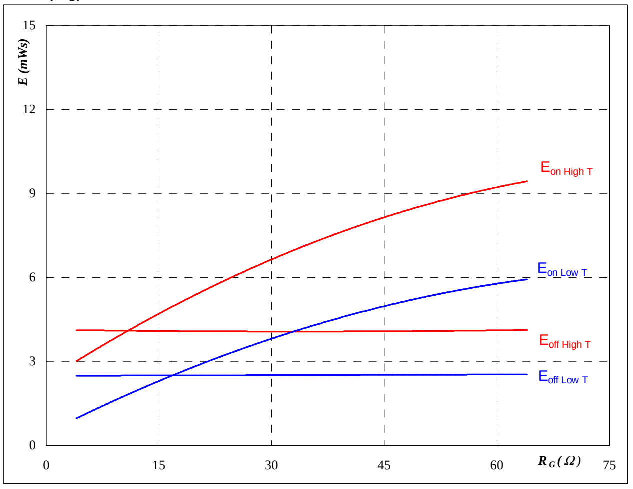


With an inductive load at

T_j =	25/150	°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
$E = f(R_G)$

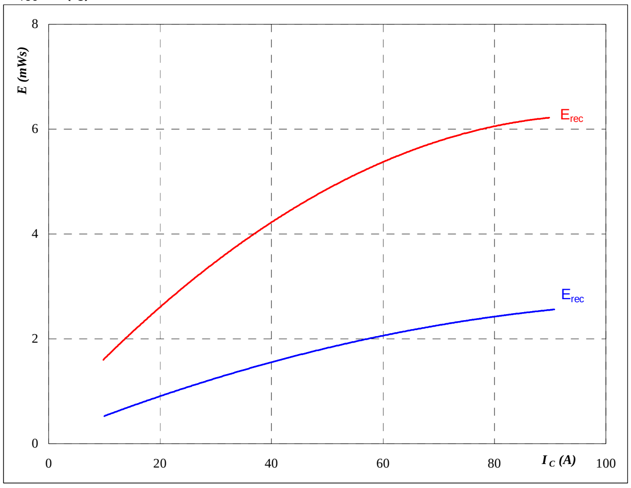


With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

Figure 7 Output inverter FWD

Typical reverse recovery energy loss
as a function of collector current
$E_{rec} = f(I_C)$

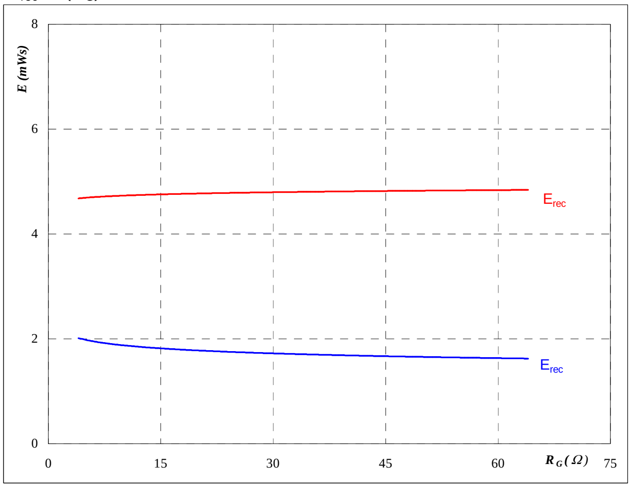


With an inductive load at

T_j =	25/150	°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

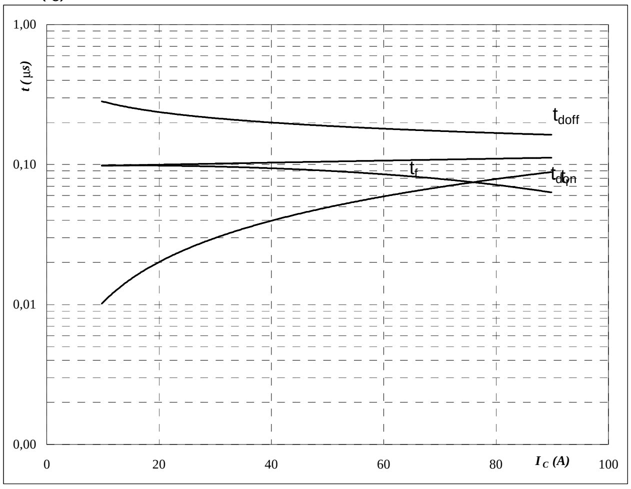
T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

Output Inverter

Figure 9 Output inverter IGBT

Typical switching times as a function of collector current

t = f(I_C)



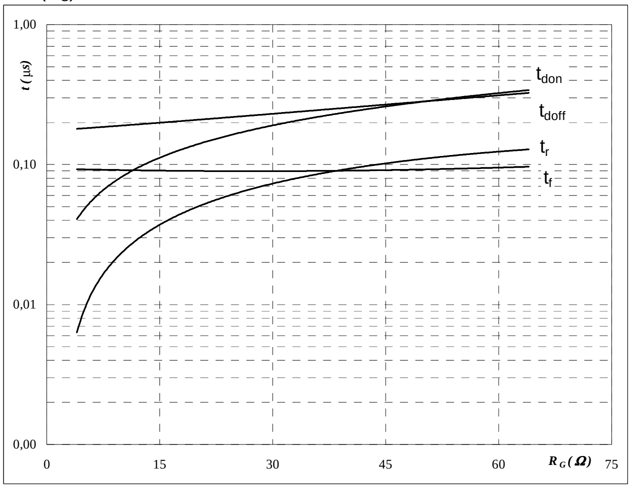
With an inductive load at

T_j =	150	°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)



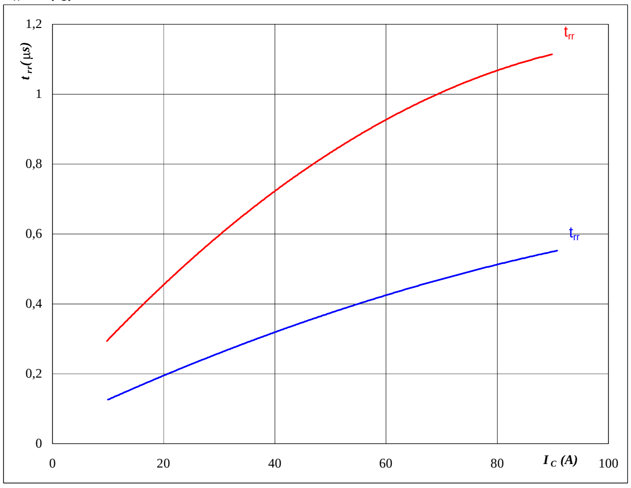
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

Figure 11 Output inverter FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



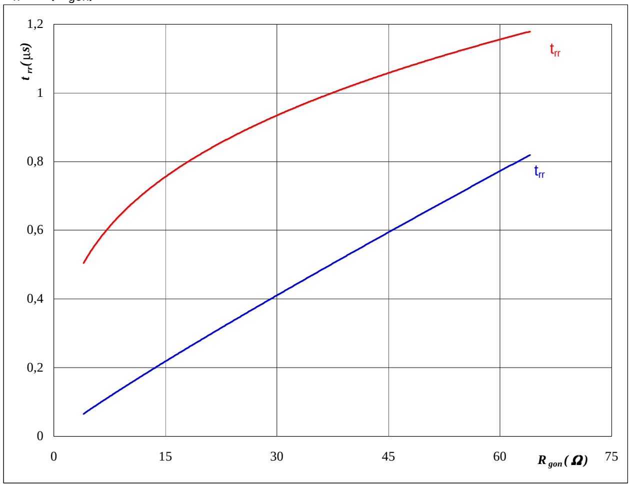
At

T_j =	25/150	°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

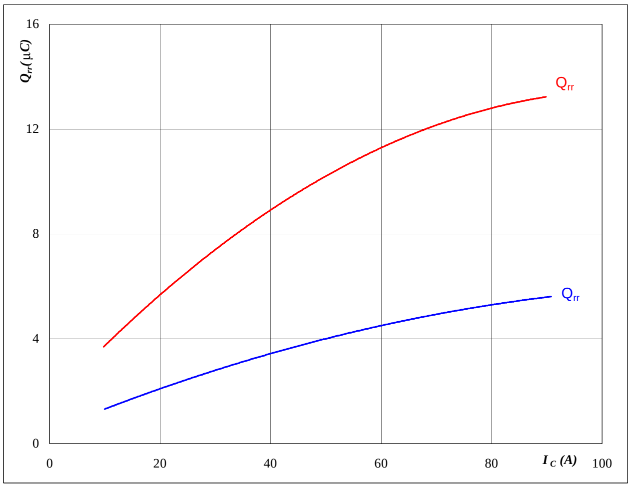
T_j =	25/150	°C
V_R =	600	V
I_F =	50	A
V_{GE} =	±15	V

Output Inverter

Figure 13 Output inverter FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



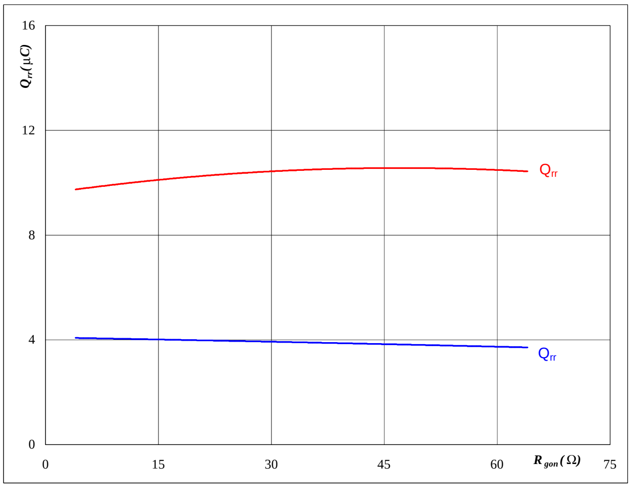
At

T_j =	25/150	°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

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



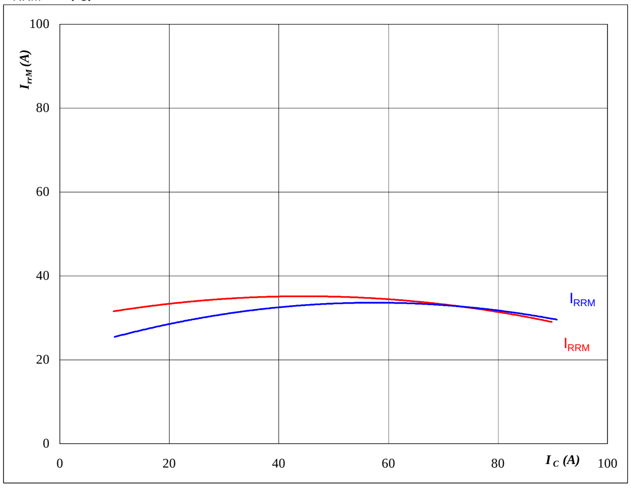
At

T_j =	25/150	°C
V_R =	600	V
I_F =	50	A
V_{GE} =	±15	V

Figure 15 Output inverter FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



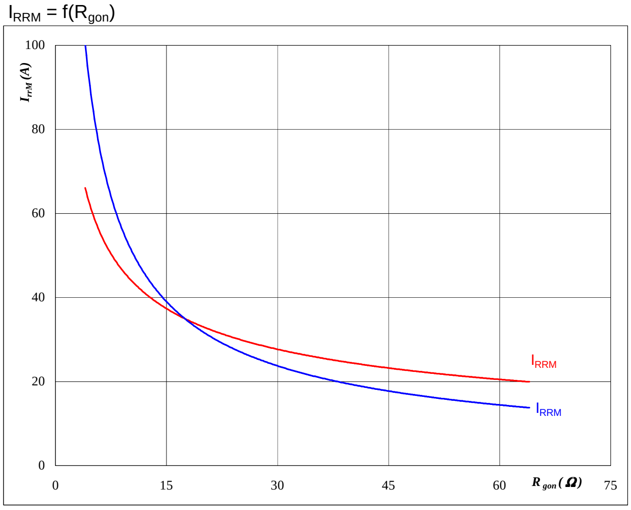
At

T_j =	25/150	°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

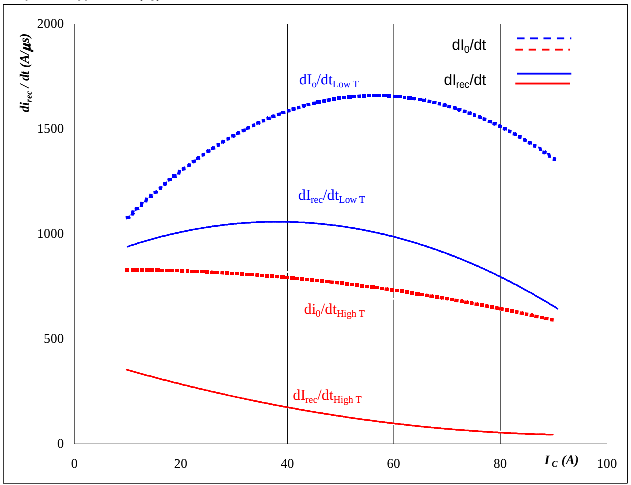
T_j =	25/150	°C
V_R =	600	V
I_F =	50	A
V_{GE} =	±15	V

Output Inverter

Figure 17 Output inverter FWD

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

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



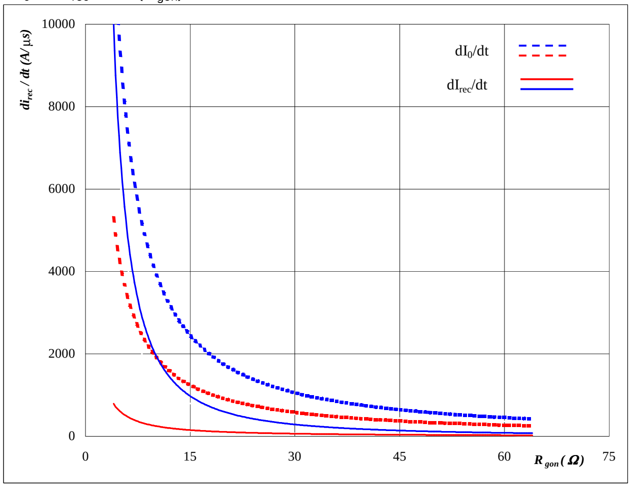
At

T_j =	25/150	°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

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



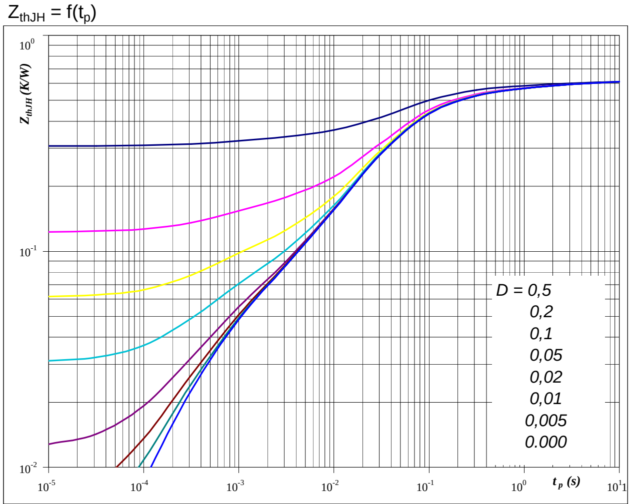
At

T_j =	25/150	°C
V_R =	600	V
I_F =	50	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} =	0,61	K/W

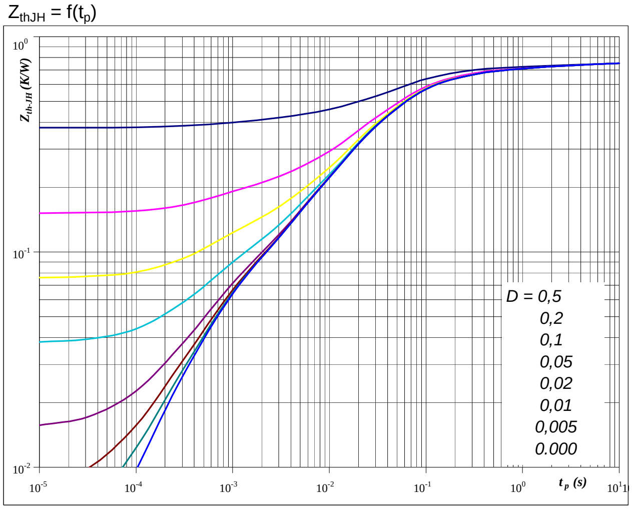
IGBT thermal model values

R (K/W)	Tau (s)
0,04	4,0E+00
0,05	7,8E-01
0,13	1,5E-01
0,26	4,5E-02
0,08	1,3E-02
0,03	1,4E-03
0,02	3,8E-04

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} =	0,75	K/W

FWD thermal model values

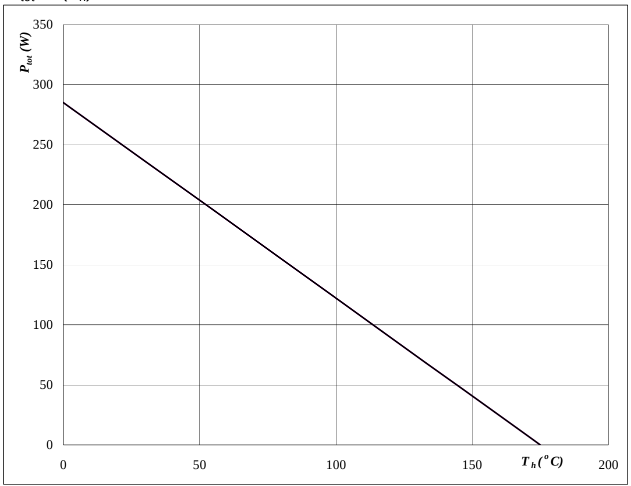
R (K/W)	Tau (s)
0,04	3,7E+00
0,07	5,6E-01
0,21	9,7E-02
0,31	2,9E-02
0,07	6,0E-03
0,05	6,6E-04

Output Inverter

Figure 21 Output inverter IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

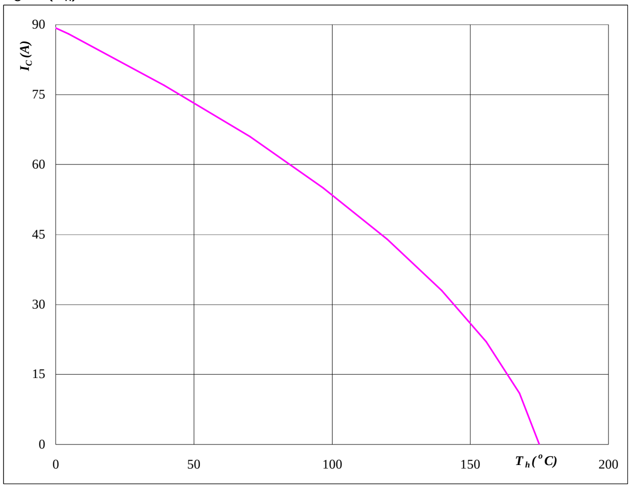


At
T_j = 175 ℃

Figure 22 Output inverter IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$

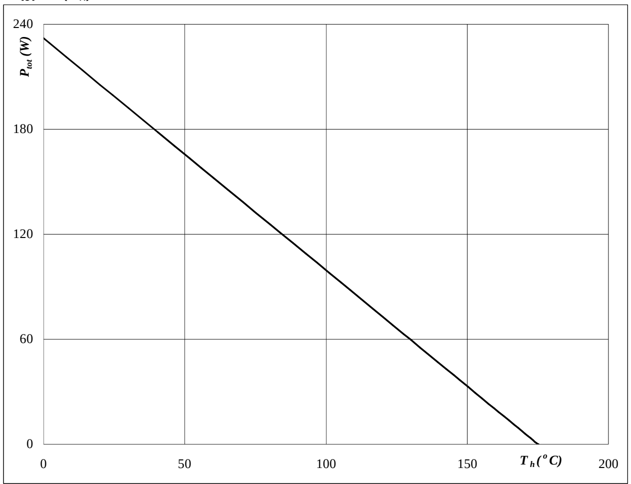


At
T_j = 175 ℃
V_{GE} = 15 V

Figure 23 Output inverter FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$

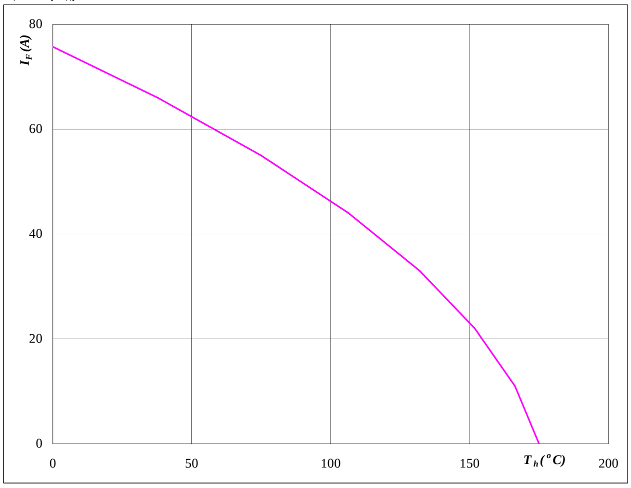


At
T_j = 175 ℃

Figure 24 Output inverter FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



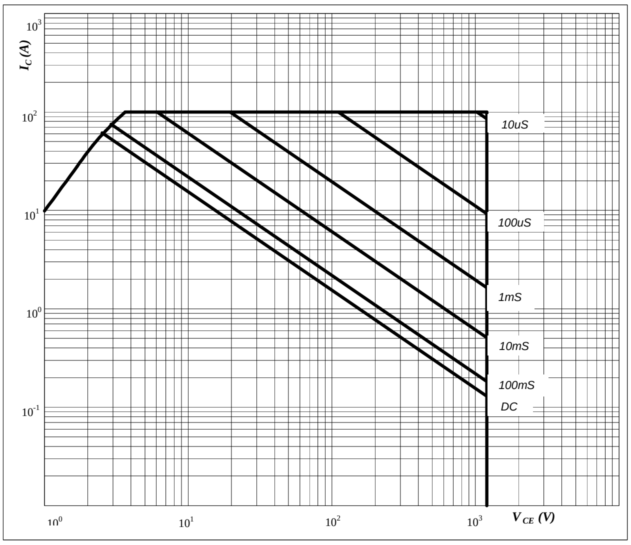
At
T_j = 175 ℃

Output Inverter

Figure 25 — Output inverter IGBT

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



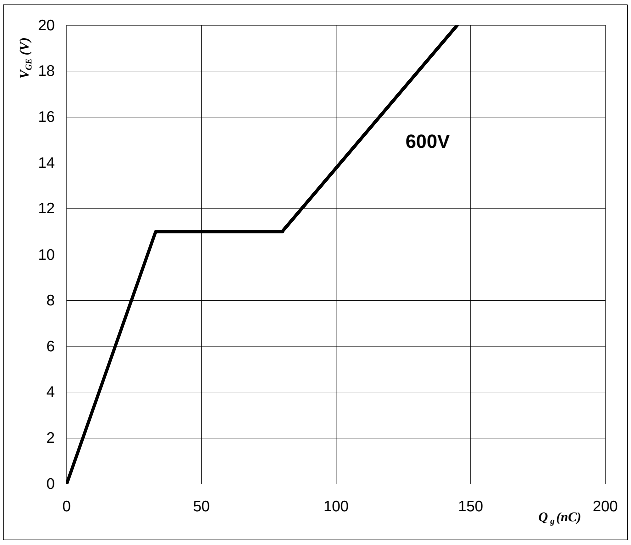
At

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

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



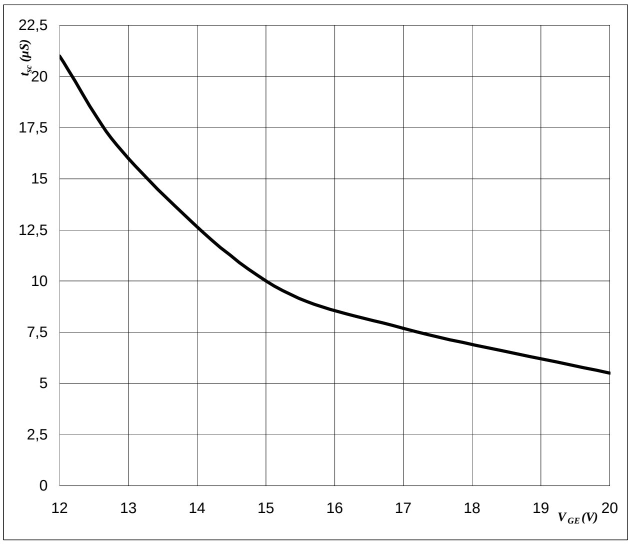
At

I_C =	50	A
T_j =	25	ºC

Figure 27 — Output inverter IGBT

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

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



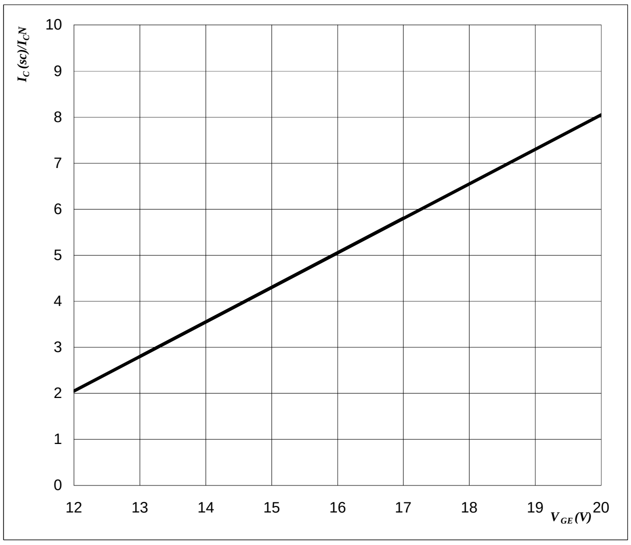
At

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

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



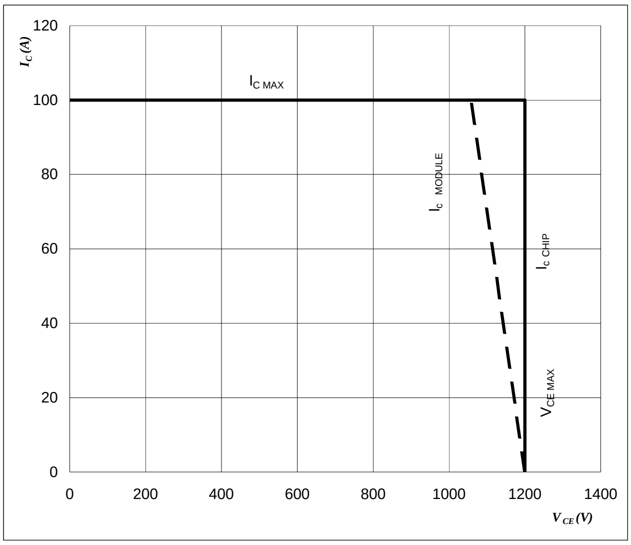
At

V_{CE} ≤	800	V
T_j =	150	ºC

Figure 29	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

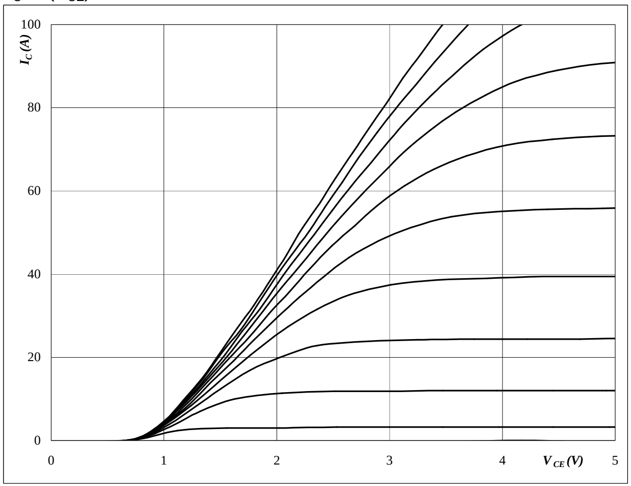
T_j =	150 ℃
Rgon =	16 Ω
Rgoff =	17 Ω

Brake

Figure 1 Brake IGBT

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

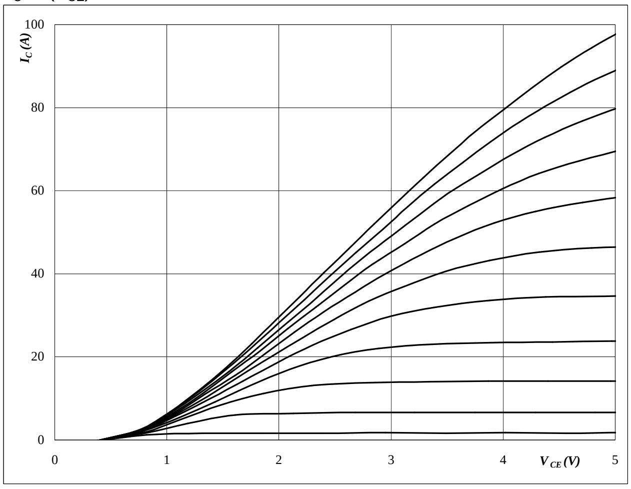
T_j = 25 ℃

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

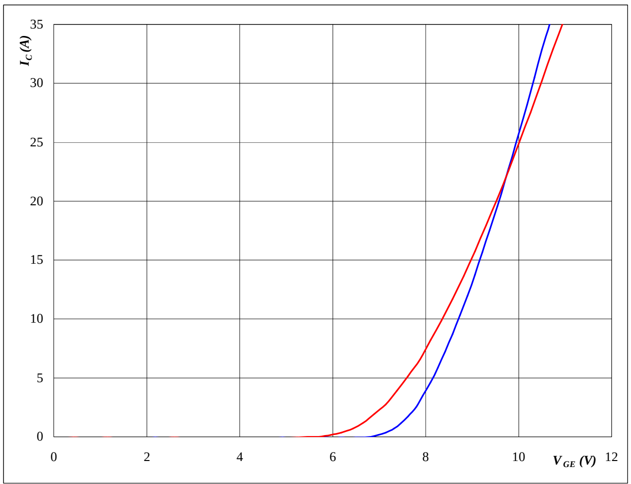
T_j = 150 ℃

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_j = 25/150 ℃

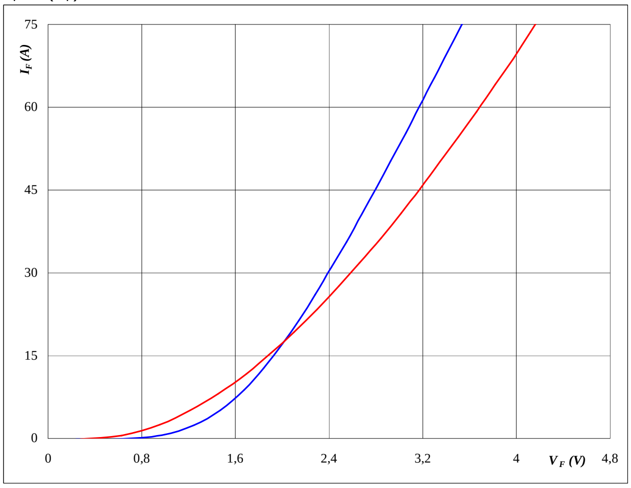
t_p = 250 µs

V_{CE} = 10 V

Figure 4 Brake FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

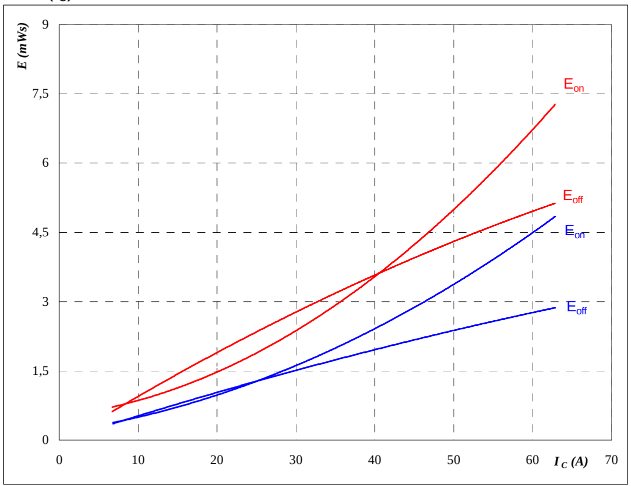
t_p = 250 µs

Brake

Figure 5 Brake IGBT

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



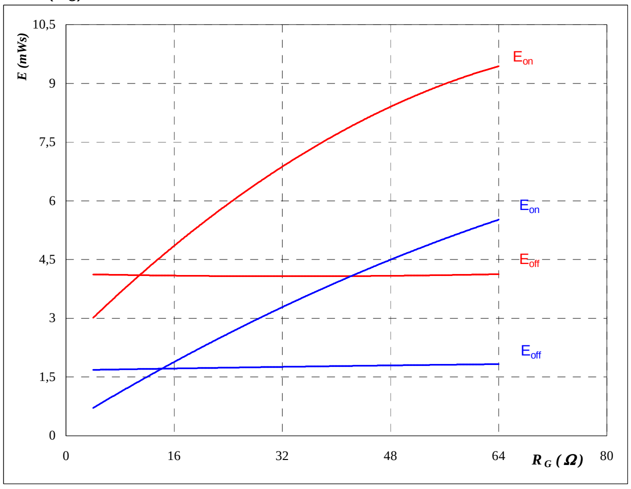
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Figure 6 Brake IGBT

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



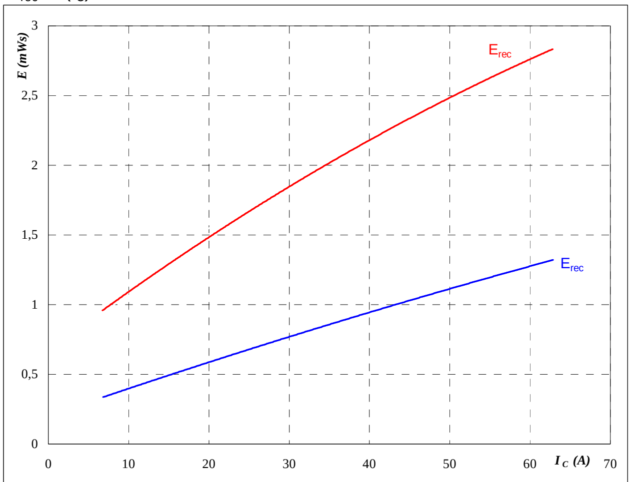
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

Figure 7 Brake FWD

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_C)$



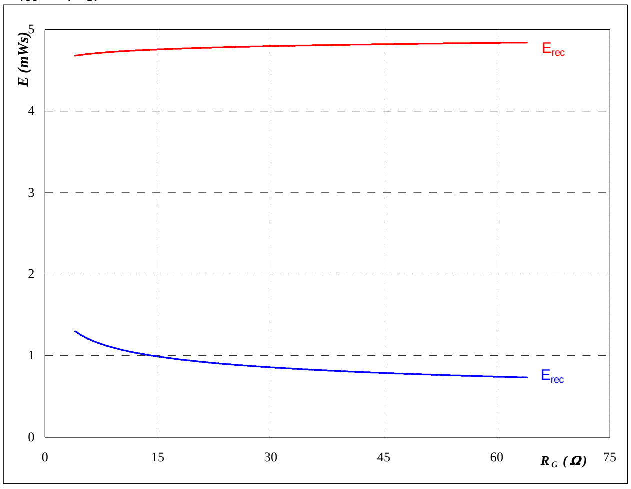
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	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

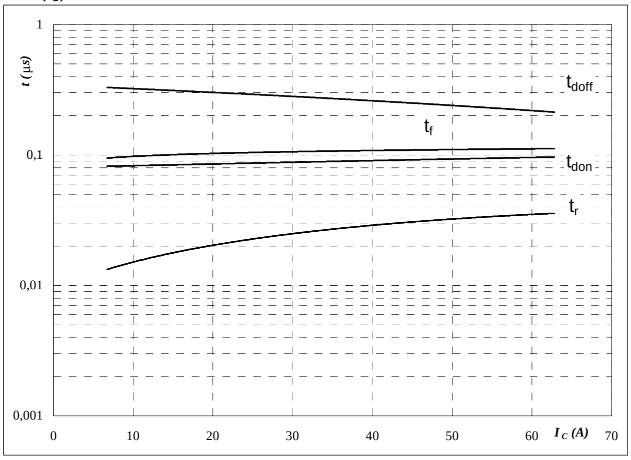
T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

Brake

Figure 9 Brake IGBT

Typical switching times as a function of collector current

t = f(I_C)



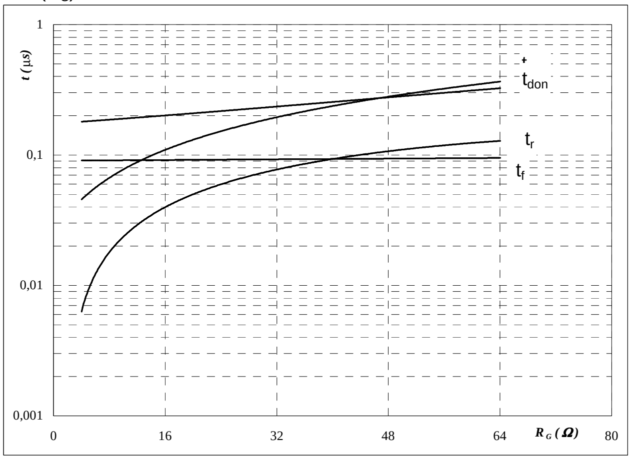
With an inductive load at

T_j =	150	℃
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Figure 10 Brake IGBT

Typical switching times as a function of gate resistor

t = f(R_G)



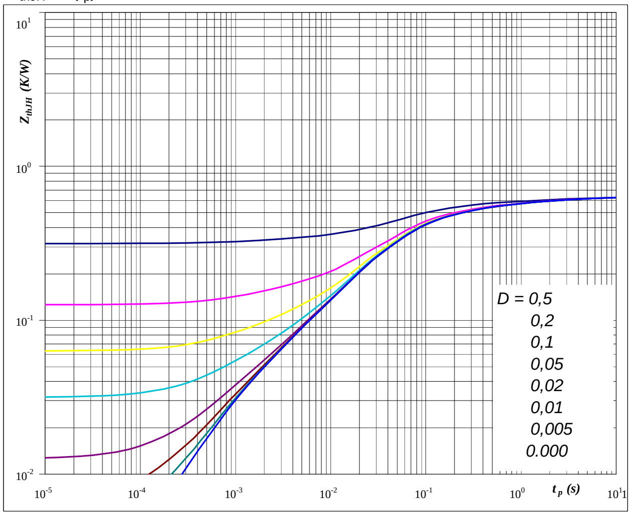
With an inductive load at

T_j =	150	℃
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

Figure 11 Brake IGBT

IGBT transient thermal impedance as a function of pulse width

Z_{thJH} = f(t_p)

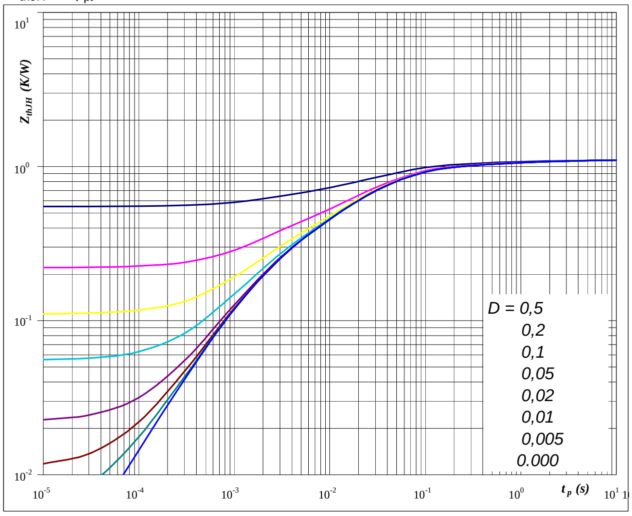


At	D =	tp / T
Psx7p		
R_{thJH} =	0,630	K/W

Figure 12 Brake FWD

FWD transient thermal impedance as a function of pulse width

Z_{thJH} = f(t_p)



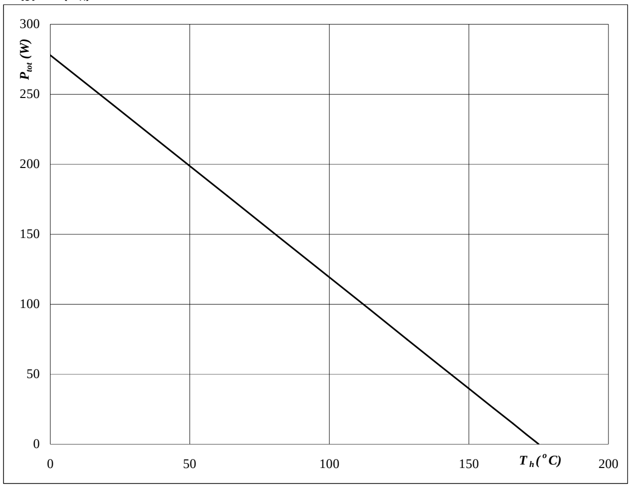
At	D =	tp / T
Psx7p		
R_{thJH} =	1,10	K/W

Brake

Figure 13 Brake IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



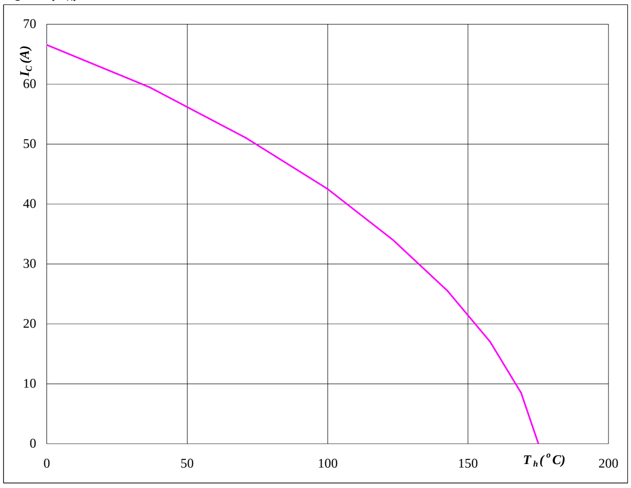
At

$T_j =$ 175 ºC

Figure 14 Brake IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

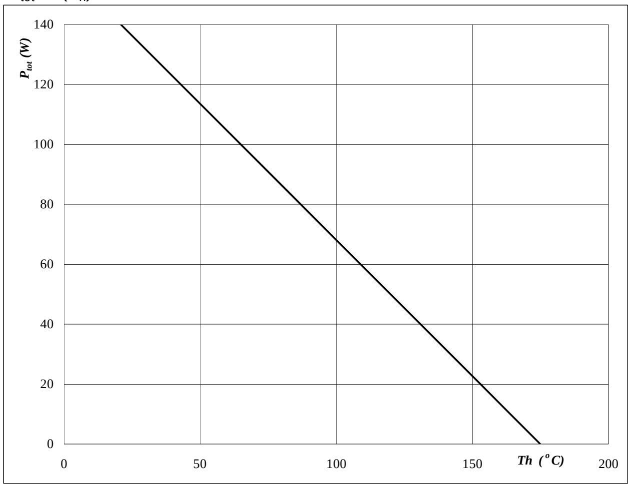
$T_j =$ 175 ºC

$V_{GE} =$ 15 V

Figure 15 Brake FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



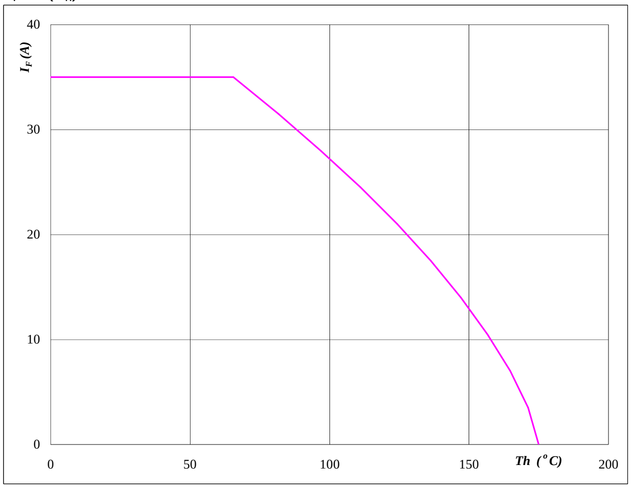
At

$T_j =$ 175 ºC

Figure 16 Brake FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

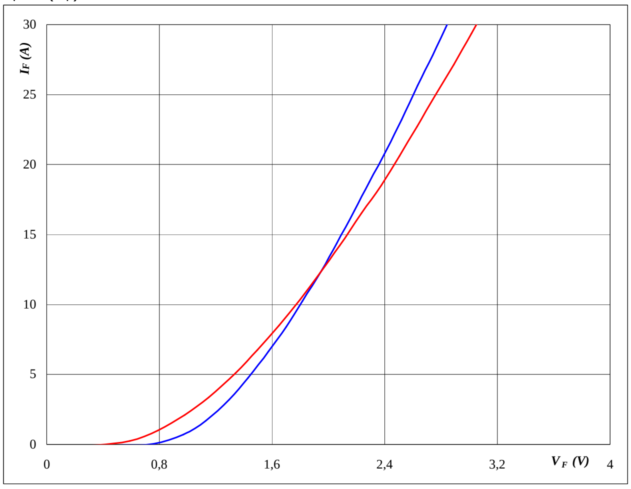
$T_j =$ 175 ºC

Brake Inverse Diode

Figure 1 Brake inverse diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

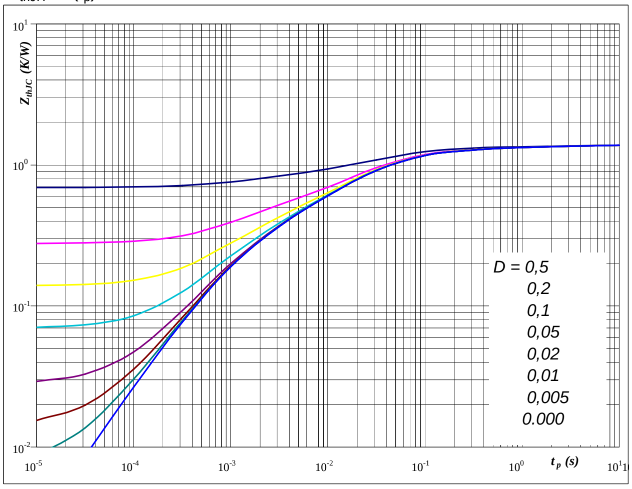
T_j = 25/150 °C

t_p = 250 μs

Figure 2 Brake inverse diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At D = tp / T

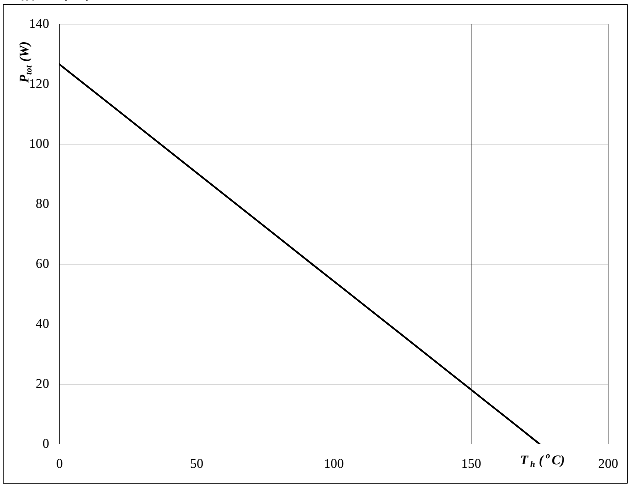
Psx7p

R_{thJH} = 1,38 K/W

Figure 3 Brake inverse diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



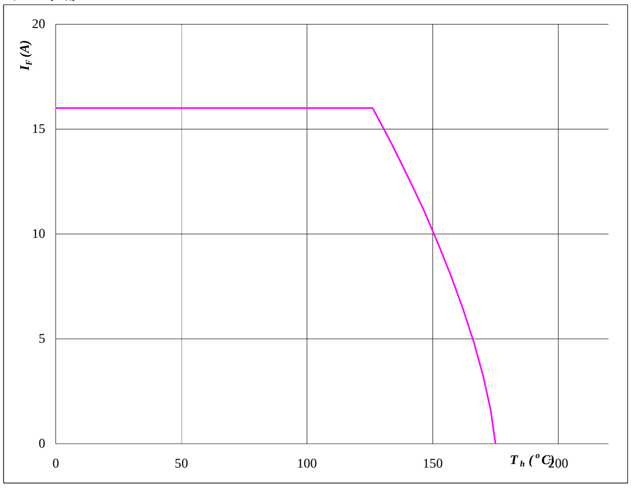
At

T_j = 150 ºC

Figure 4 Brake inverse diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

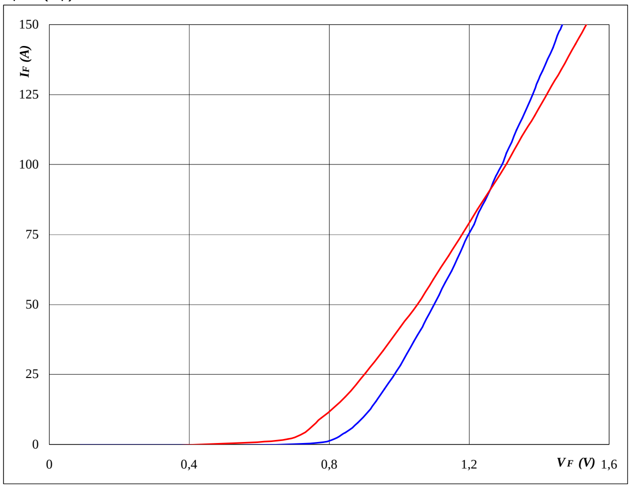
T_j = 150 ºC

Input Rectifier Bridge

Figure 1 Rectifier diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

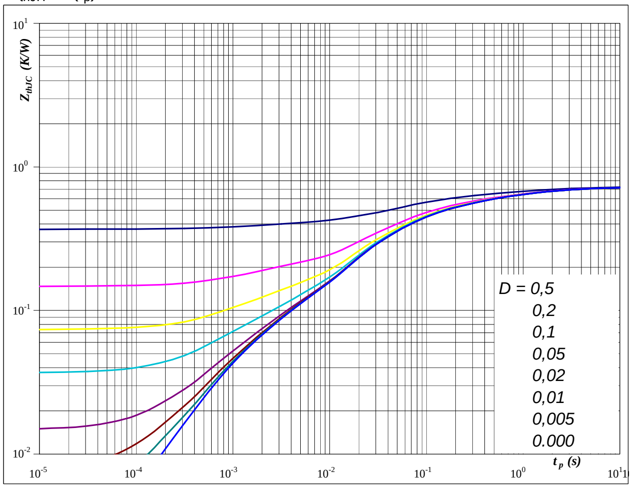
T_j = 25/125 ℃

t_p = 250 µs

Figure 2 Rectifier diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

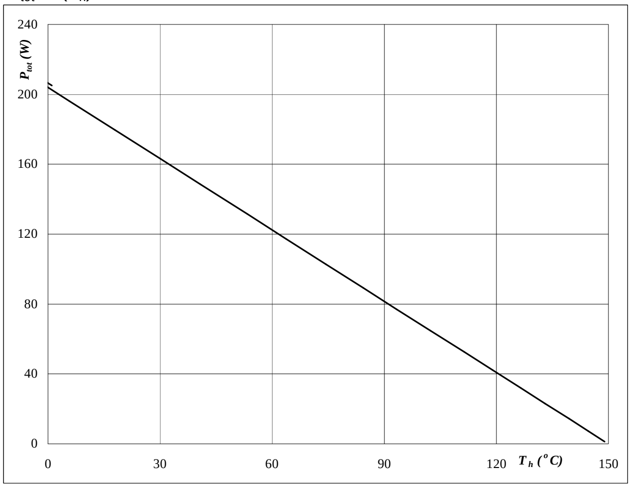
D = t_p / T

R_{thJH} = 0,74 K/W

Figure 3 Rectifier diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



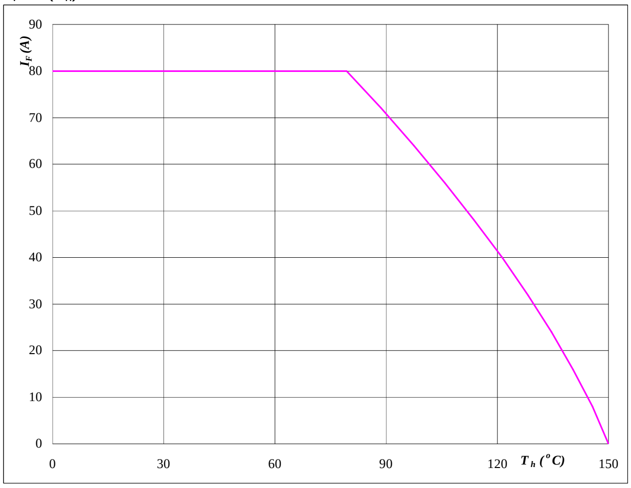
At

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

$R_T = f(T)$

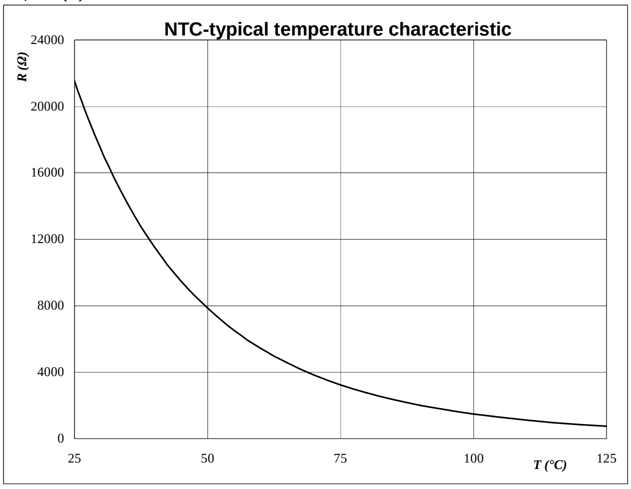


Figure 2 Thermistor

Typical NTC resistance values

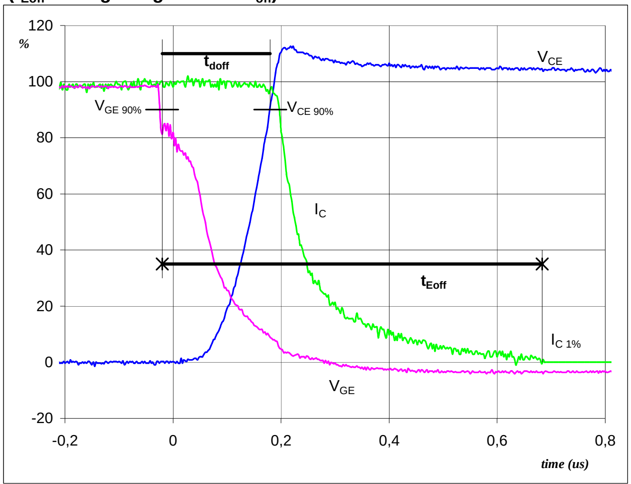
$$R(T) = R_{25} \cdot e^{\left(B_{25/100} \cdot \left(\frac{1}{T} - \frac{1}{T_{25}}\right)\right)} \quad [\Omega]$$

Switching Definitions Output Inverter

General conditions		
T_j	=	150 ℃
R_{gon}	=	16 Ω
R_{goff}	=	17 Ω

Figure 1 Output inverter IGBT

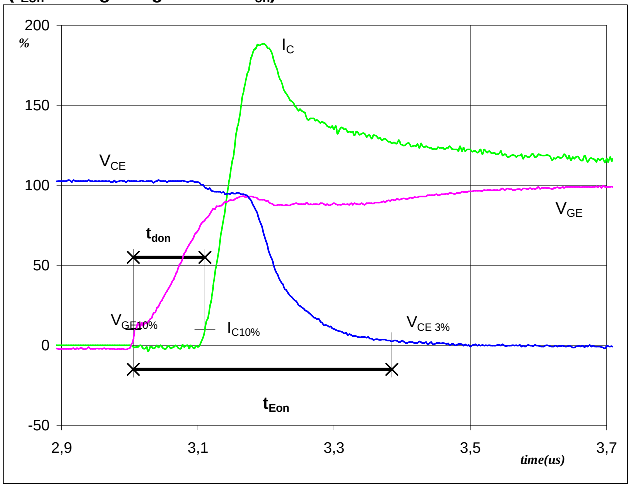
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	50	A
t_{doff} =	0,21	µs
t_{Eoff} =	0,70	µs

Figure 2 Output inverter IGBT

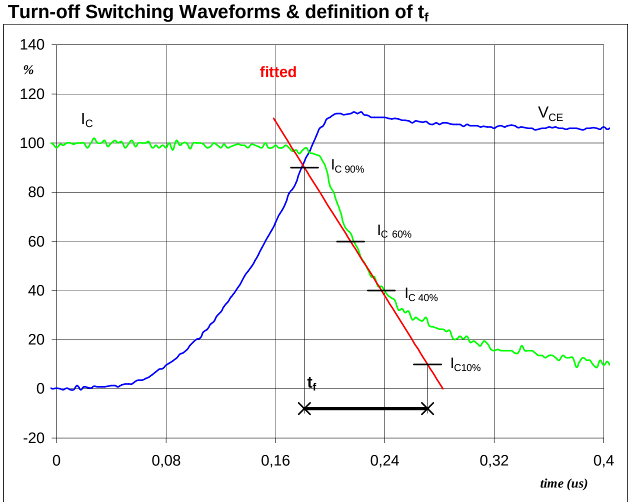
Turn-on Switching Waveforms & definition of tdon, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	50	A
t_{don} =	0,10	µs
t_{Eon} =	0,38	µs

Figure 3 Output inverter IGBT

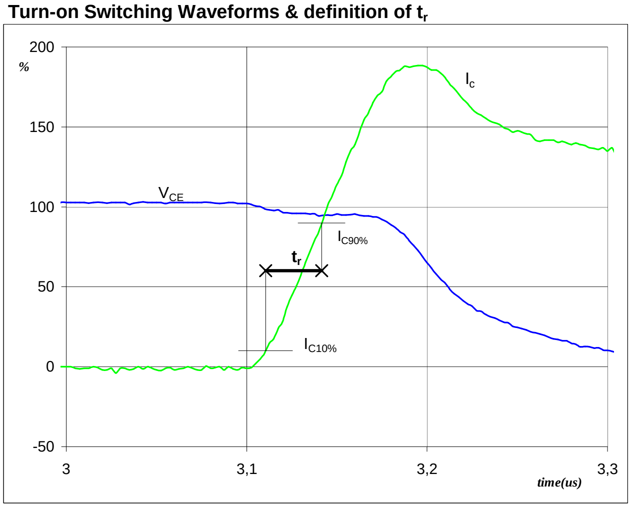
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	50	A
t_f =	0,09	µs

Figure 4 Output inverter IGBT

Turn-on Switching Waveforms & definition of t_r

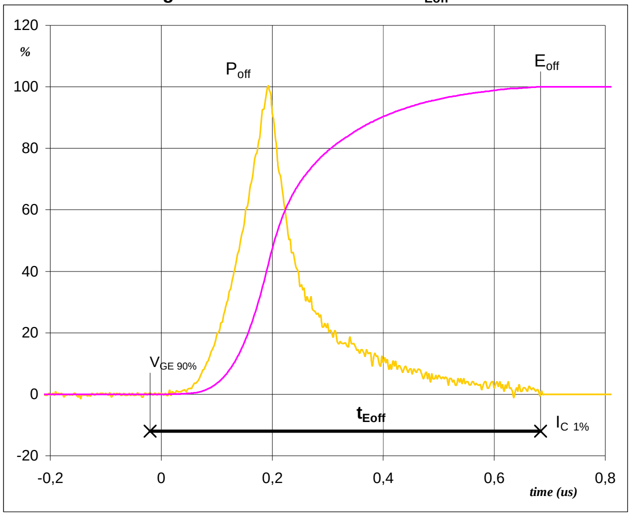


V_C (100%) =	600	V
I_C (100%) =	50	A
t_r =	0,03	µs

Switching Definitions Output Inverter

Figure 5 Output inverter IGBT

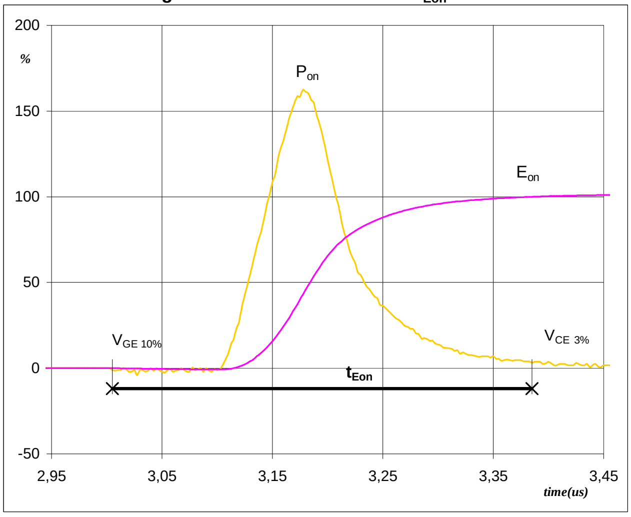
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	30,14	kW
E_{off} (100%) =	4,09	mJ
t_{Eoff} =	0,70	μs

Figure 6 Output inverter IGBT

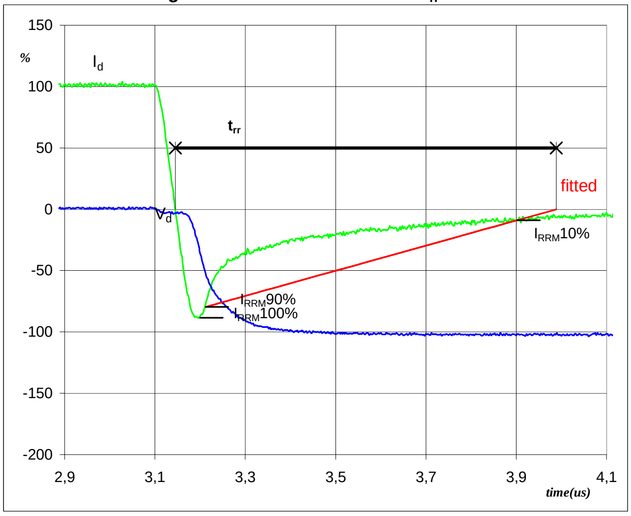
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	30,14	kW
E_{on} (100%) =	4,39	mJ
t_{Eon} =	0,38	μs

Figure 7 Output inverter FWD

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

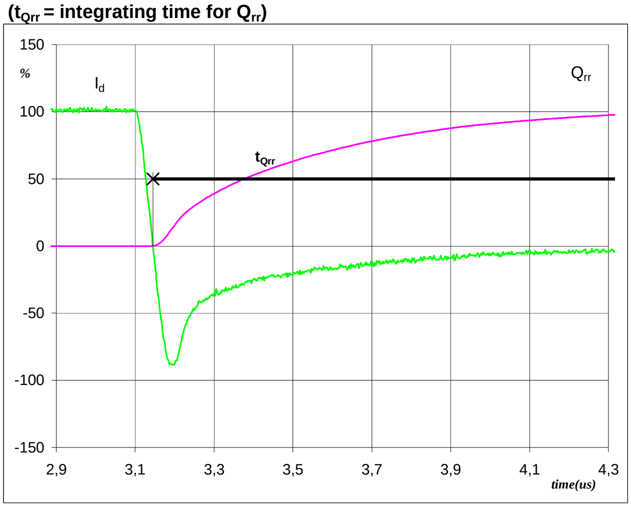


V_d (100%) =	600	V
I_d (100%) =	50	A
I_{RRM} (100%) =	-45	A
t_{rr} =	0,73	μs

Switching Definitions Output Inverter

Figure 8	Output inverter FWD

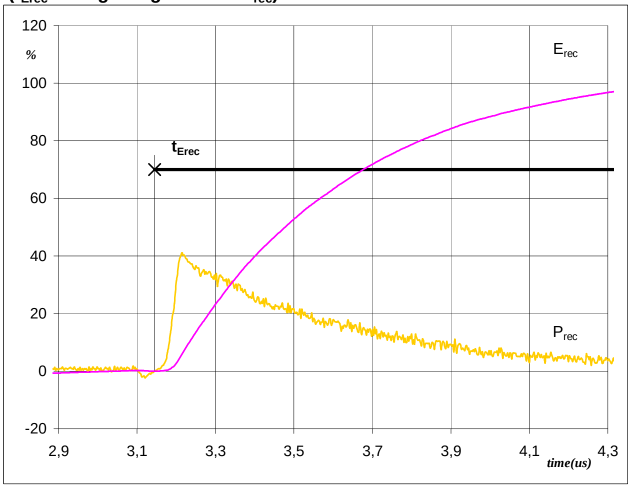
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	50	A
Q_{rr} (100%) =	10,81	µC
t_{Qrr} =	2,00	µs

Figure 9	Output inverter FWD

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



P_{rec} (100%) =	30,14	kW
E_{rec} (100%) =	5,14	mJ
t_{Erec} =	2,00	µs

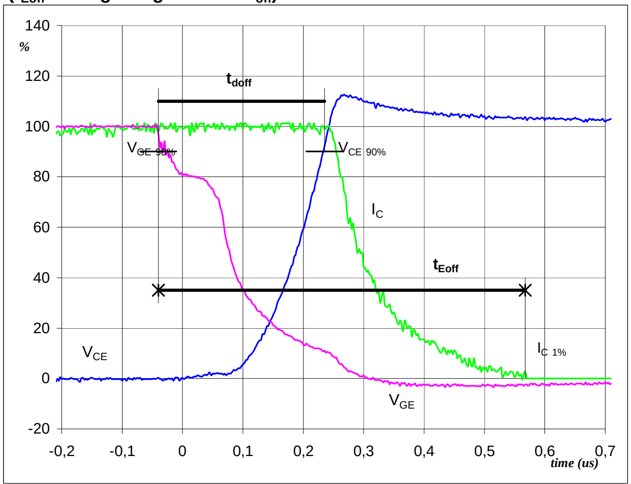
Switching Definitions Brake

General conditions

T_j	=	150 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

Figure 1 IGBT

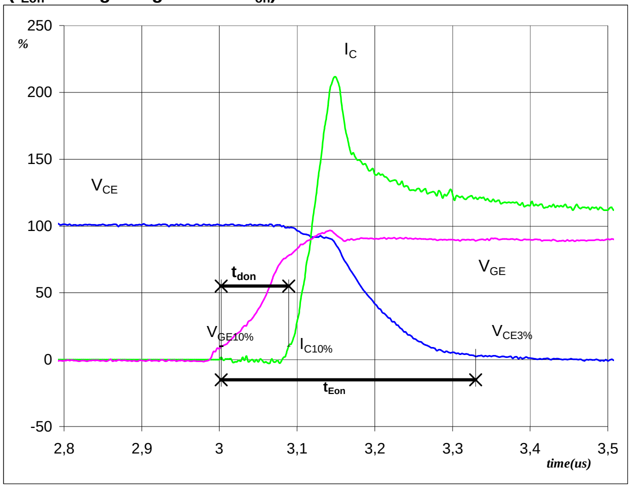
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{doff} =	0,27	µs
t_{Eoff} =	0,61	µs

Figure 2 IGBT

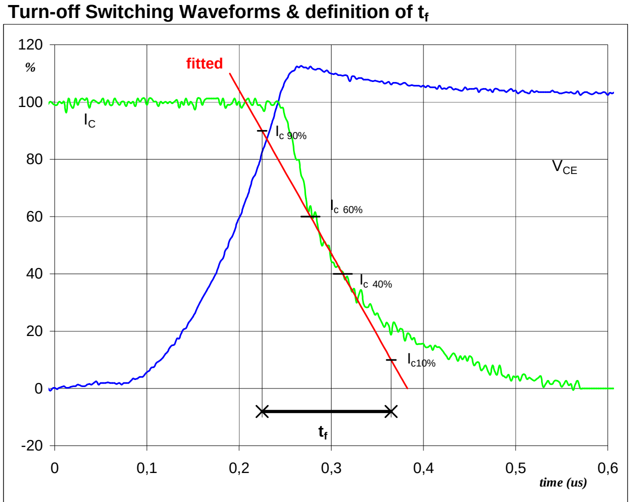
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{don} =	0,09	µs
t_{Eon} =	0,33	µs

Figure 3 IGBT

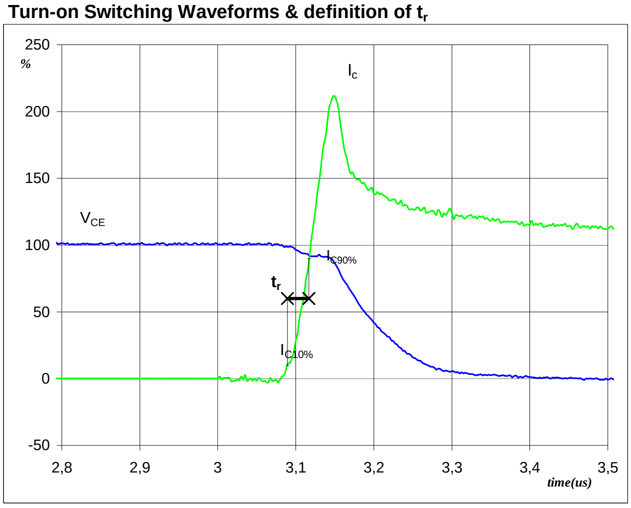
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	35	A
t_f =	0,13	µs

Figure 4 IGBT

Turn-on Switching Waveforms & definition of t_r

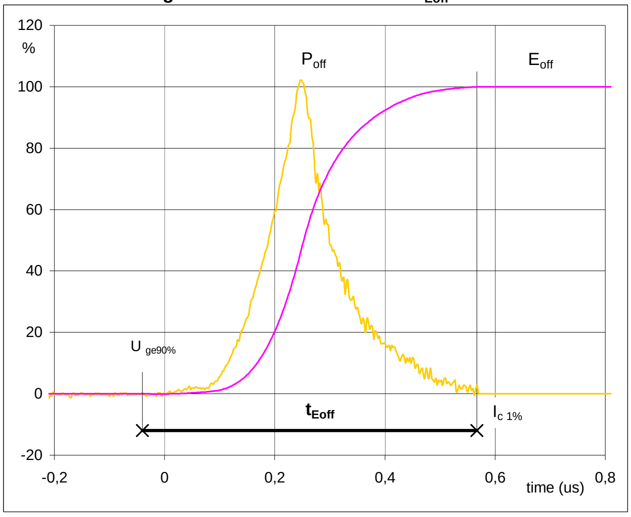


V_C (100%) =	600	V
I_C (100%) =	35	A
t_r =	0,03	µs

Switching Definitions Brake

Figure 5 IGBT

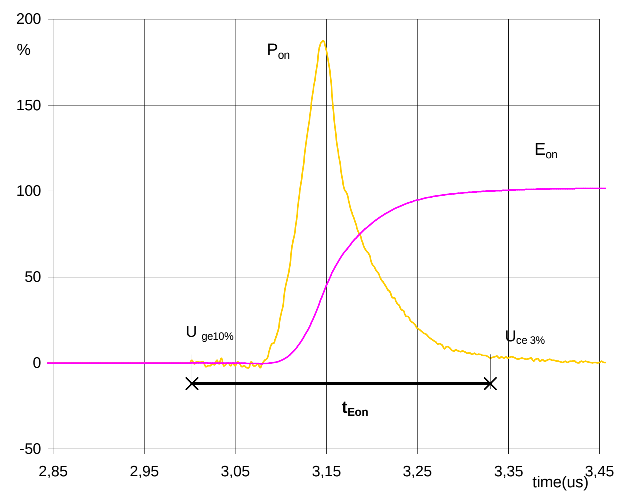
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	20,96	kW
E_{off} (100%) =	3,18	mJ
t_{Eoff} =	0,61	μs

Figure 6 IGBT

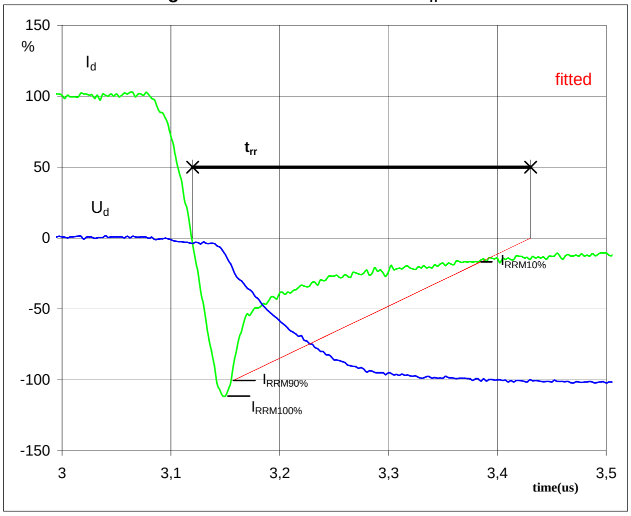
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	20,9586	kW
E_{on} (100%) =	2,92	mJ
t_{Eon} =	0,33	μs

Figure 7 FWD

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

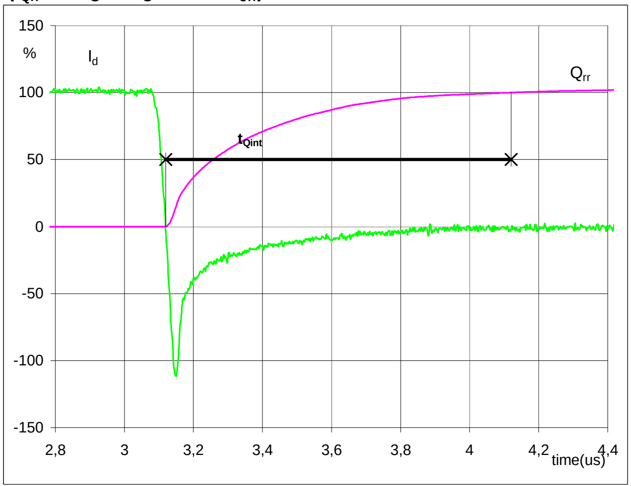


V_d (100%) =	600	V
I_d (100%) =	35	A
I_{RRM} (100%) =	-39	A
t_{rr} =	0,42	μs

Switching Definitions Brake

Figure 8 FWD

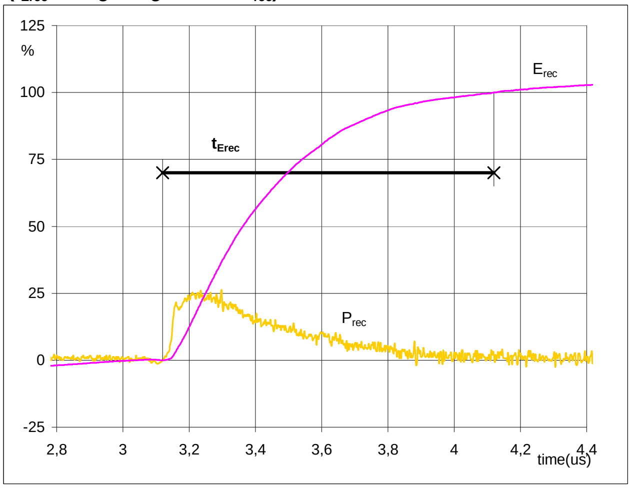
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr}= integrating time for Q_{rr})



I_d (100%) =	35	A
Q_{rr} (100%) =	4,84	µC
t_{Qint} =	1,00	µs

Figure 9 FWD

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



P_{rec} (100%) =	20,96	kW
E_{rec} (100%) =	1,98	mJ
t_{Erec} =	1,00	µs

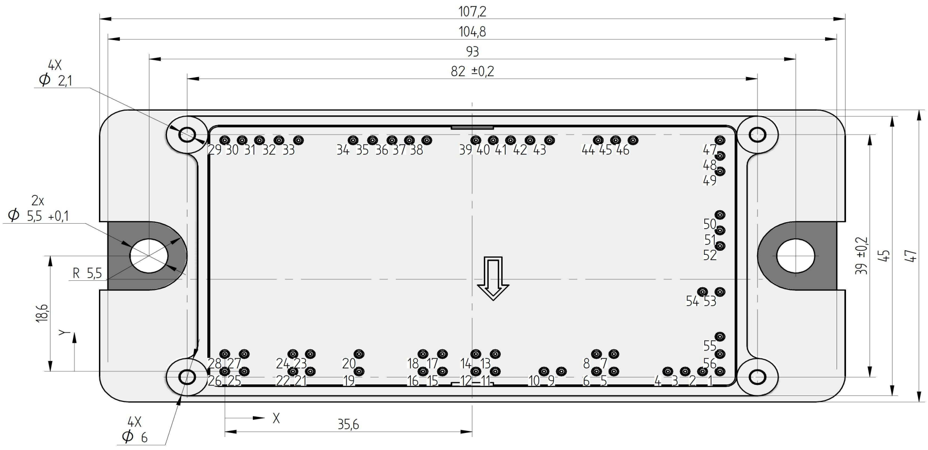
Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

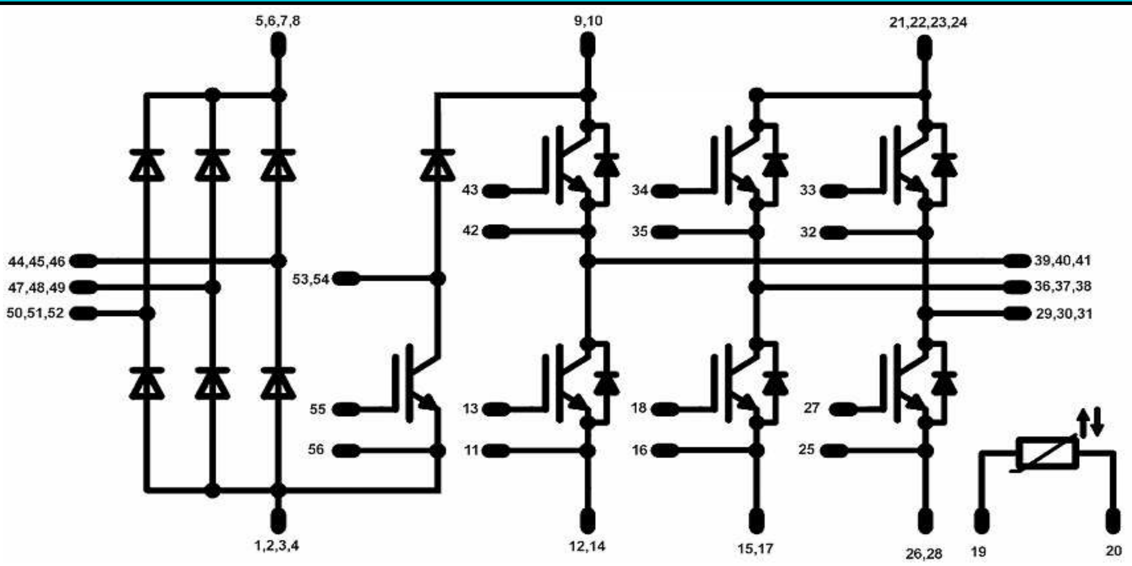
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 17mm housing	V23990-P768-A60-PM	P768-A60	P768-A60

Outline

Pin table				Pin table			
Pin		X	Y	Pin		X	Y
1	DC –	71,2	0	29	U	0	37,2
2	DC –	68,7	0	30	U	2,5	37,2
3	DC –	66,2	0	31	U	5	37,2
4	DC –	63,7	0	32	E	7,8	37,2
5	DC +	55,95	0	33	G	10,6	37,2
6	DC +	53,45	0	34	G	18,45	37,2
7	DC +	55,95	2,8	35	E	21,25	37,2
8	DC +	53,45	2,8	36	V	24,05	37,2
9	DC +	48,4	0	37	V	26,55	37,2
10	DC +	45,9	0	38	V	29,05	37,2
11	E	38,9	0	39	W	36,1	37,2
12	DC –	36,1	0	40	W	38,6	37,2
13	G	38,9	2,8	41	W	41,1	37,2
14	DC –	36,1	2,8	42	E	43,9	37,2
15	DC –	31,3	0	43	G	46,7	37,2
16	E	28,5	0	44	L1	53,7	37,2
17	DC –	31,3	2,8	45	L1	56,2	37,2
18	G	28,5	2,8	46	L1	58,7	37,2
19	R2	19,3	0	47	L2	71,2	37,2
20	R1	19,3	2,8	48	L2	71,2	34,7
21	DC +	12,3	0	49	L2	71,2	32,2
22	DC +	9,8	0	50	L3	71,2	25,2
23	DC +	12,3	2,8	51	L3	71,2	22,7
24	DC +	9,8	2,8	52	L3	71,2	20,2
25	E	2,8	0	53	BrC	68,7	12,8
26	DC –	0	0	54	BrC	71,2	12,8
27	G	2,8	2,8	55	BrG	71,2	5,6
28	DC –	0	2,8	56	BrE	71,2	2,8



Pinout



DISCLAIMER

The information given in this datasheet describes the type of component and does not represent assured characteristics. For tested values please contact Vincotech.Vincotech reserves the right to make changes without further notice to any products herein to improve reliability, function or design. Vincotech does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

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.