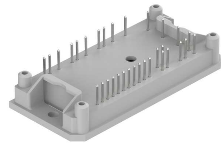
V23990-P589-A/ C-PM
datasheet

***flow* PIM 1** **1200 V / 25 A**

Features

- 3phase rectifier, optional BRC, Inverter, NTC
- Very compact housing, easy to route
- Trench Fieldstop IGBT's for low saturation losses

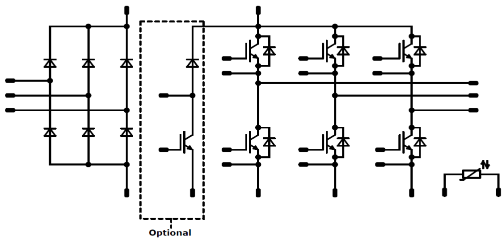
flow 1 17mm housing



Target Applications

- Industrial drives
- Embedded drives

Schematic



Types

- V23990-P589-A-PM
- V23990-P589-C-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	45	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms		280	A
I2t-value	I^2t			390	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	59	W
Maximum Junction Temperature	T_{jmax}			150	°C
Inverter Switch					
Collector-emitter breakdown voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	31	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		75	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	74	W
Gate-emitter peak voltage	V_{GE}			±20	V
Maximum Junction Temperature	T_{jmax}			150	°C
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	58	W
Maximum Junction Temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Brake Switch					
Collector-emitter breakdown voltage	V_{CE}			1200	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	21	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		45	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	59	W
Gate-emitter peak voltage	V_{GE}			±20	V
Maximum Junction Temperature	T_{jmax}			150	°C
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	8	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	32	W
Maximum Junction Temperature	T_{jmax}			150	°C
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{is}	t = 2 s	DC Test Voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	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]	Min	Typ	Max	Unit
Rectifier Diode										
Forward voltage	V_F				30	25 125		1,17 1,12	1,3	V
Threshold voltage (for power loss calc. only)	V_{to}					25 125		0,9 0,77		V
Slope resistance (for power loss calc. only)	r_t					25 125		9 11		mΩ
Reverse current	I_r			1600		25			20	mA
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,19		K/W
Inverter Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,001	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125	1,35	1,79 2,05	2,05	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25			150	µA
Gate-emitter leakage current	I_{GES}		20	0		25			600	nA
Integrated Gate resistor	R_{gint}							8		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 36 Ω R_{gon} = 36 Ω	±15	600	25	25 125		266 76		ns
Rise time	t_r					25 125		18 26		ns
Turn-off delay time	$t_{d(off)}$					25 125		400 487		ns
Fall time	t_f					25 125		107 179		ns
Turn-on energy loss	E_{on}					25 125		2,18 3,45		mWs
Turn-off energy loss	E_{off}					25 125		1,82 2,57		mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		1808		pF
Output capacitance	C_{oss}							95		pF
Reverse transfer capacitance	C_{rss}							82		pF
Gate charge	Q_G		15	960	25	25		155		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,94		K/W
Inverter Diode										
Diode forward voltage	V_F				30	25 125		2,17 1,74		V
Peak reverse recovery current	I_{RRM}	R_{gon} = 36 Ω	±15	600	25	25 125		39,08 46,1		A
Reverse recovery time	t_{rr}					25 125		43 332		ns
Reverse recovered charge	Q_{rr}					25 125		2,04 4,82		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		3582 1622		A/µs
Reverse recovered energy	E_{rec}					25 125		0,6 1,42		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,20		K/W

Characteristic Values

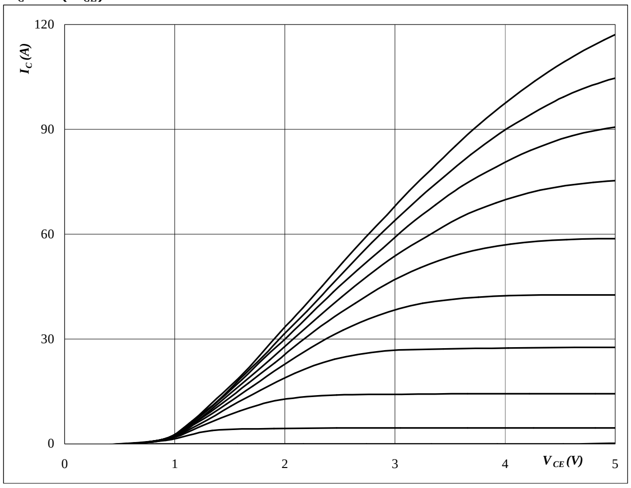
Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Brake Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0006	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		15	25 125	1,35	1,77 2,01	2,05	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		25			2	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Integrated Gate resistor	R_{gint}							none		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 20 Ω R_{gon} = 40 Ω	15	600	15	25 125		36 36		ns
Rise time	t_r					25 125		21 25		ns
Turn-off delay time	$t_{d(off)}$					25 125		312 375		ns
Fall time	t_f					25 125		135 198		ns
Turn-on energy loss	E_{on}					25 125		0,85 1,38		mWs
Turn-off energy loss	E_{off}					25 125		1,29 1,95		mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		1090		pF
Output capacitance	C_{oss}							58		pF
Reverse transfer capacitance	C_{rss}							48		pF
Gate charge	Q_G		15	960	15	25		85		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,19		K/W
Brake Diode										
Diode forward voltage	V_F				6	25 125		2,1 1,56		V
Reverse leakage current	I_r			1200		25			50	µA
Peak reverse recovery current	I_{RRM}	R_{gon} = 40 Ω	15	600	15	25 125		14,19 19,42		A
Reverse recovery time	t_{rr}					25 125		254 385		ns
Reverse recovered charge	Q_{rr}					25 125		1,1 1,1		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		690 350		A/µs
Reverse recovery energy	E_{rec}					25 125		0,43 0,93		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						2,1		K/W
Thermistor										
Rated resistance	R					25		21500		Ω
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-4,5		4,5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3884		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3964		K
Vincotech NTC Reference									F	

Inverter Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



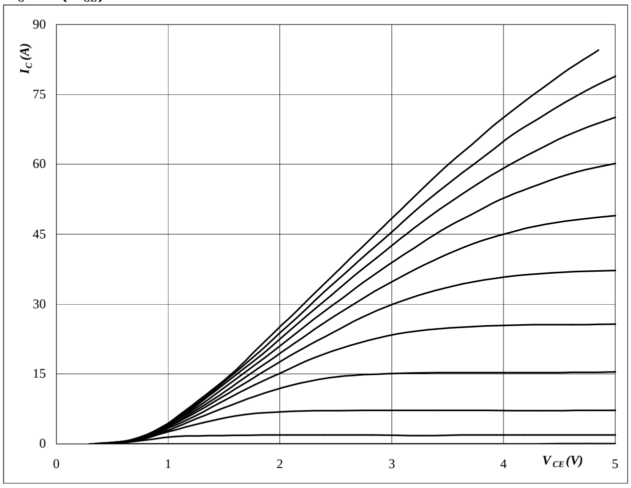
At

t_p =	250	µs
T_j =	25	°C
V_{GE} from	6 V to 16 V in steps of 1 V	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



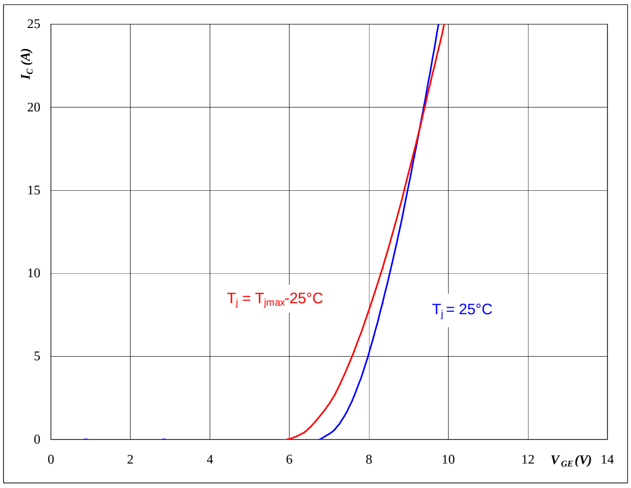
At

t_p =	250	µs
T_j =	125	°C
V_{GE} from	6 V to 16 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



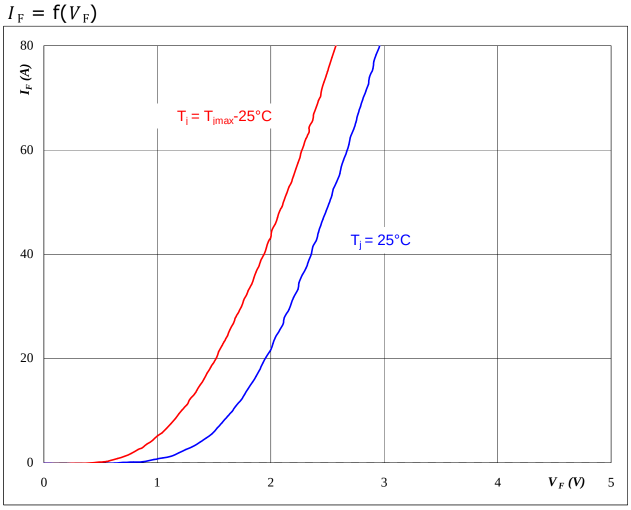
At

t_p =	250	µs
V_{CE} =	10	V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

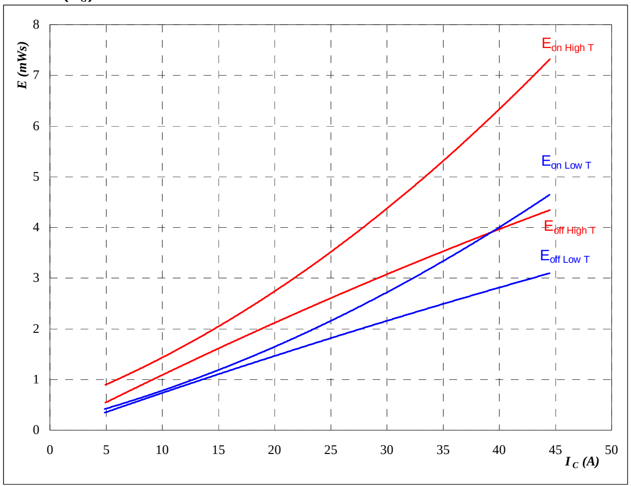
t_p =	250	µs

Inverter Characteristics

figure 5. **IGBT**

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



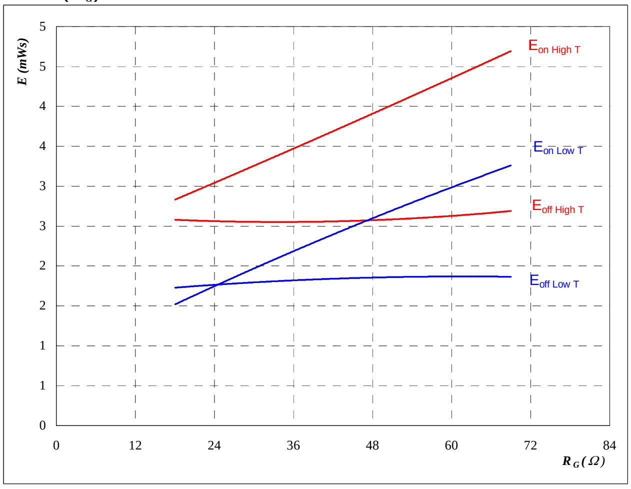
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	36	Ω
R_{goff} =	36	Ω

figure 6. **IGBT**

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



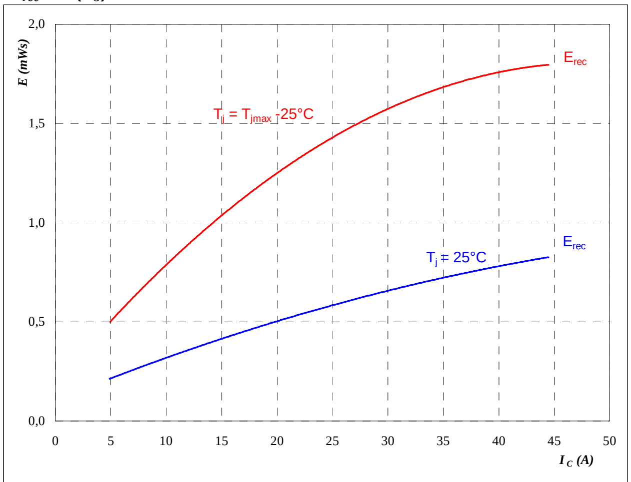
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_C)$



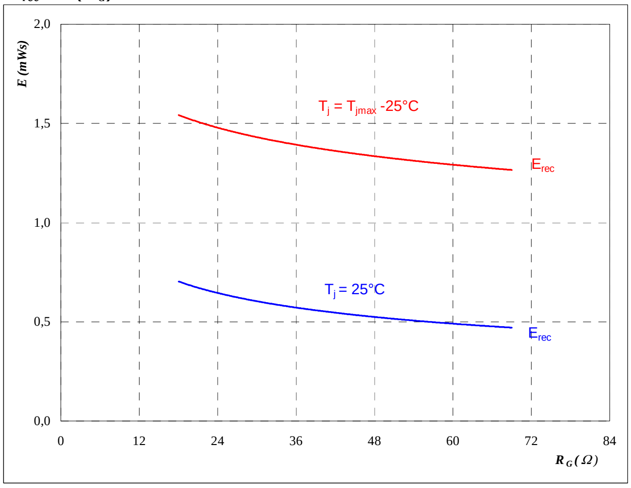
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	36	Ω

figure 8. **FWD**

Typical reverse recovery energy loss
as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

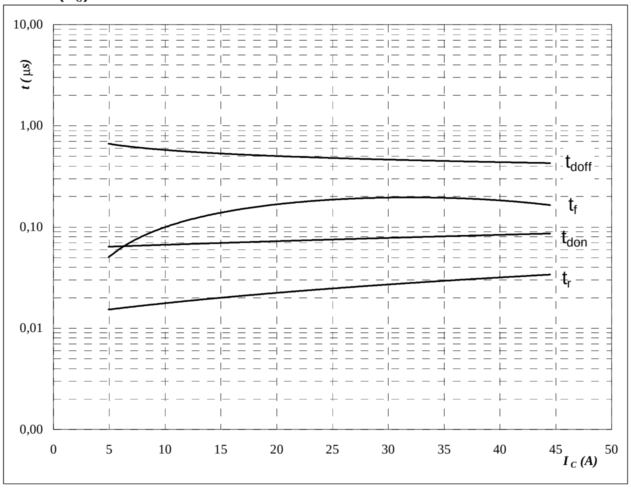
T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	25	A

Inverter Characteristics

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



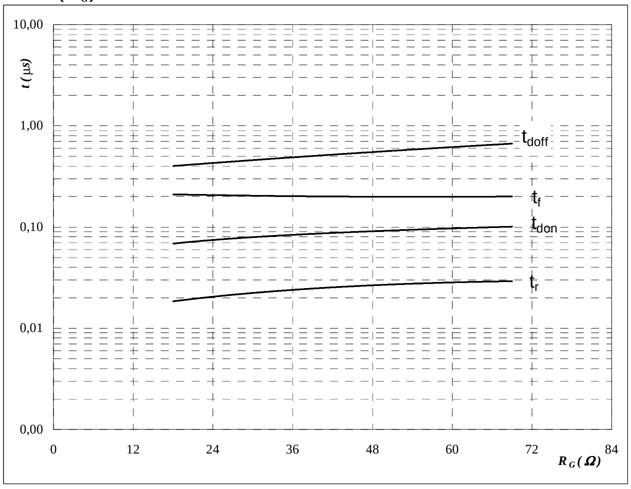
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	36	Ω
R_{goff} =	36	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



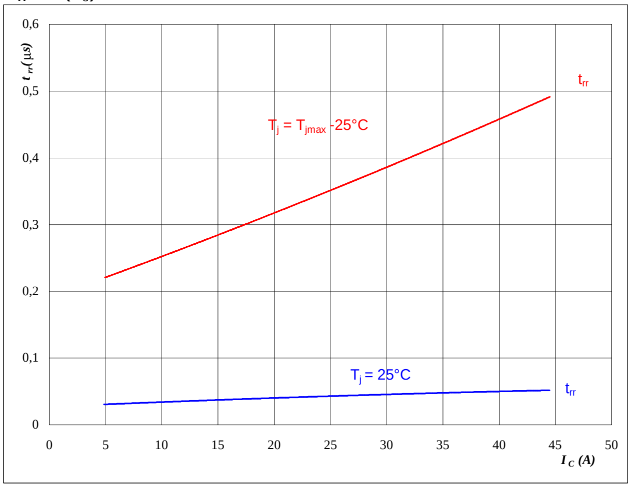
With an inductive load at

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

figure 11. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



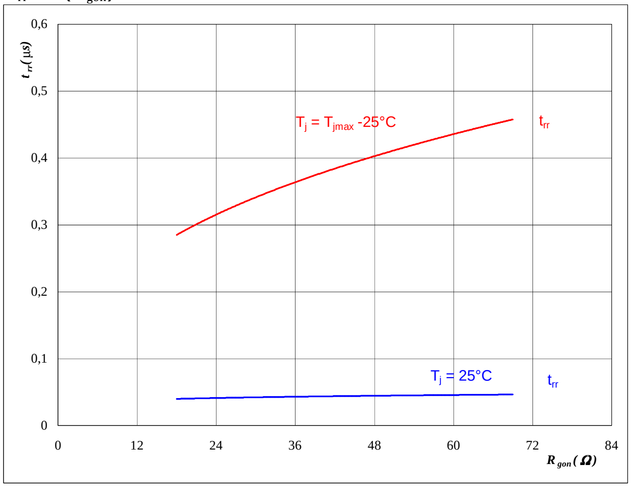
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	36	Ω

figure 12. **FWD**

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

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



At

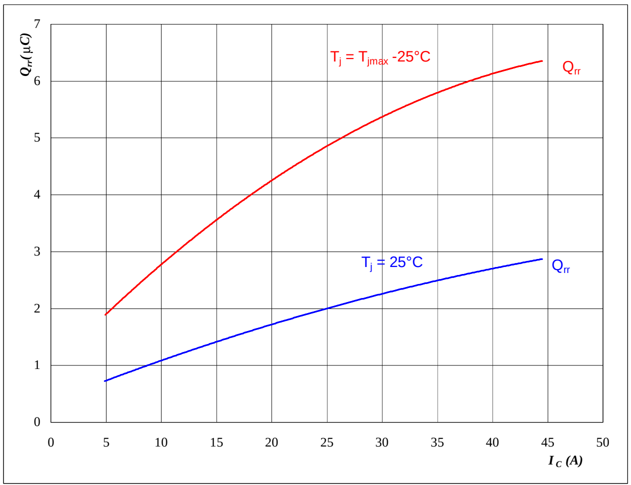
T_j =	25/125	°C
V_R =	600	V
I_F =	25	A
V_{GE} =	±15	V

Inverter Characteristics

figure 13. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



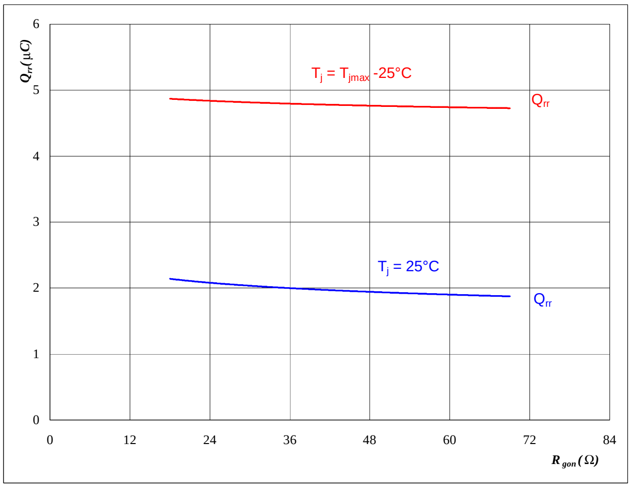
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	36	Ω

figure 14. **FWD**

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

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



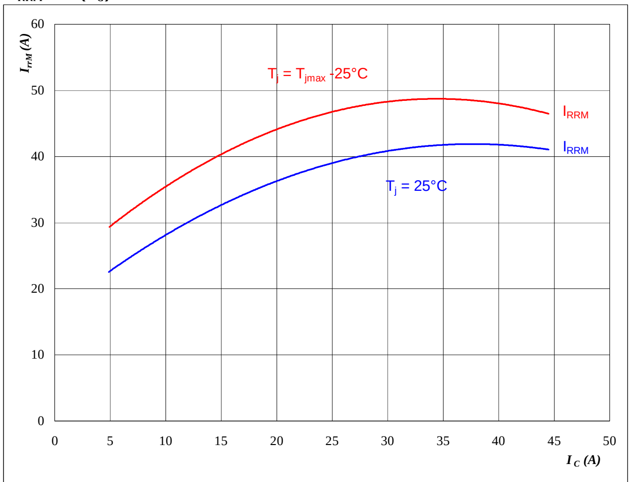
At

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

figure 15. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



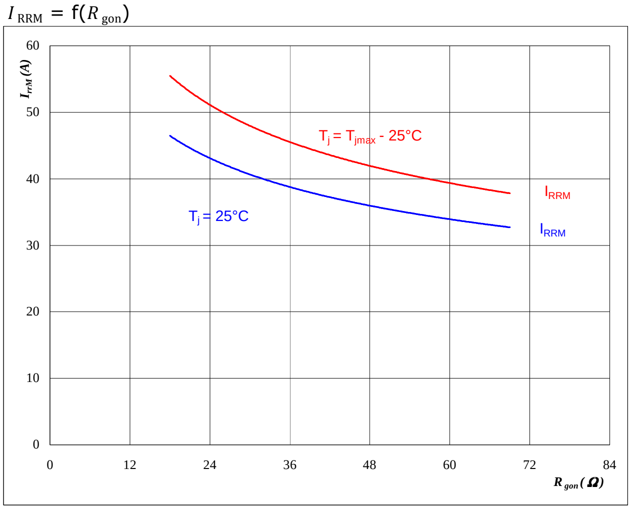
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	36	Ω

figure 16. **FWD**

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

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



At

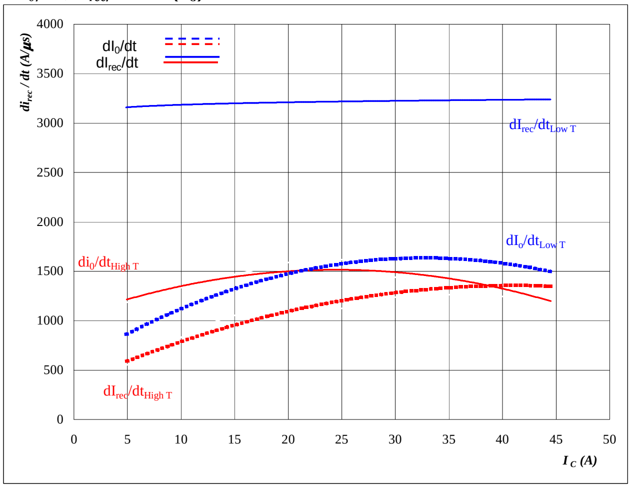
T_j =	25/125	°C
V_R =	600	V
I_F =	25	A
V_{GE} =	±15	V

Inverter Characteristics

figure 17. **FWD**

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

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



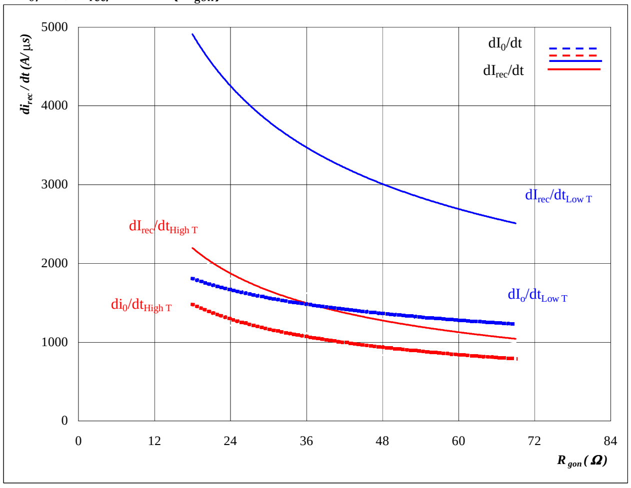
At

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	36	Ω

figure 18. **FWD**

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

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



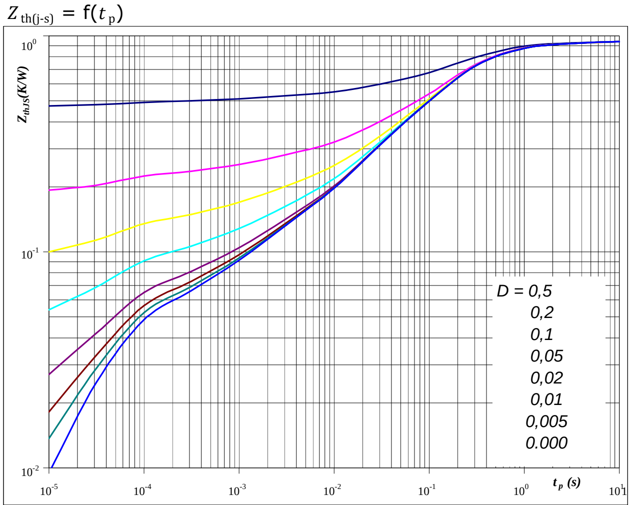
At

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

figure 19. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	0,94	K/W

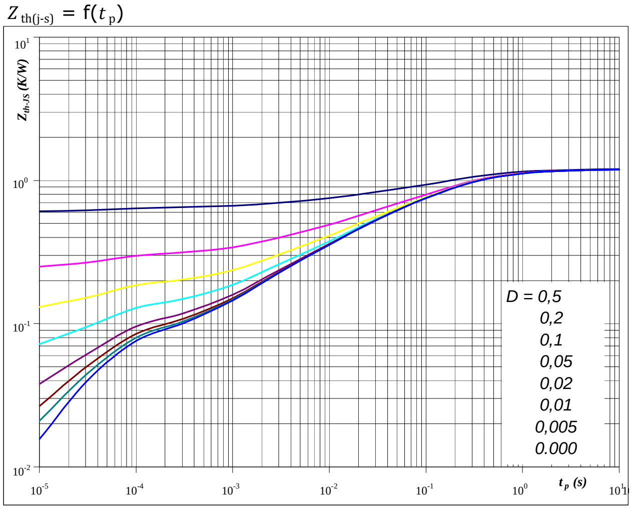
IGBT thermal model values

R (K/W)	Tau (s)
5,25E-02	3,57E+00
3,04E-01	4,16E-01
3,64E-01	1,16E-01
1,22E-01	1,52E-02
5,10E-02	1,15E-03
5,03E-02	5,13E-05

figure 20. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	1,20	K/W

FWD thermal model values

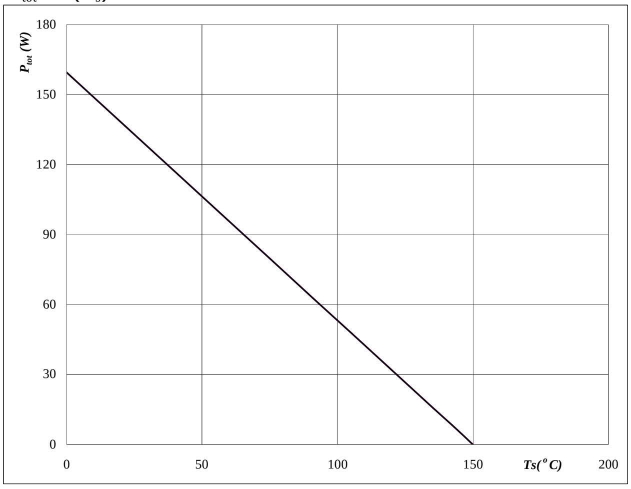
R (K/W)	Tau (s)
2,86E-02	1,01E+02
8,35E-02	1,99E+00
3,35E-01	3,21E-01
3,59E-01	8,30E-02
2,23E-01	1,29E-02
1,07E-01	1,77E-03
7,67E-02	4,66E-05

Inverter Characteristics

figure 21. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



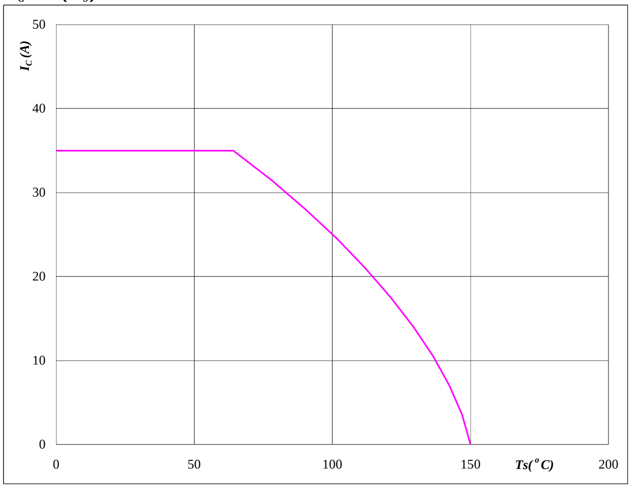
At

T_j = 150 °C

figure 22. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

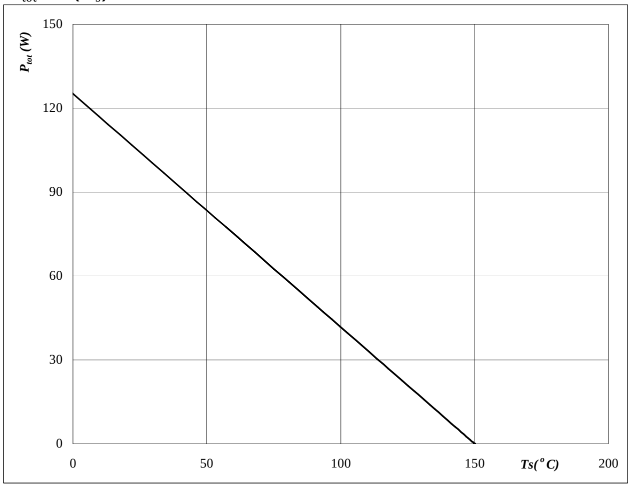
T_j = 150 °C

V_{GE} = 15 V

figure 23. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



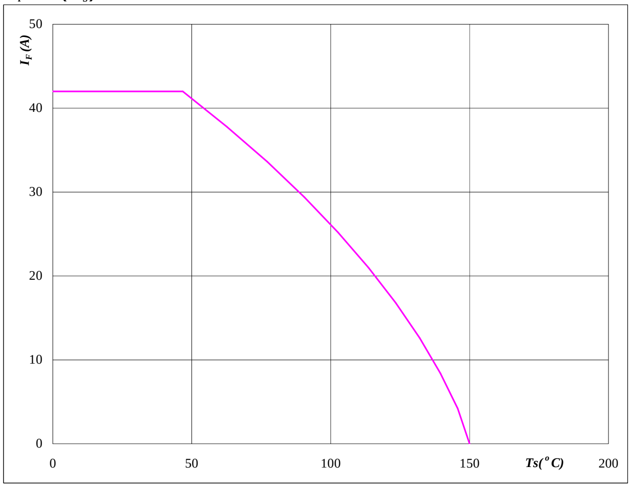
At

T_j = 150 °C

figure 24. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

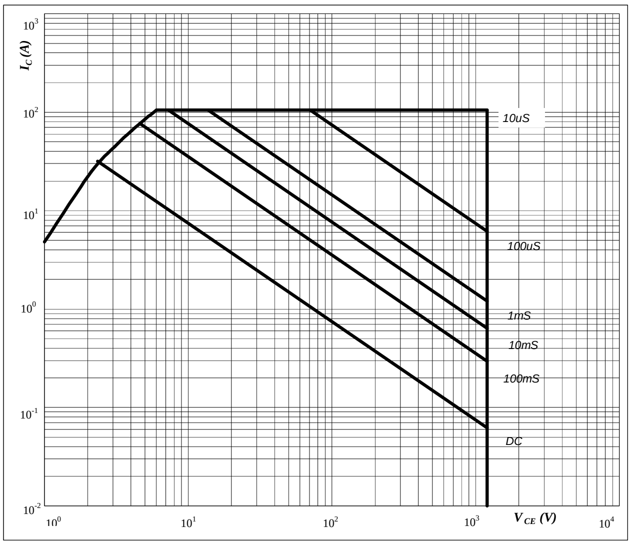
T_j = 150 °C

Inverter Characteristics

figure 25. **IGBT**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



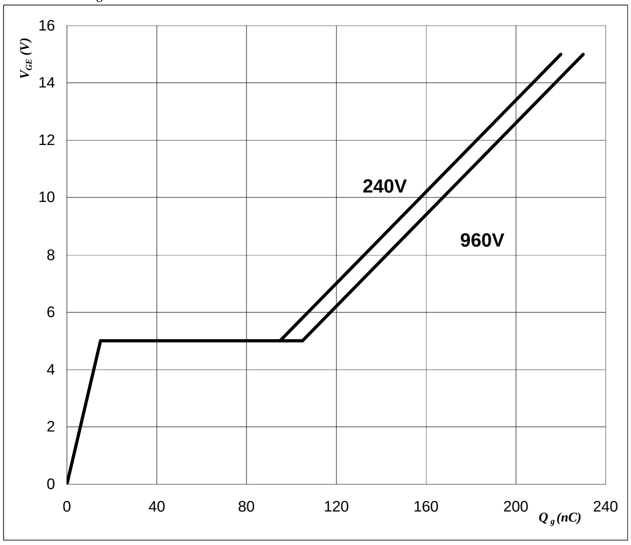
At

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

figure 26. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



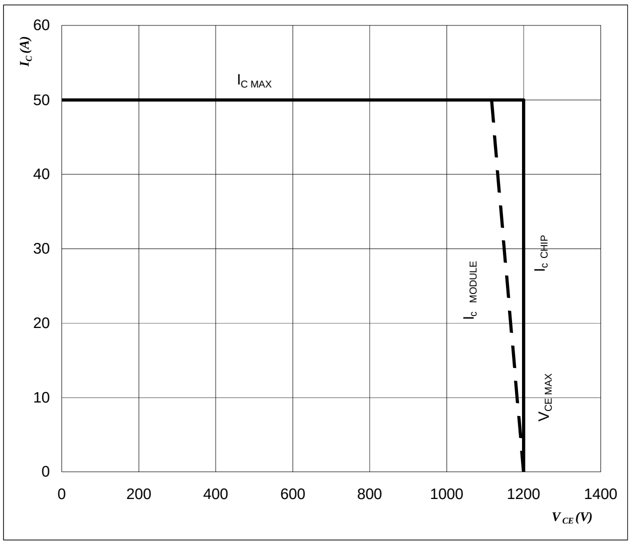
At

I_C =	25	A

figure 29. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

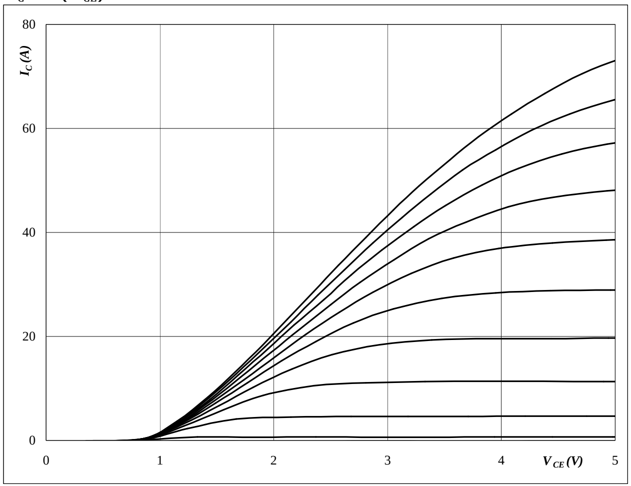
T_j =	124 °C
R_{gon} =	36 Ω
R_{goff} =	36 Ω

Brake Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

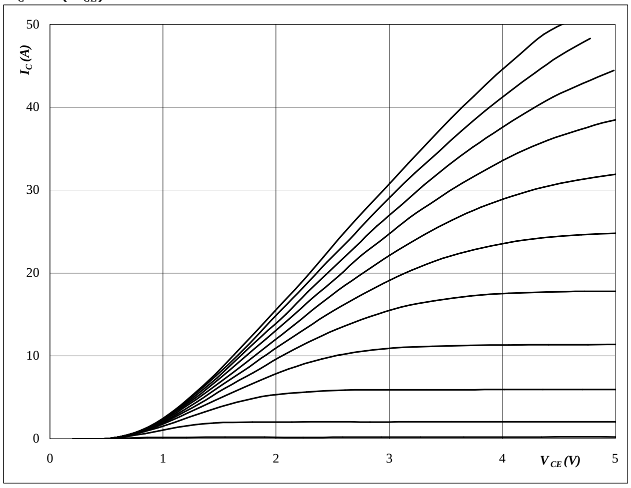
T_j = 25 °C

V_{GE} from 6 V to 16 V in steps of 1 V

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

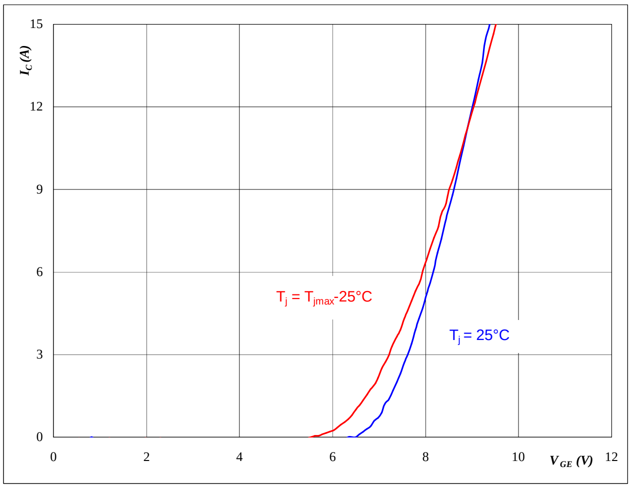
T_j = 125 °C

V_{GE} from 6 V to 16 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



At

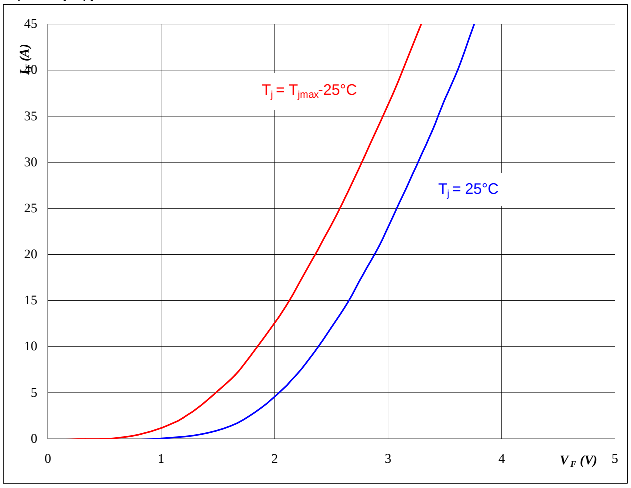
t_p = 250 µs

V_{CE} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

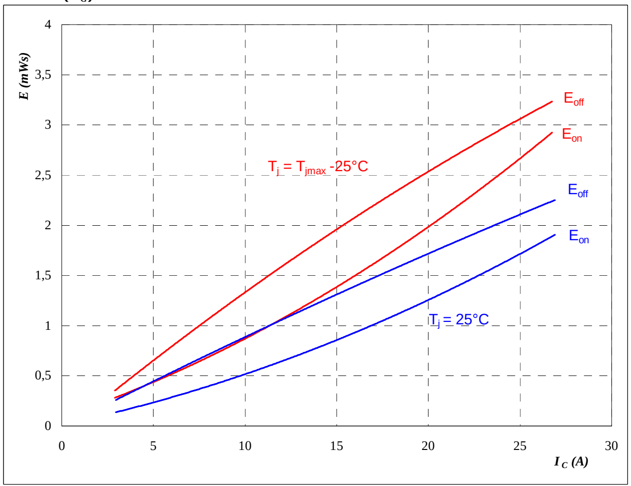
t_p = 250 µs

Brake Characteristics

figure 5. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



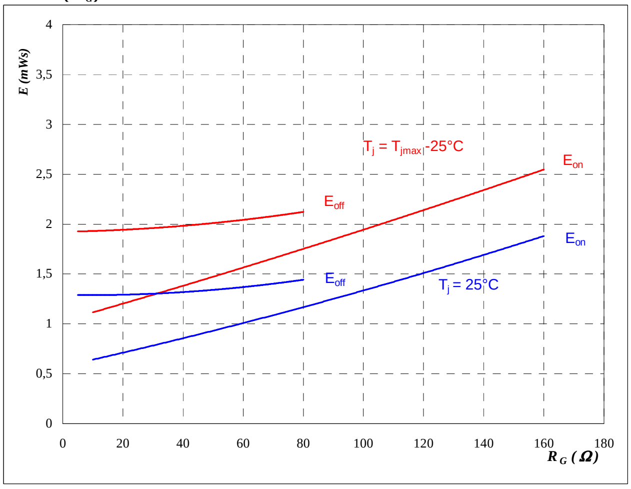
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	15	V
R_{gon} =	40	Ω
R_{goff} =	20	Ω

figure 6. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



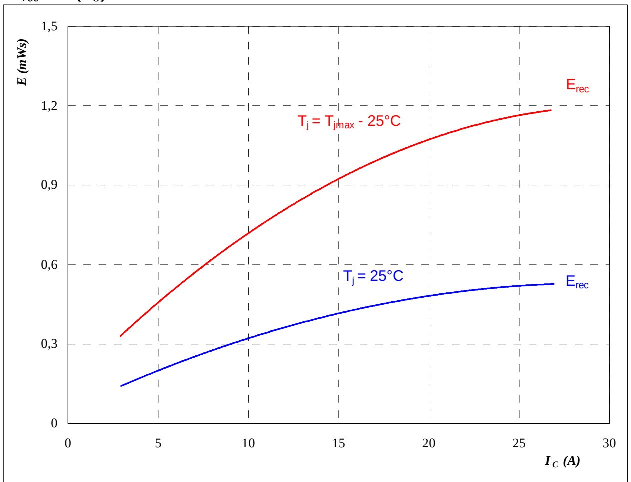
With an inductive load at

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

figure 7. **FWD**

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



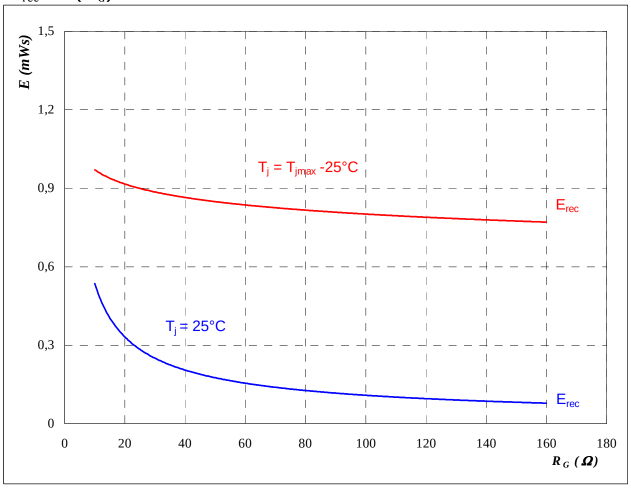
With an inductive load at

T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	15	V
R_{gon} =	40	Ω

figure 8. **FWD**

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

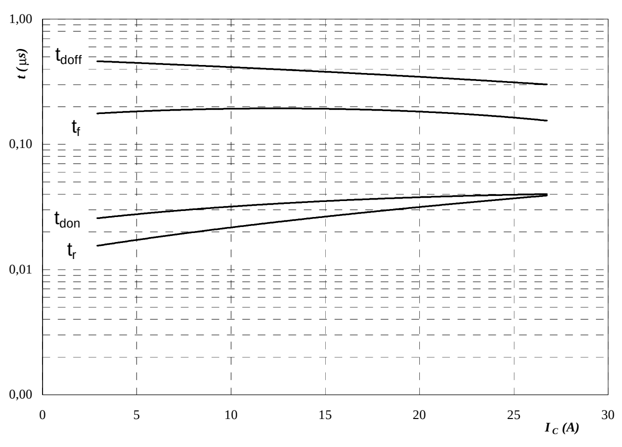
T_j =	25/125	°C
V_{CE} =	600	V
V_{GE} =	15	V
I_C =	15	A

Brake Characteristics

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



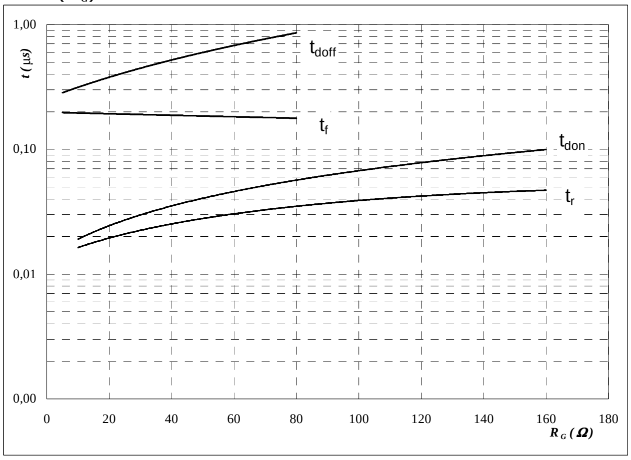
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	15	V
R_{gon} =	40	Ω
R_{goff} =	20	Ω

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



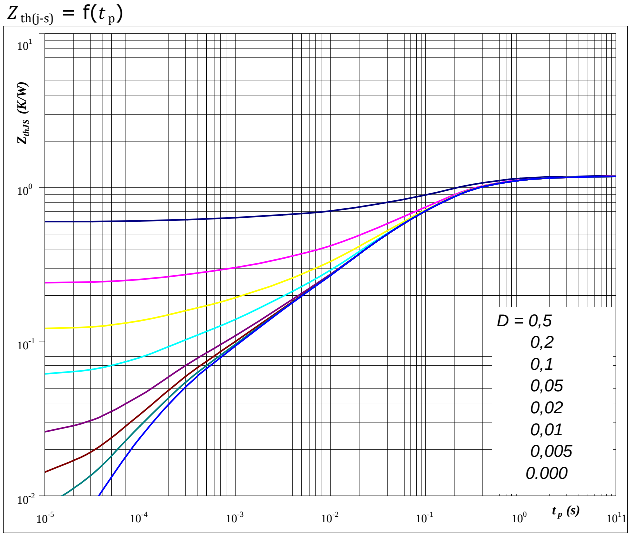
With an inductive load at

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

figure 11. **IGBT**

IGBT transient thermal impedance as a function of pulse width

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



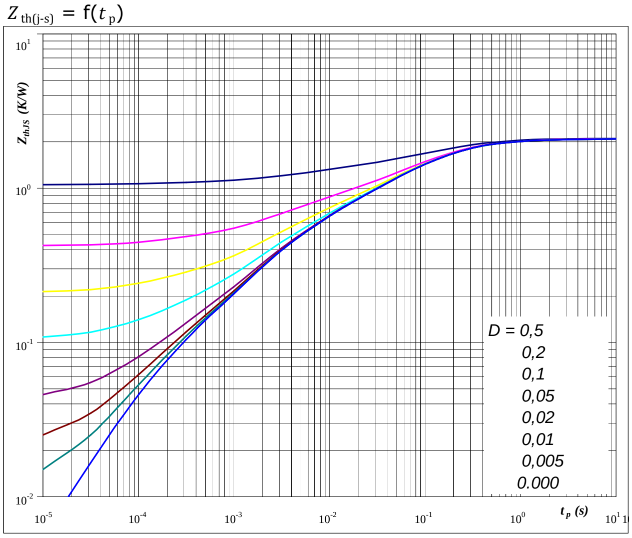
At $D = t_p / T$

$R_{th(j-s)}$ = 1,19 K/W

figure 12. **FWD**

FWD transient thermal impedance as a function of pulse width

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



At $D = t_p / T$

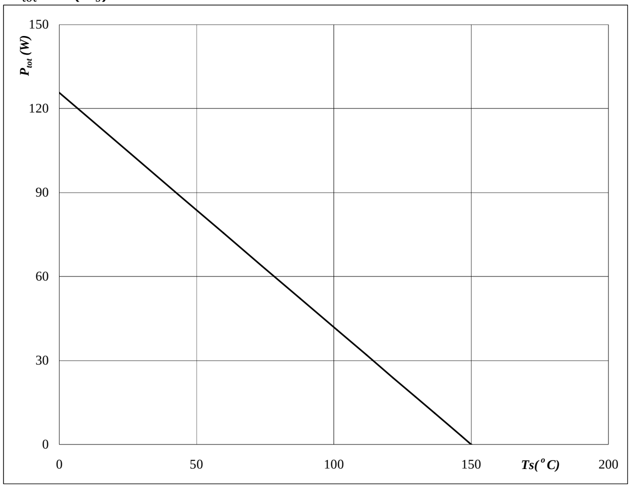
$R_{th(j-s)}$ = 2,10 K/W

Brake Characteristics

figure 13. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



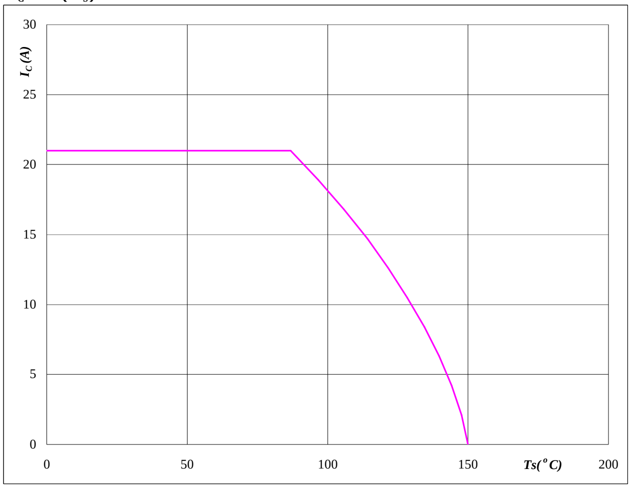
At

T_j = 150 ºC

figure 14. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

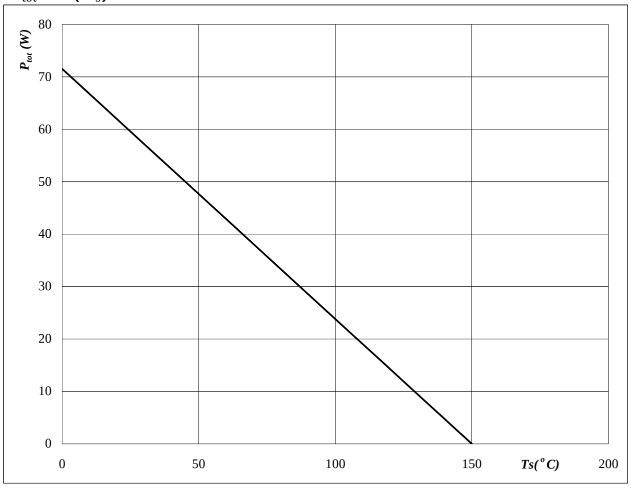
T_j = 150 ºC

V_{GE} = 15 V

figure 15. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



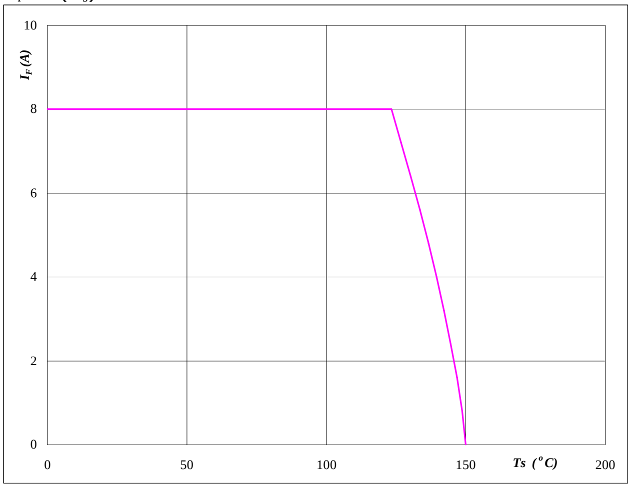
At

T_j = 150 ºC

figure 16. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

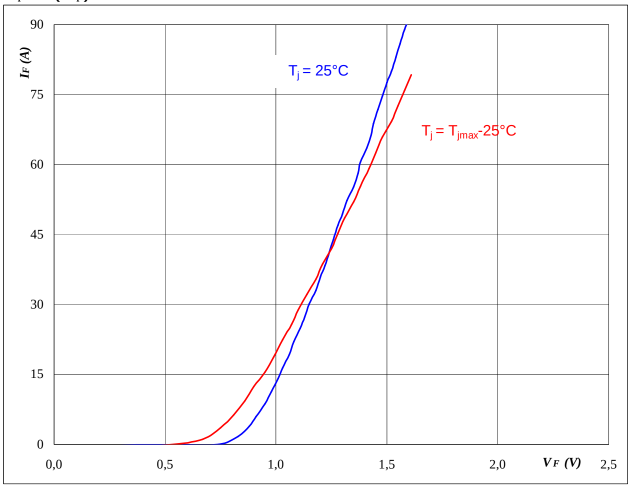
T_j = 150 ºC

Rectifier Characteristics

figure 1. **Rectifier Diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



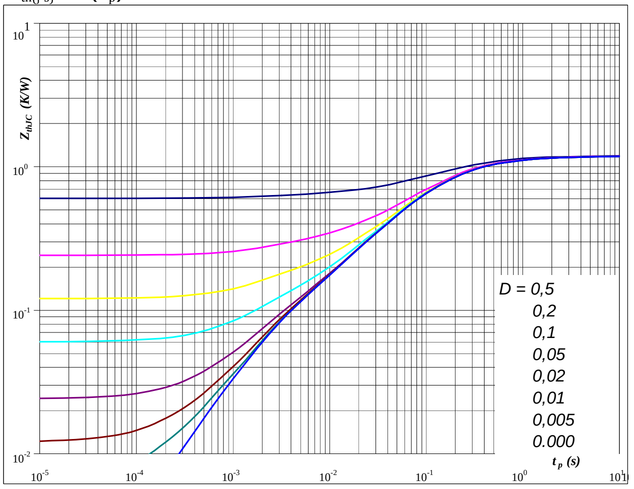
At

t_p = 250 µs

figure 2. **Rectifier Diode**

Diode transient thermal impedance as a function of pulse width

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



At

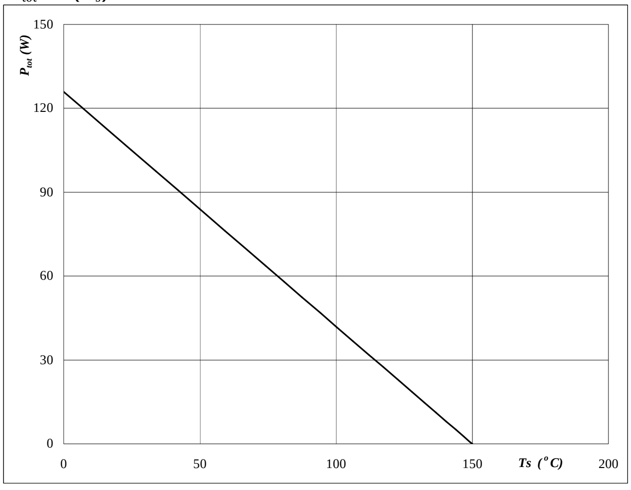
$D = t_p / T$

$R_{th(j-s)}$ = 1,19 K/W

figure 3. **Rectifier Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



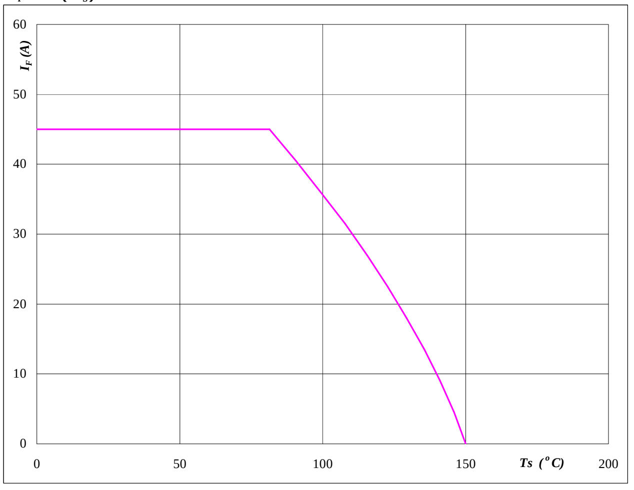
At

T_j = 150 ºC

figure 4. **Rectifier Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



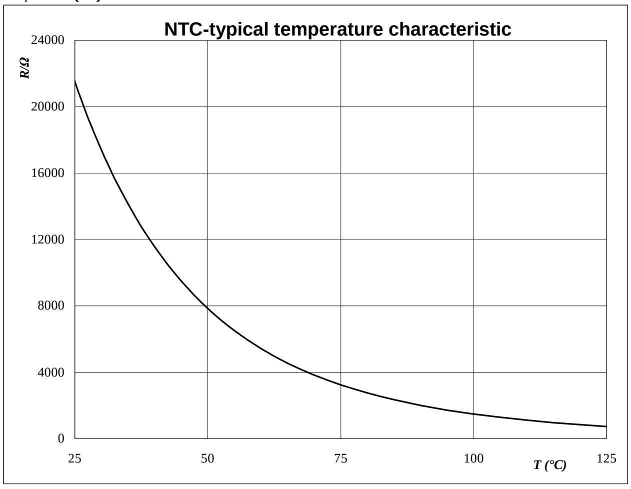
At

T_j = 150 ºC

Thermistor

figure 1.	Thermistor

Typical NTC characteristic
as a function of temperature
$R_T = f(T)$



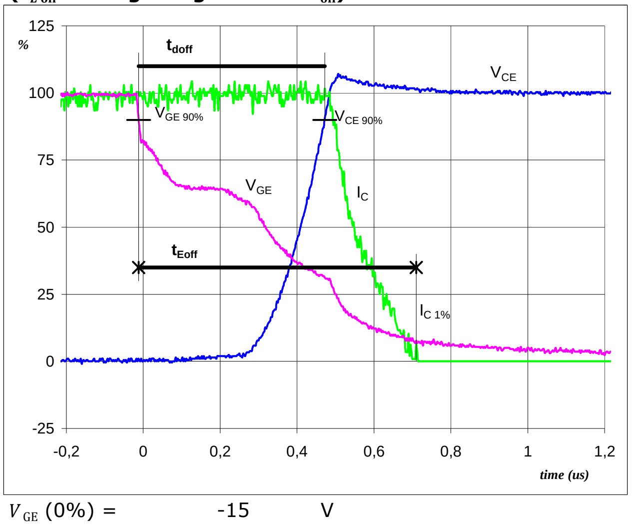
Switching Definitions Output Inverter

General conditions

T_j	=	124 °C
R_{gon}	=	36 Ω
R_{goff}	=	36 Ω

figure 1. **IGBT**

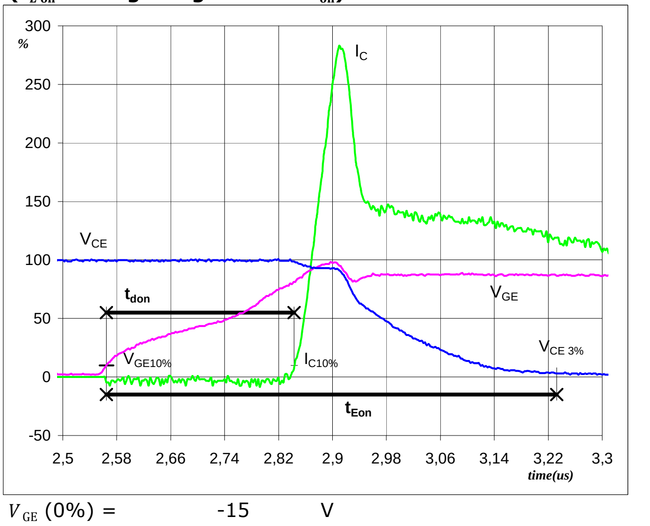
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	25	A
t_{doff} =	0,49	µs
$t_{E\,off}$ =	0,72	µs

figure 2. **IGBT**

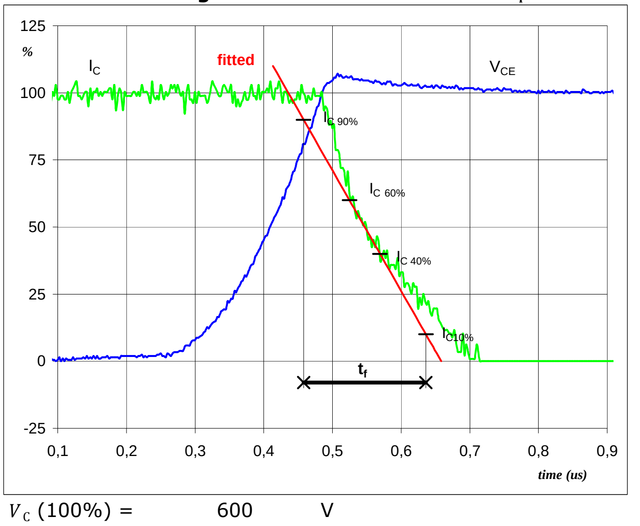
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	25	A
t_{don} =	0,27	µs
$t_{E\,on}$ =	0,67	µs

figure 3. **IGBT**

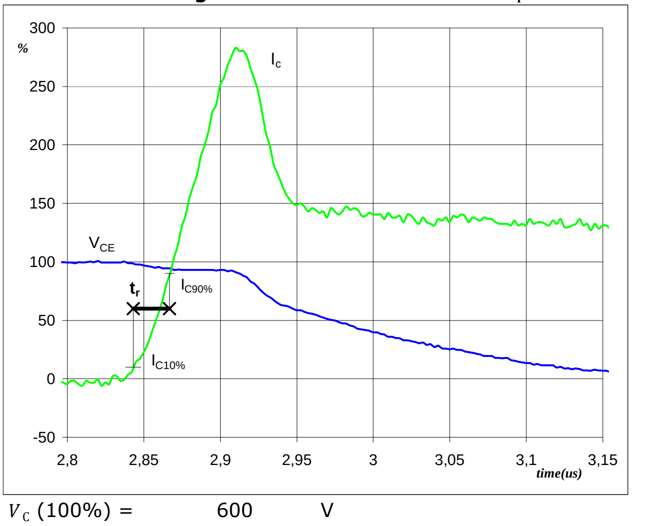
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	25	A
t_f =	0,18	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

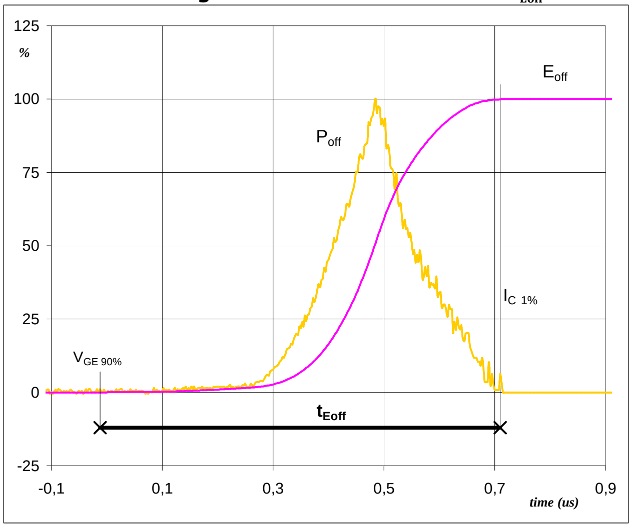


V_C (100%) =	600	V
I_C (100%) =	25	A
t_r =	0,03	µs

Switching Definitions Output Inverter

figure 5. **IGBT**

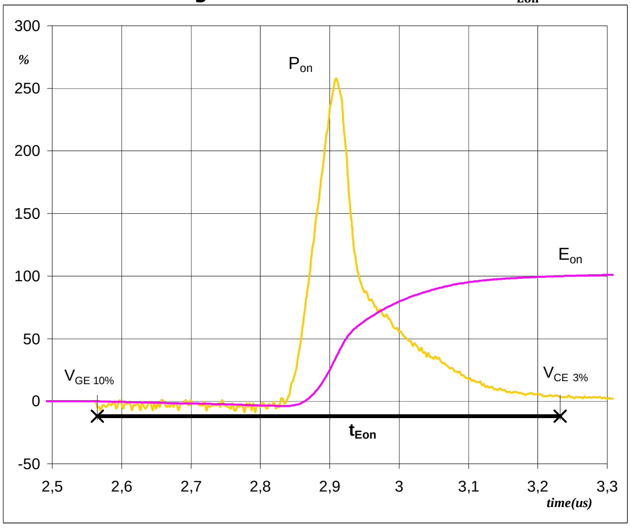
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	14,79	kW
E_{off} (100%) =	2,57	mJ
$t_{E\,off}$ =	0,72	µs

figure 6. **IGBT**

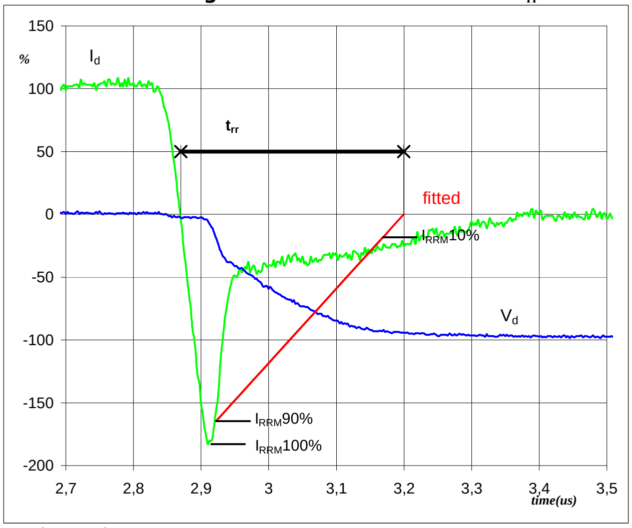
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	14,79	kW
E_{on} (100%) =	3,45	mJ
$t_{E\,on}$ =	0,67	µs

figure 7. **FWD**

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

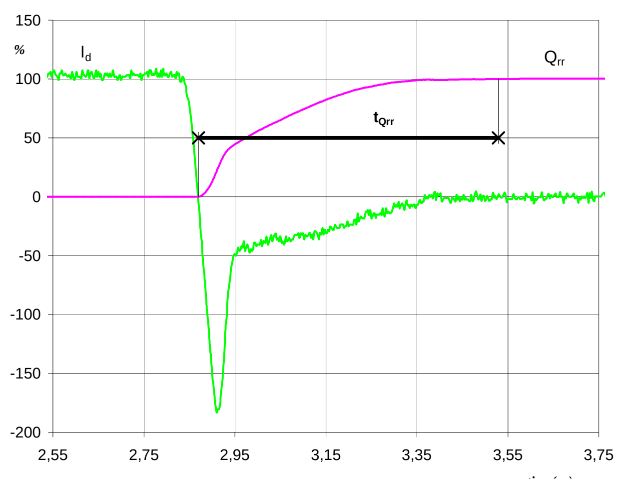


V_d (100%) =	600	V
I_d (100%) =	25	A
I_{RRM} (100%) =	46	A
t_{rr} =	0,33	µs

Switching Definitions Output Inverter

figure 8.	FWD

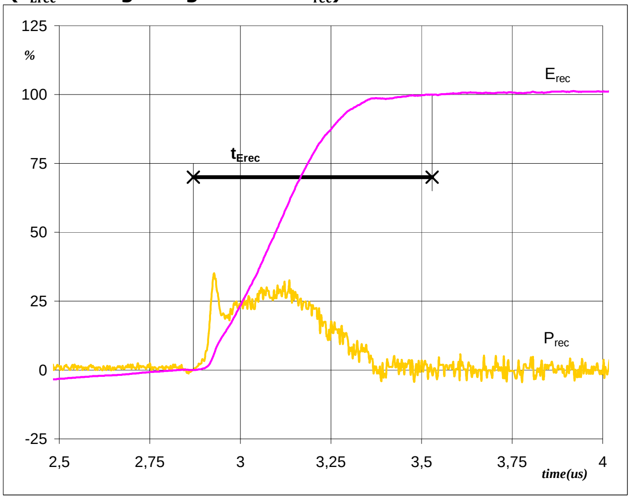
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	25	A
Q_{rr} (100%) =	4,82	µC
$t_{Q\,rr}$ =	0,66	µs

figure 9.	FWD

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



P_{rec} (100%) =	14,79	kW
E_{rec} (100%) =	1,42	mJ
$t_{E\,rec}$ =	0,66	µs

Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

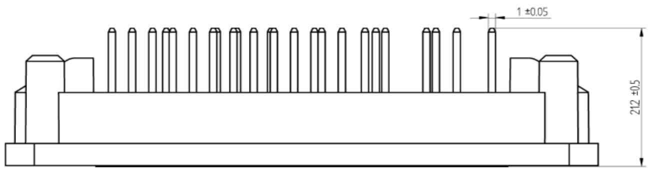
Version	Ordering Code
without thermal paste 17mm housing with solder pins	V23990-P589-A-PM
with thermal paste 17mm housing with solder pins	V23990-P589-A-/3/-PM
without thermal paste 17mm housing with solder pins w/o BRC	V23990-P589-C-PM

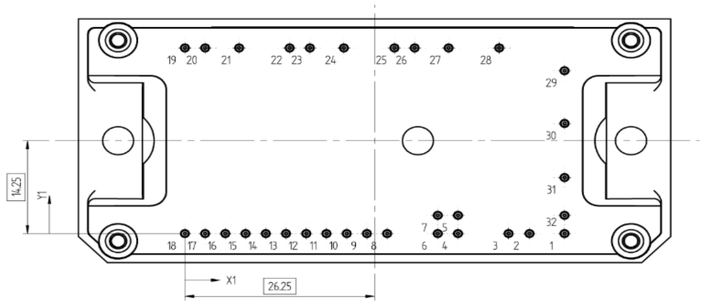
	VIN	Date code	Name&Ver	UL	Lot	Serial
Text	VIN	WWYY	NNNNNNVV	UL	LLLLL	SSSS
	Name&Ver	Lot number	Serial	Date code		
Datamatrix	NNNNNNVV	LLLLL	SSSS	WWYY		

Outline

Pinout table

Pin	X	Y	Function
1	52,55	0	BrG
2	47,7	0	DC-
3	44,8	0	DC-
4	37,8	0	DC+
5	37,8	2,8	DC+
6	35	0	Inv+
7	35	2,8	Inv+
8	28	0	R1
9	25,2	0	R2
10	22,4	0	N6
11	19,6	0	G6
12	16,8	0	S6
13	14	0	N4
14	11,2	0	G4
15	8,4	0	S4
16	5,6	0	N2
17	2,8	0	G2
18	0	0	S2
19	0	28,5	U
20	2,8	28,5	G1
21	7,5	28,5	S1
22	14,5	28,5	V
23	17,3	28,5	G3
24	22	28,5	S3
25	29	28,5	W
26	31,8	28,5	G5
27	36,5	28,5	S5
28	43,5	28,5	L1
29	52,55	25	L2
30	52,55	16,9	L3
31	52,55	8,6	BrC
32	52,55	2,8	BrE



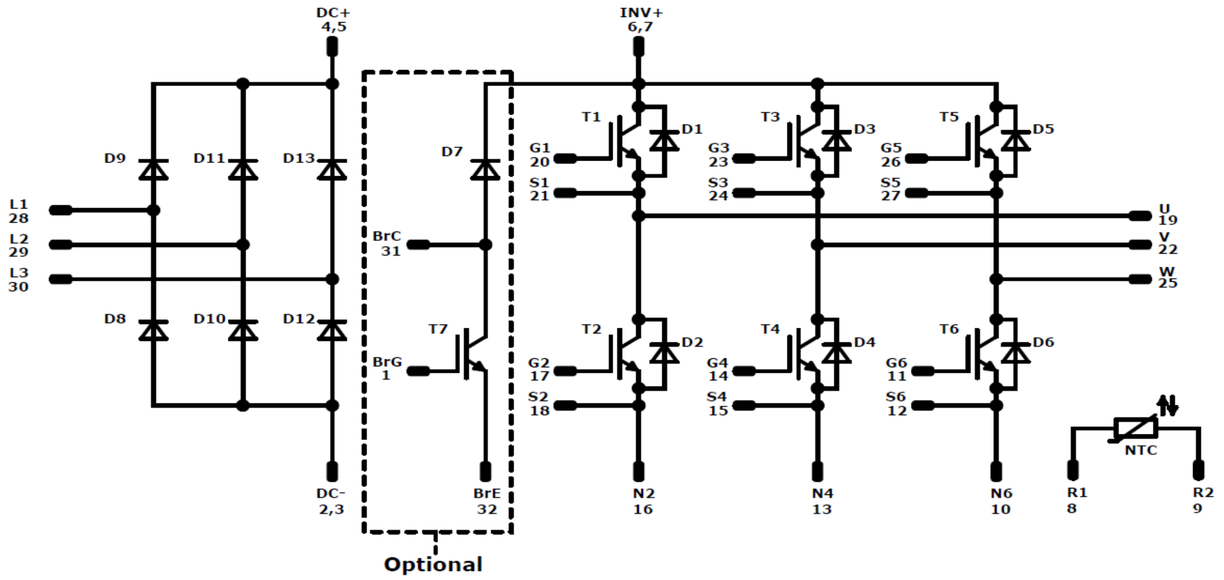


Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout variation	
Module subtype	Not assembled pins
V23990-P589-A-PM	-
V23990-P589-C-PM	1, 31, 32

Ordering Code and Marking - Outline - Pinout

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	1200 V	25 A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	1200 V	30 A	Inverter Diode	
T7	IGBT	1200 V	15 A	Brake Switch	
D7	FWD	1200 V	6 A	Brake Diode	
D8,D9,D10,D11,D12	Rectifier	1200 V	30 A	Rectifier Diode	
NTC	NTC			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	**100**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 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-P589-A-C-D2-14	18 Jul. 2016	New brand, PCM Rth values	all