flow PIM 1 | **1200 V / 35 A**

Features

- Three-phase rectifier, optional BRC, Inverter, NTC
- Very compact housing, easy to route
- IGBT4 / EmCon4 technology for low saturation losses and improved EMC behaviour

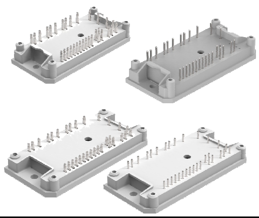
Target Applications

- Industrial drives
- Embedded drives

Types

- V23990-P580-A41-PM
- V23990-P580-A41Y-PM
- V23990-P580-A418-PM
- V23990-P580-A418Y-PM
- V23990-P580-C41-PM
- V23990-P580-C41Y-PM
- V23990-P580-C418-PM

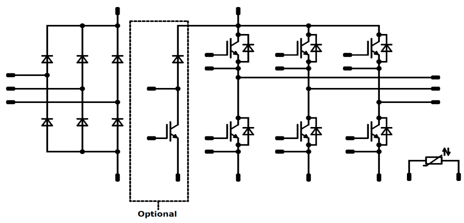
flow 1 housing



17 mm housing
Press-fit pin
/ Solder pin

12 mm housing
Press-fit pin
/ Solder pin

Schematic



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}			35	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms 50Hz half sine wave		280	A
I^2t-value	I^2t			390	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	56	W
Maximum Junction Temperature	T_{jmax}			150	°C
Inverter Switch					
Collector-emitter breakdown voltage	V_{CE}			1200	V
DC collector current	I_C			35	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		105	A
Turn off safe operating area		V_{CE} ≤ 1200 V, $T_j \leq T_{op}$ max		105	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	114	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 Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
DC forward current	I_F		35	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	70	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	80	W
Maximum Junction Temperature	T_{jmax}		175	°C
Brake Switch				
Collector-emitter breakdown voltage	V_{CE}		1200	V
DC collector current	I_C		25	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	75	A
Turn off safe operating area		V_{CE} ≤ 1200V, $T_j \le T_{op}$ max	50	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	94	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 Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
DC forward current	I_F		10	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	20	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	46	W
Maximum Junction Temperature	T_{jmax}		175	°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 Voltage*	6000	V
		t = 1 min AC Voltage	2500	V
Creepage distance			min 12,7	mm
Clearance		12 mm housing solder pin / press-fit pin	7,91 / 7,96	mm
		17 mm housing	min 12,7	mm
Comparative tracking index	CTI		>200	

* 100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			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	
Rectifier Diode										
Forward voltage	V_F				30	25 125	0,8	1,16 1,13	1,6	V
Threshold voltage (for power loss calc. only)	V_{to}					25 125		0,90 0,78		V
Slope resistance (for power loss calc. only)	r_t					25 125		8 11		mΩ
Reverse current	I_r			1600		25 150			0,02 2	mA
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,25		K/W
Inverter Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0012	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		35	25 125	1,6	1,95 2,39	2,3	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	1200		25			0,5	mA
Gate-emitter leakage current	I_{GES}		20	0		25			300	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	35	25 125		92 92		ns
Rise time	t_r					25 125		18 23		
Turn-off delay time	$t_{d(off)}$					25 125		213 274		
Fall time	t_f					25 125		75 105		
Turn-on energy loss	E_{on}					25 125		1,62 2,49		mWs
Turn-off energy loss	E_{off}					25 125		1,81 2,82		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		1950		pF
Output capacitance	C_{oss}							155		
Reverse transfer capacitance	C_{rss}							115		
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,83		K/W
Inverter Diode										
Diode forward voltage	V_F				35	25 125	1	1,83 1,80	2,2	V
Peak reverse recovery current	I_{RRM}	R_{gon} = 16 Ω	±15	600	35	25 125		69 79		A
Reverse recovery time	t_{rr}					25 125		150 277		ns
Reverse recovered charge	Q_{rr}					25 125		3,93 7,47		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		4100 2080		A/μs
Reverse recovered energy	E_{rec}					25 125		1,69 3,31		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,19		K/W

Characteristic Values

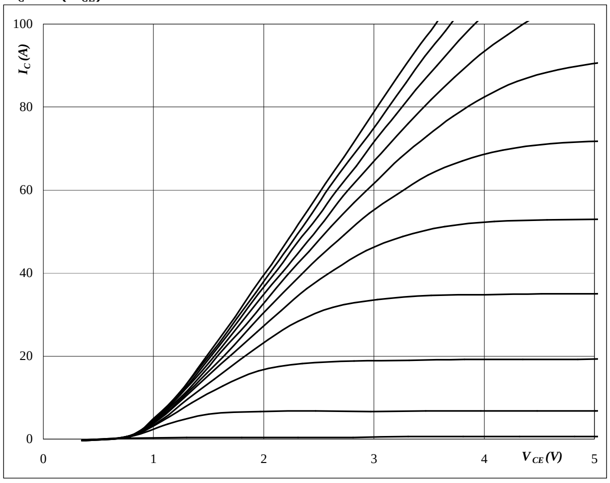
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Brake Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}$			0,00085	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125	1,6	1,86 2,31	2,2	V
Collector-emitter cut-off incl diode	I_{CES}		0	1200		25			0,005	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		127 129		
Rise time	t_r					25 125		36 42		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 32 Ω R_{gon} = 32 Ω	15	600	25	25 125		232 276		
Fall time	t_f					25 125		74 112		
Turn-on energy loss	E_{on}					25 125		1,81 2,42		mWs
Turn-off energy loss	E_{off}					25 125		1,37 2,19		
Input capacitance	C_{ies}							1430		
Output capacitance	C_{oss}	f = 1 MHz	0	25		25		115		pF
Reverse transfer capacitance	C_{rss}							85		
Gate charge	Q_G		15	960	25	25		120		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,01		K/W
Brake Diode										
Diode forward voltage	V_F				10	25 125	1,35	1,85 1,76	2,05	V
Reverse leakage current	I_r			1200		25			2,7	μA
Peak reverse recovery current	I_{RRM}					25 125		10 12		A
Reverse recovery time	t_{rr}					25 125		396 624		ns
Reverse recovered charge	Q_{rr}	R_{gon} = 32 Ω	15	600	25	25 125		1,55 3,03		μC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		36 32		A/μs
Reverse recovery energy	E_{rec}					25 125		0,63 1,30		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,07		K/W
Thermistor										
Rated resistance	R					25		22000		Ω
Deviation of R_{100}	$\Delta_{R/R}$					25	-5		5	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$					25		3996		K
Vincotech NTC Reference									B	

Inverter Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



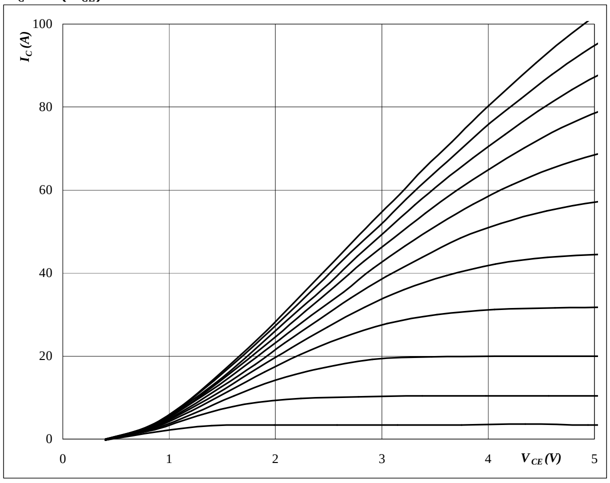
At

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

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



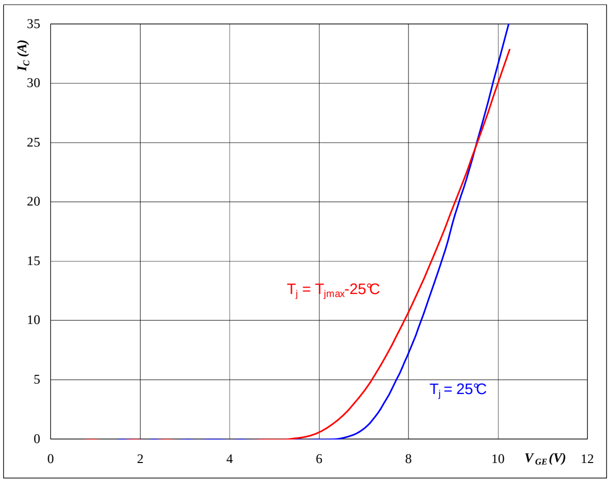
At

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



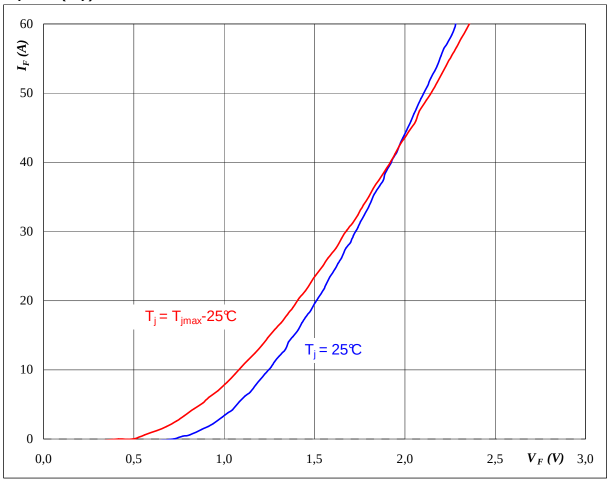
At

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

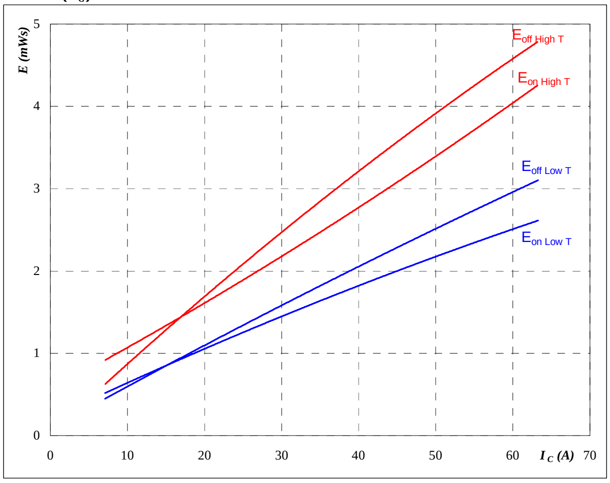
t_p = 250 µs

Inverter Characteristics

figure 5. **IGBT**

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



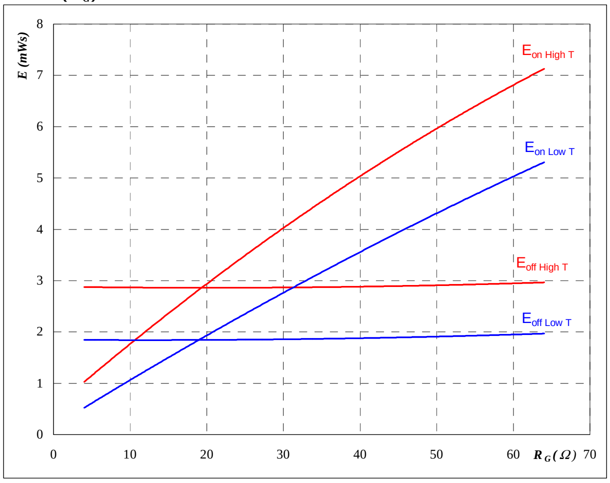
With an inductive load at

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

figure 6. **IGBT**

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



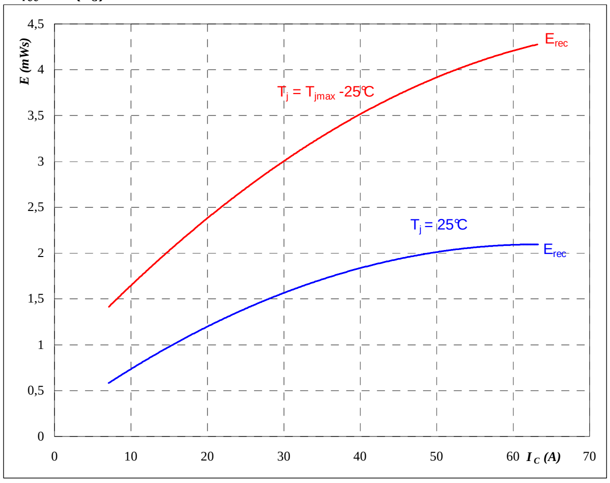
With an inductive load at

T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	35	A

figure 7. **FWD**

Typical reverse recovery energy loss
as a function of collector current

$E_{rec} = f(I_C)$



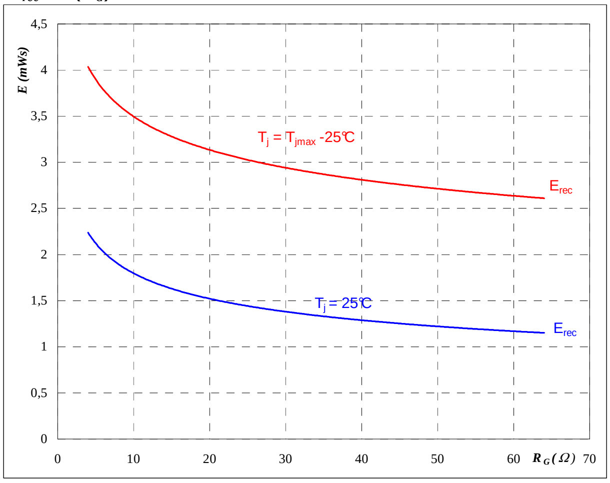
With an inductive load at

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

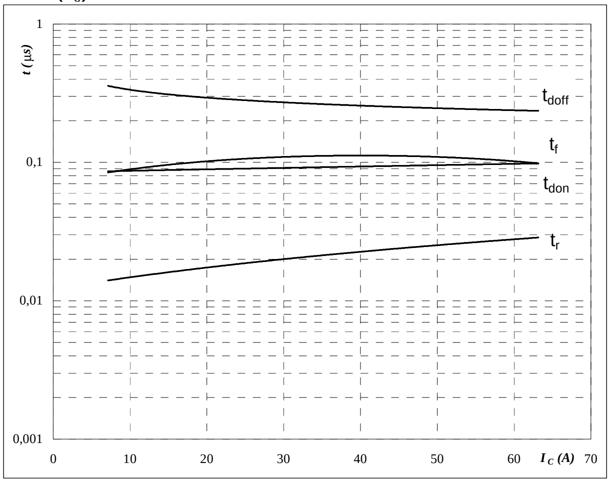
T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	35	A

Inverter Characteristics

figure 9. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



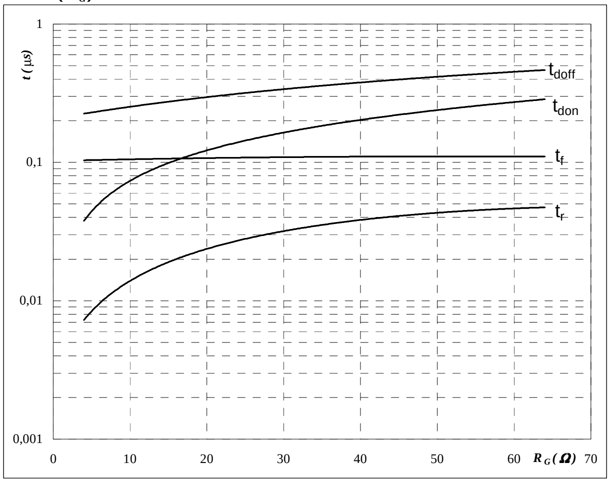
With an inductive load at

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

figure 10. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_G)$



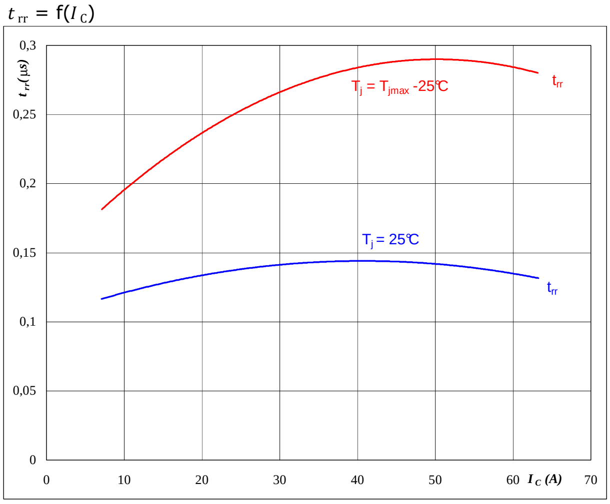
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	35	A

figure 11. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



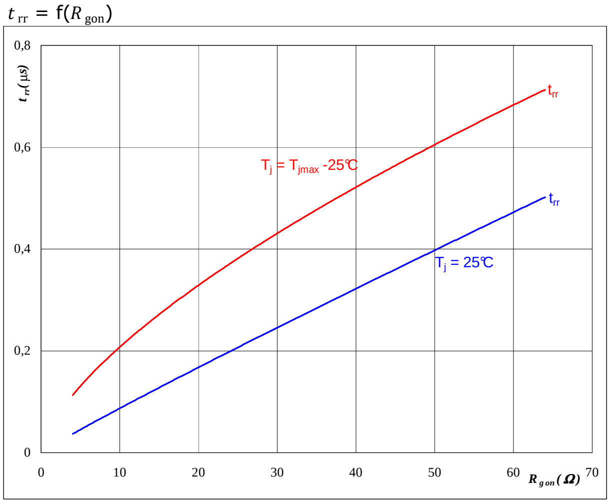
At

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

figure 12. **FWD**

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

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



At

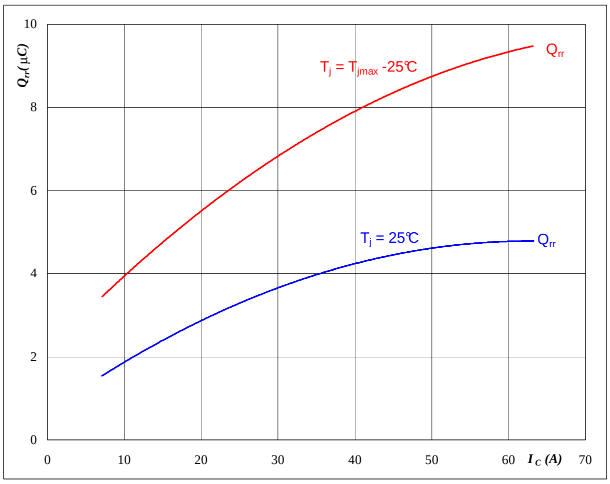
T_j =	25/150	°C
V_R =	600	V
I_F =	35	A
V_{GE} =	±15	V

Inverter Characteristics

figure 13. **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



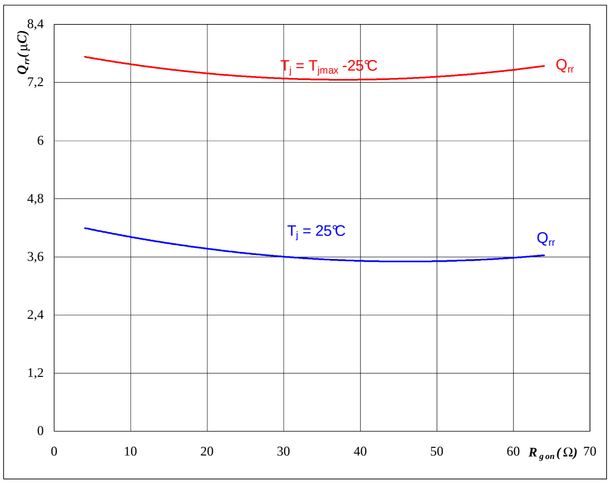
At

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

figure 14. **FWD**

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

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



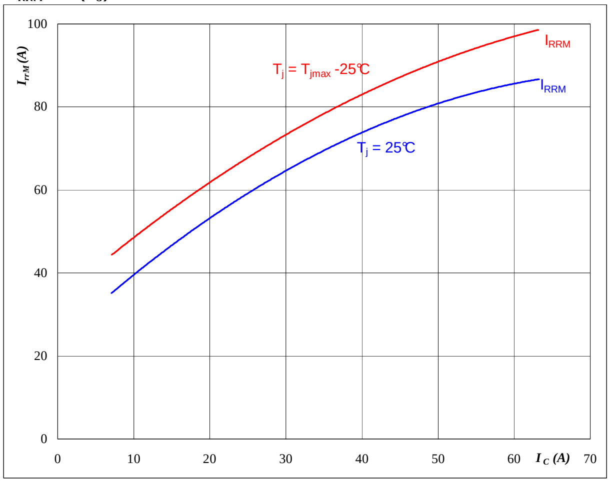
At

T_j =	25/150	°C
V_R =	600	V
I_F =	35	A
V_{GE} =	±15	V

figure 15. **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



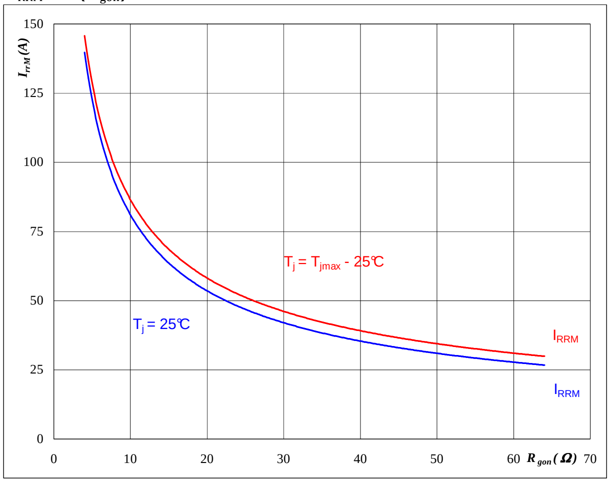
At

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

figure 16. **FWD**

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

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



At

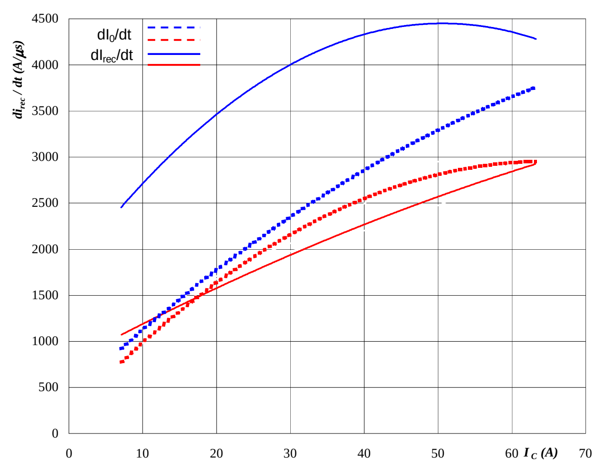
T_j =	25/150	°C
V_R =	600	V
I_F =	35	A
V_{GE} =	±15	V

Inverter Characteristics

figure 17. FWD

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

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



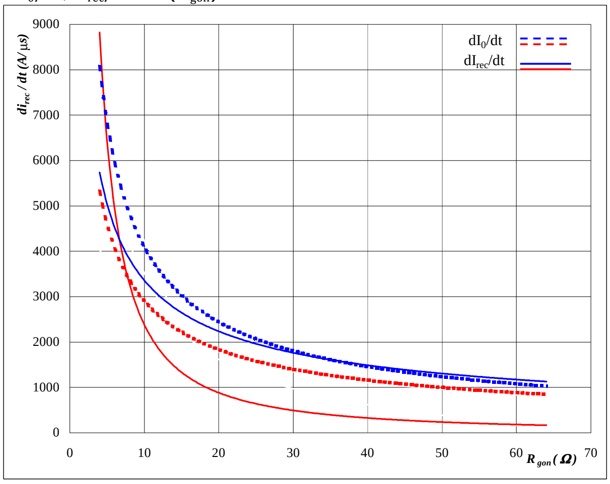
At

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

figure 18. FWD

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

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



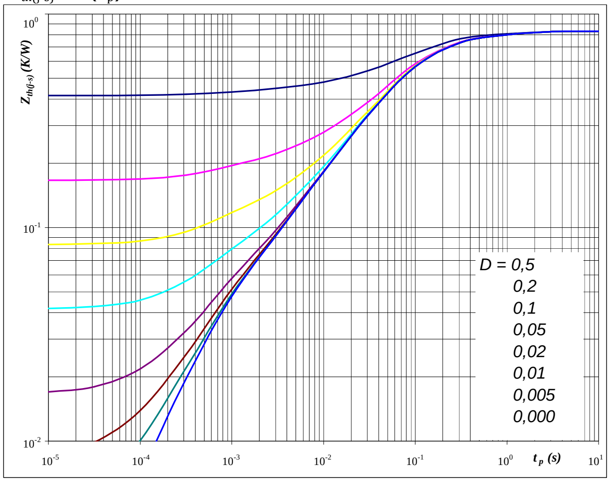
At

T_j =	25/150	°C
V_R =	600	V
I_F =	35	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	
$R_{th(j-s)}$ =	0,83	K/W

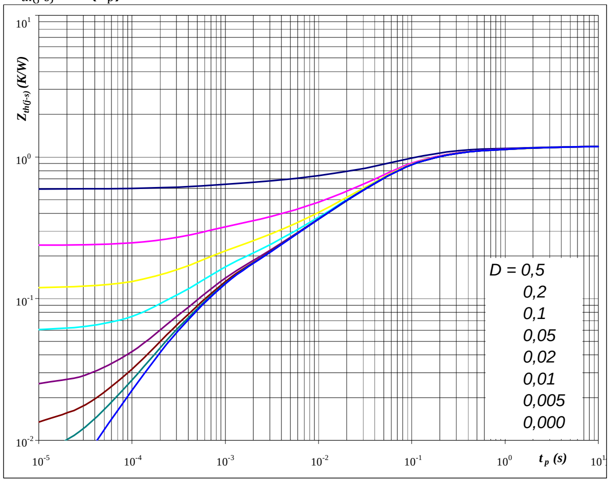
IGBT thermal model values

R (K/W)	Tau (s)
1,05E-01	8,25E-01
3,41E-01	1,19E-01
2,63E-01	4,37E-02
8,23E-02	7,94E-03
3,86E-02	7,50E-04

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

FWD thermal model values

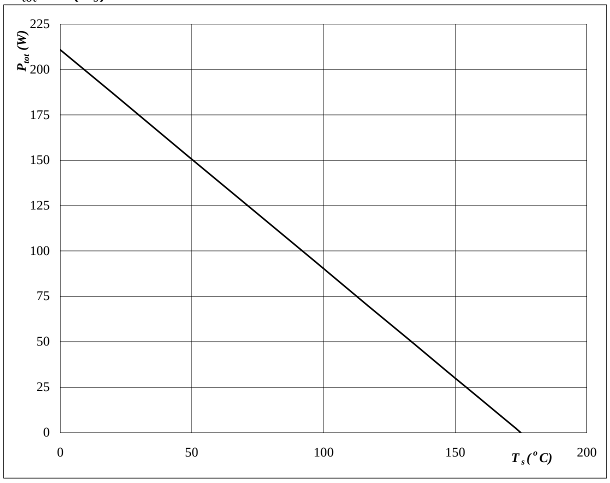
R (K/W)	Tau (s)
6,30E-02	2,93E+00
1,30E-01	4,06E-01
5,50E-01	7,36E-02
2,26E-01	2,16E-02
1,15E-01	4,46E-03
9,49E-02	5,82E-04
8,50E-03	2,11E-04

Inverter Characteristics

figure 21. **IGBT**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



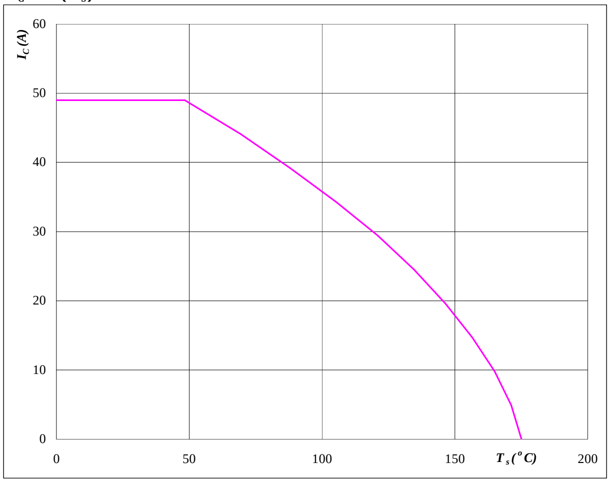
At

T_j = 175 °C

figure 22. **IGBT**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

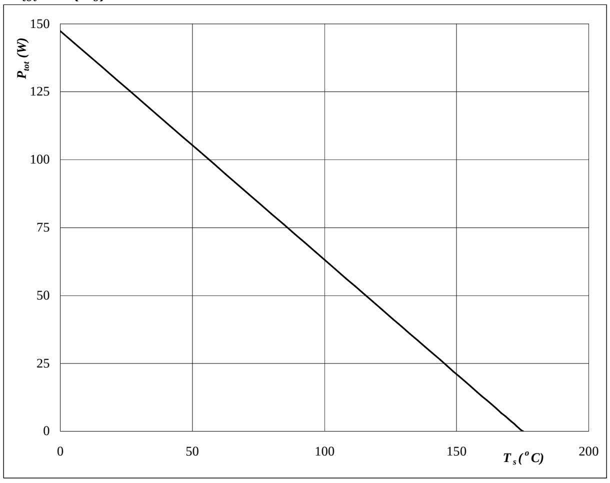
T_j = 175 °C

V_{GE} = 15 V

figure 23. **FWD**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



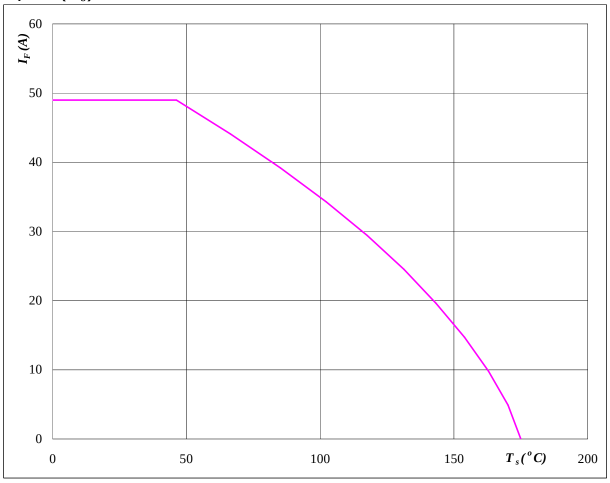
At

T_j = 175 °C

figure 24. **FWD**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

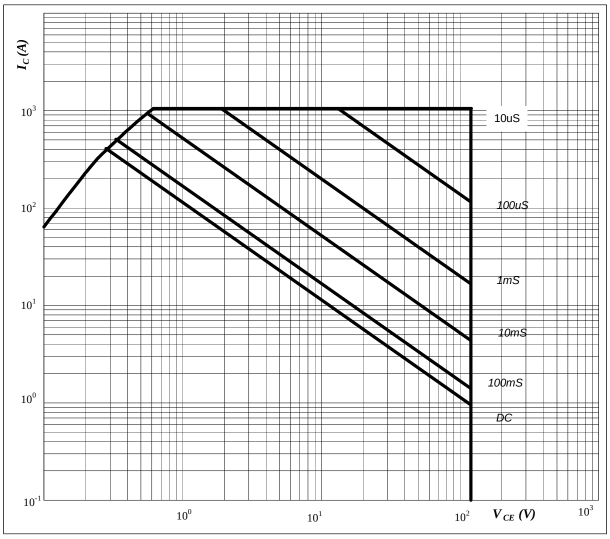
T_j = 175 °C

Inverter Characteristics

figure 25. **IGBT**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



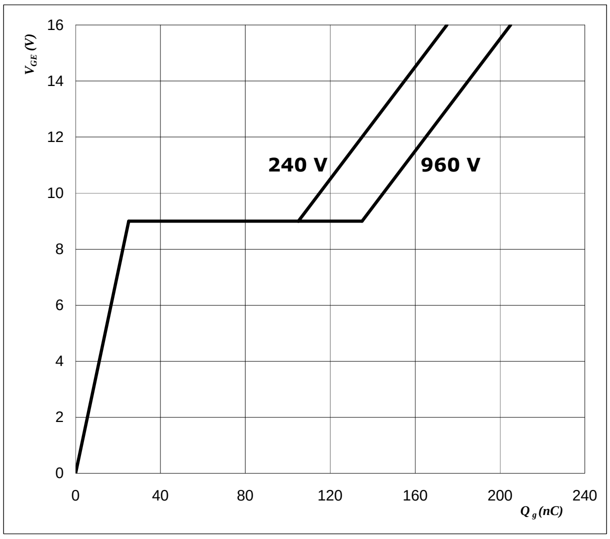
At

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

figure 26. **IGBT**

Gate voltage vs Gate charge

$V_{GE} = f(Q_G)$



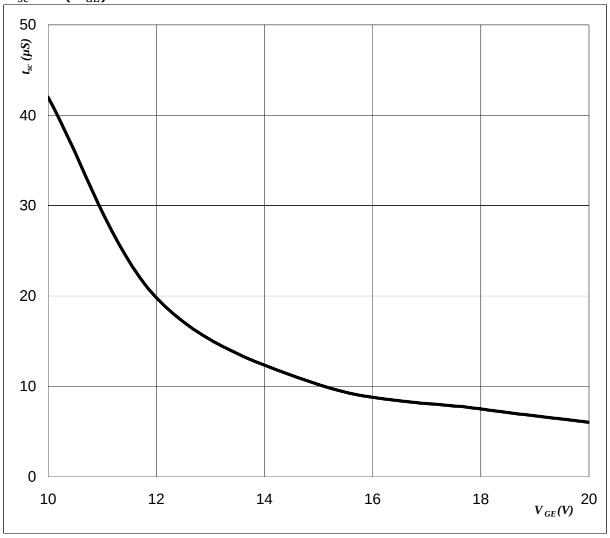
At

I_C =	35	A

figure 27. **IGBT**

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

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



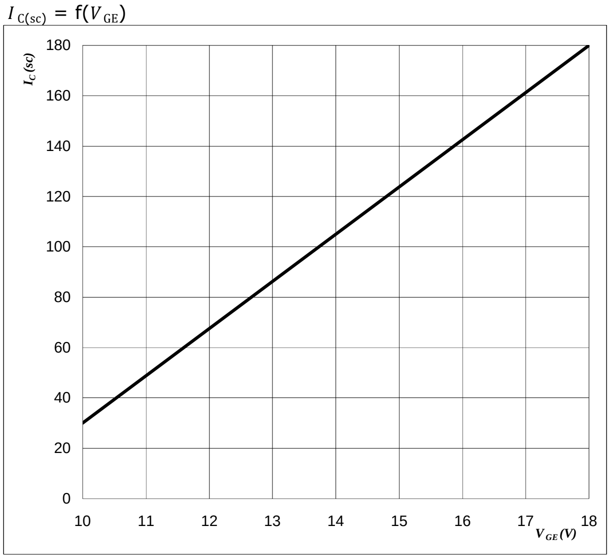
At

V_{CE} =	1200	V
T_j ≤	175	ºC

figure 28. **IGBT**

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

$I_{C(sc)} = f(V_{GE})$



At

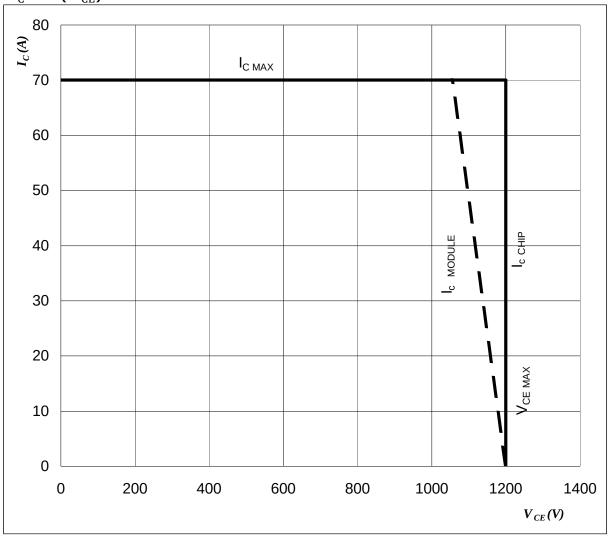
V_{CE} ≤	1200	V
T_j =	175	ºC

Inverter Characteristics

figure 29.	IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

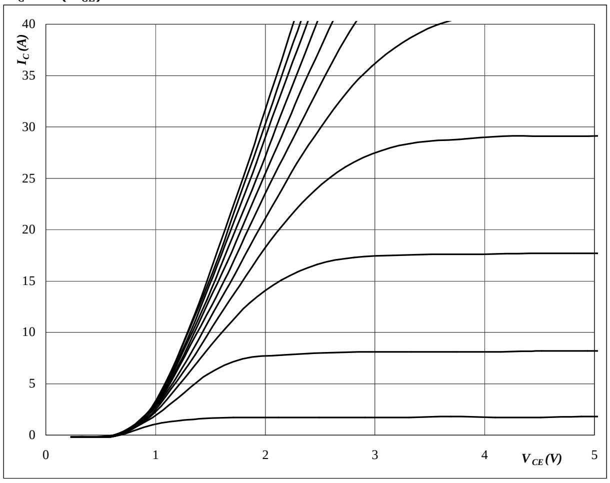
T_j = T_{jmax}-25 ºC

Brake Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

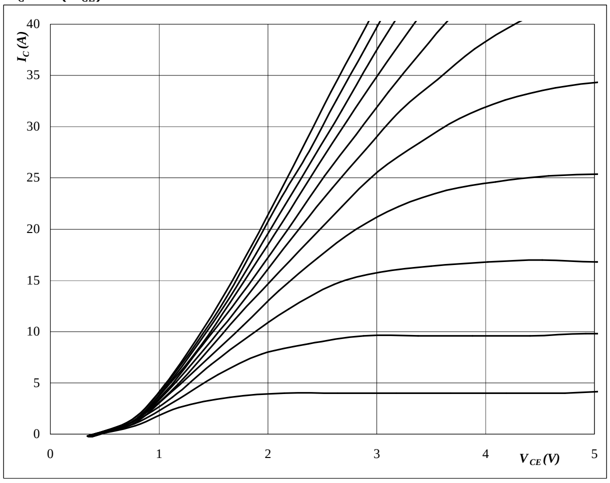
T_j = 25 °C

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

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p = 250 µs

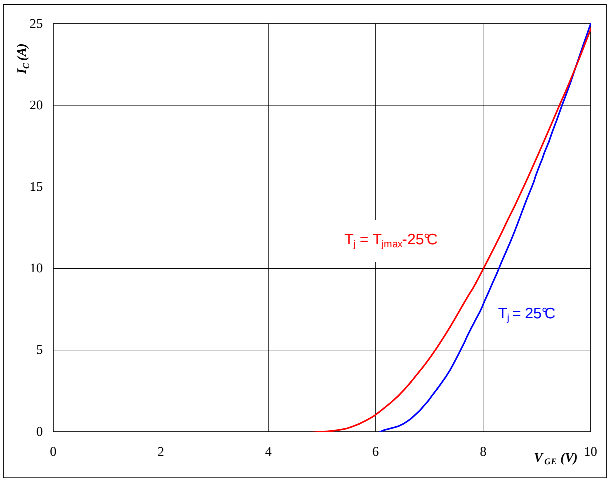
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



At

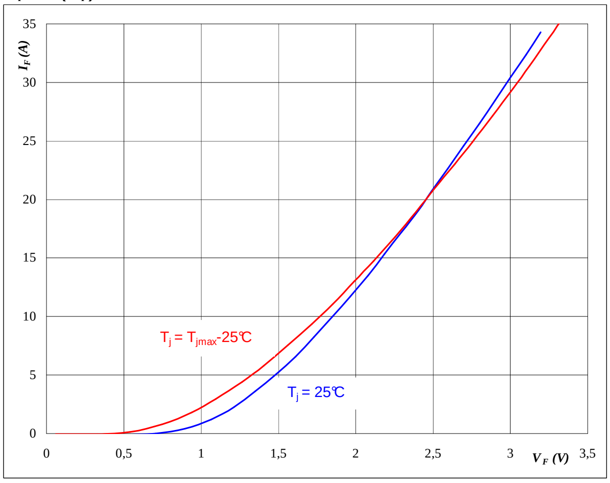
t_p = 250 µs

V_{CE} = 10 V

figure 4. **FWD**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

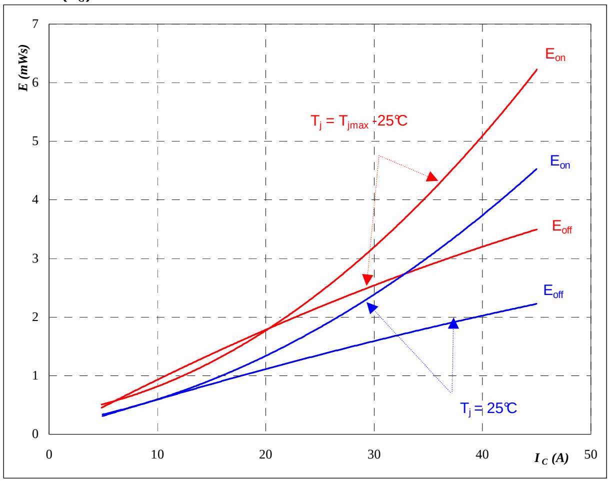
t_p = 250 µs

Brake Characteristics

figure 5. **IGBT**

Typical switching energy losses
as a function of collector current

$E = f(I_C)$



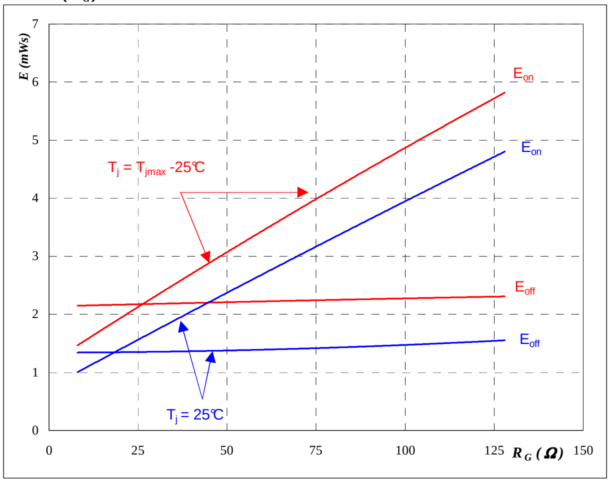
With an inductive load at

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

figure 6. **IGBT**

Typical switching energy losses
as a function of gate resistor

$E = f(R_G)$



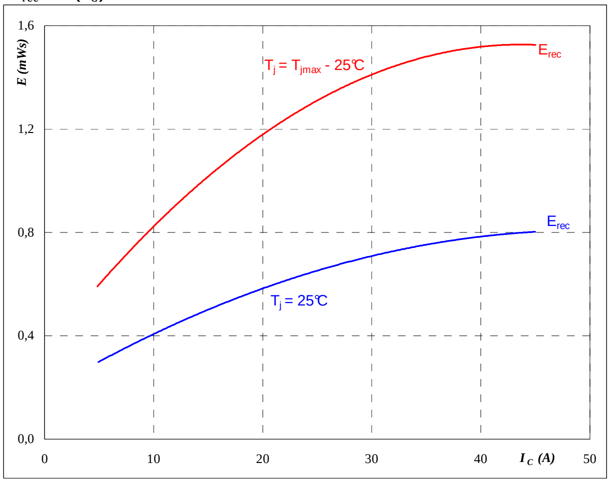
With an inductive load at

T_j =	25/150	°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

$E_{rec} = f(I_C)$



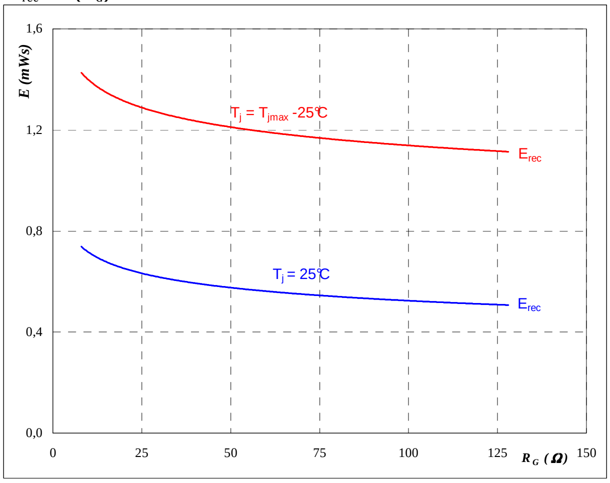
With an inductive load at

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

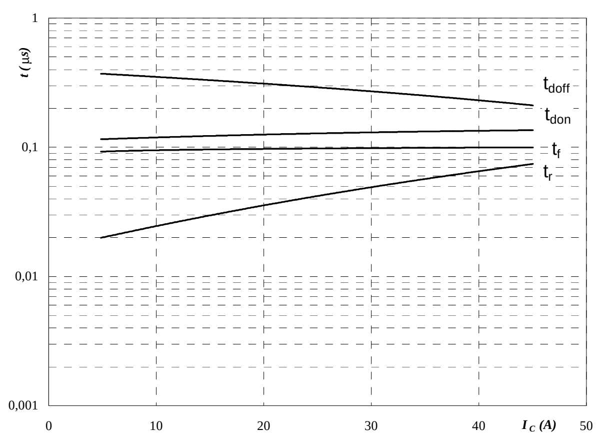
T_j =	25/150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	25	A

Brake Characteristics

figure 9.	IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



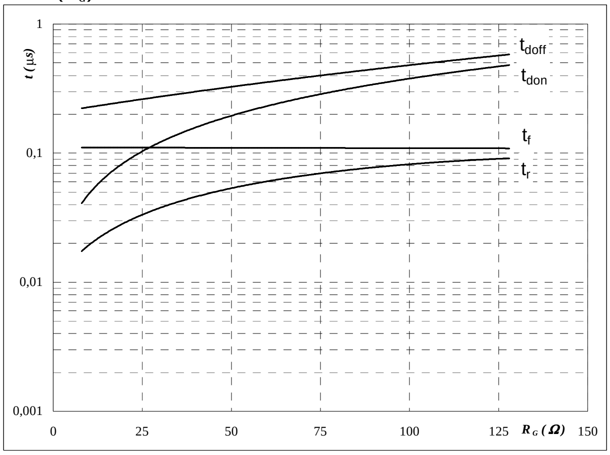
With an inductive load at

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

figure 10.	IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



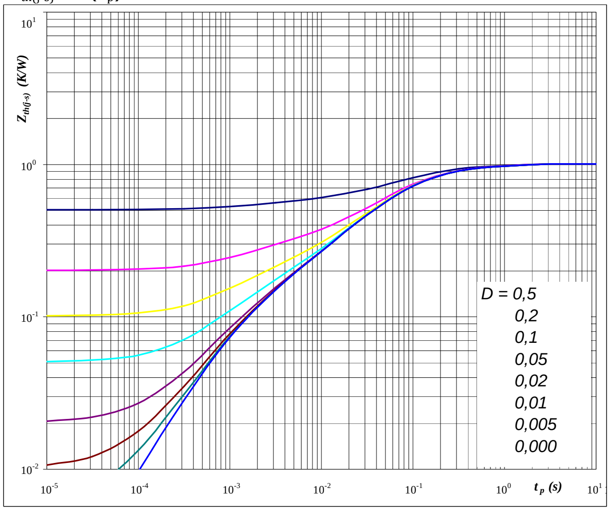
With an inductive load at

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

figure 11.	IGBT

IGBT transient thermal impedance as a function of pulse width

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



At $D = t_p / T$

$R_{th(j-s)}$ = 1,01 K/W

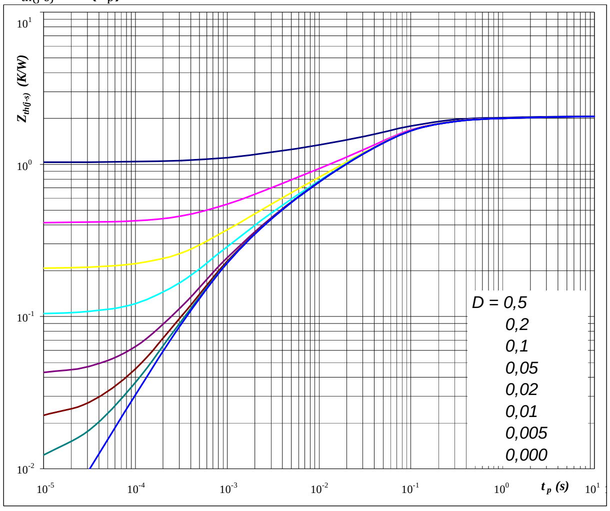
IGBT thermal model values

R (K/W)	Tau (s)
8,44E-02	1,03E+00
2,46E-01	1,79E-01
4,48E-01	5,38E-02
1,38E-01	1,04E-02
5,48E-02	1,66E-03
3,85E-02	8,73E-04

figure 12.	FWD

FWD transient thermal impedance as a function of pulse width

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



At $D = t_p / T$

$R_{th(j-s)}$ = 2,07 K/W

FWD thermal model values

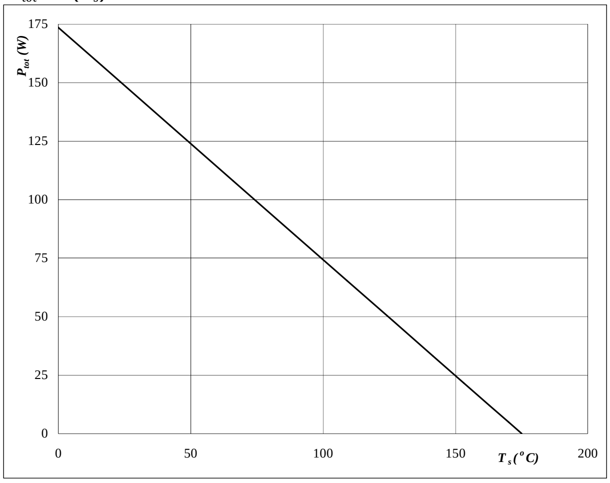
R (K/W)	Tau (s)
5,09E-02	4,26E+00
1,55E-01	5,03E-01
7,75E-01	7,89E-02
5,33E-01	2,68E-02
3,54E-01	5,03E-03
1,97E-01	9,09E-04

Brake Characteristics

figure 13.	IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



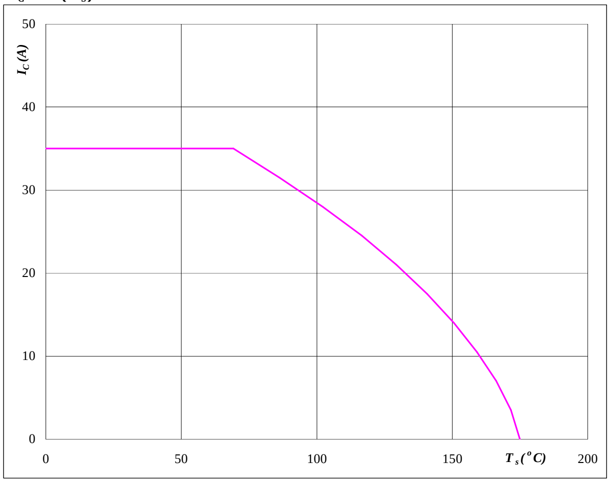
At

T_j = 175 ºC

figure 14.	IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

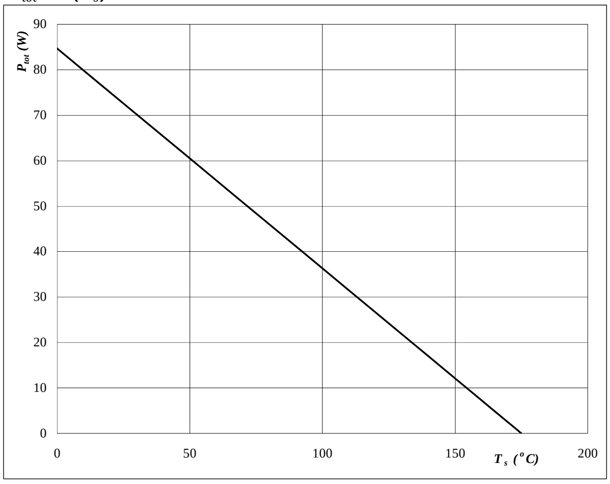
T_j = 175 ºC

V_{GE} = 15 V

figure 15.	FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



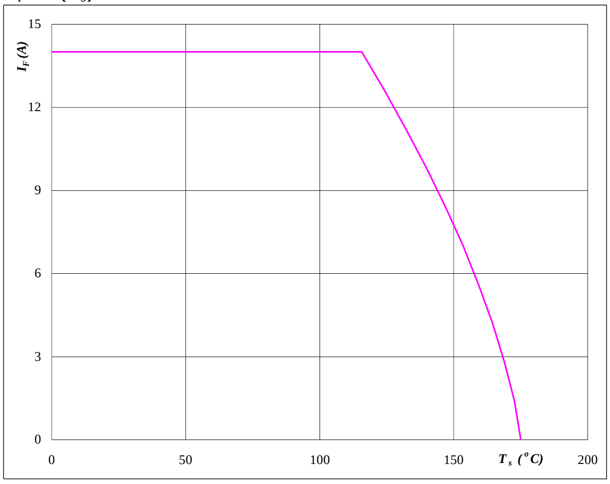
At

T_j = 175 ºC

figure 16.	FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

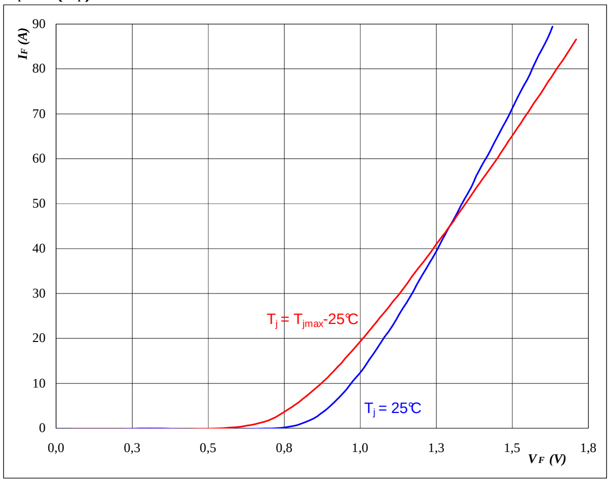
T_j = 175 ºC

Rectifier Diode

figure 1.	**Rectifier Diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



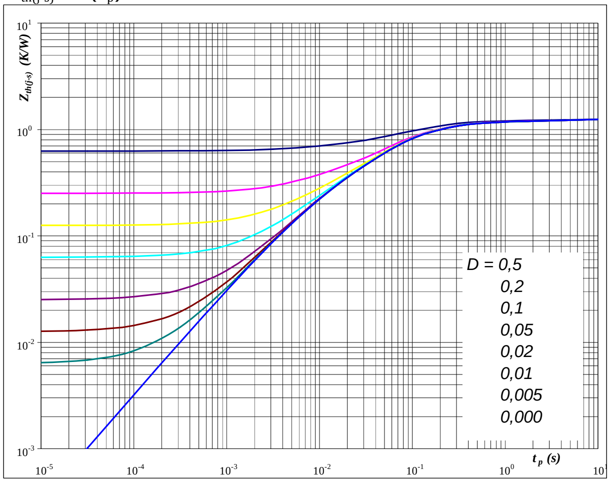
At

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

$D = t_p / T$

$R_{th(j-s)}$ = 1,25 K/W

Diode thermal model values

R (K/W)	Tau (s)
8,00E-02	5,22E+00
1,56E-01	4,18E-01
6,95E-01	8,82E-02
2,23E-01	3,07E-02
9,97E-02	5,99E-03

figure 3.	**Rectifier Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$

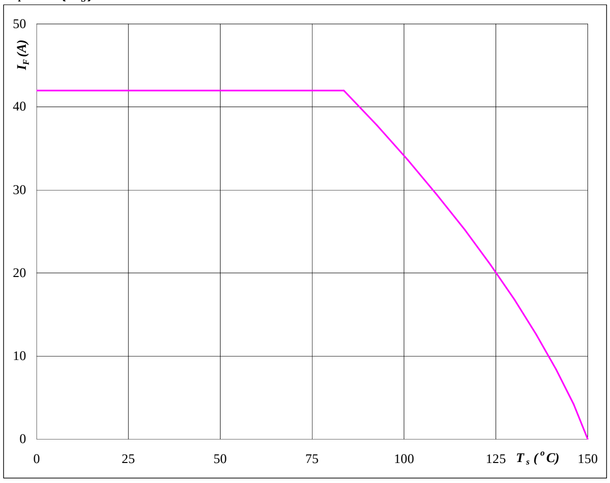
At

T_j = 150 ºC

figure 4.	**Rectifier Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



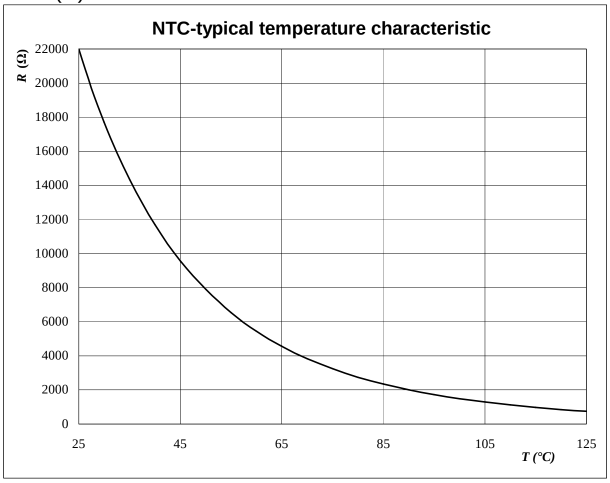
At

T_j = 150 ºC

Thermistor

figure 1.	Thermistor

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



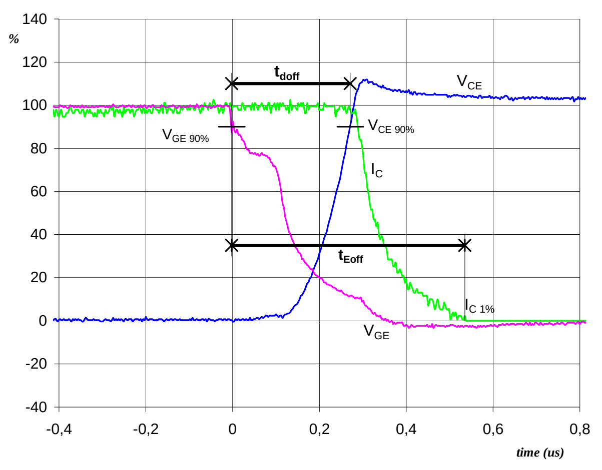
Switching Definitions Inverter

General conditions

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

figure 1. **IGBT**

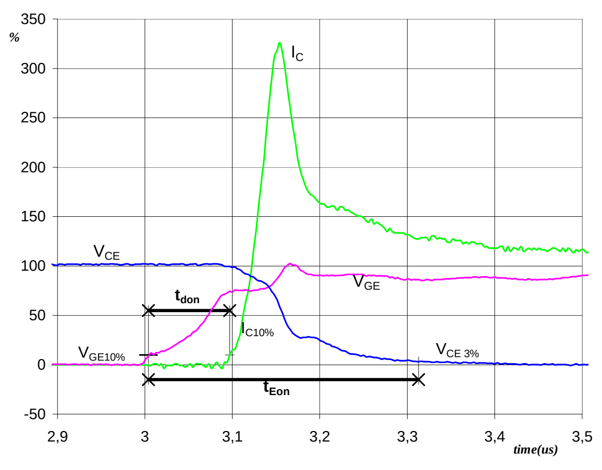
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{doff} =	0,27	μs
$t_{E\,off}$ =	0,54	μs

figure 2. **IGBT**

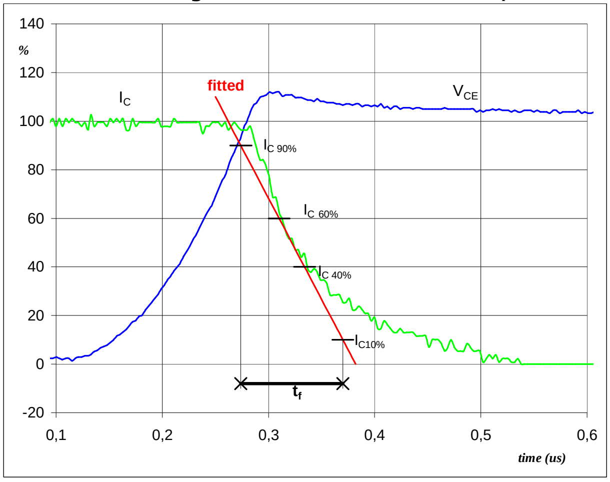
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{don} =	0,09	μs
$t_{E\,on}$ =	0,31	μs

figure 3. **IGBT**

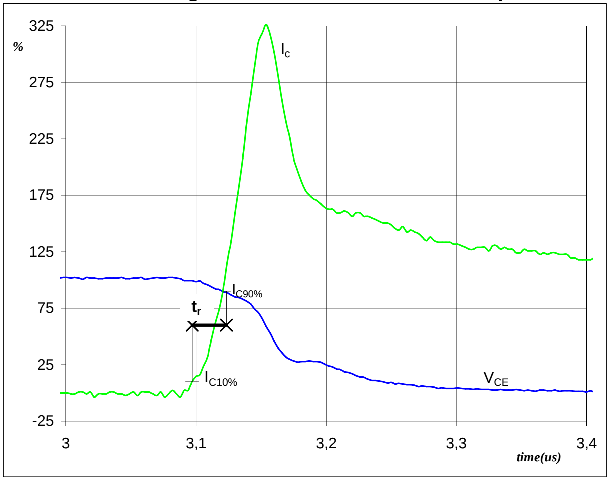
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	35	A
t_f =	0,11	μs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

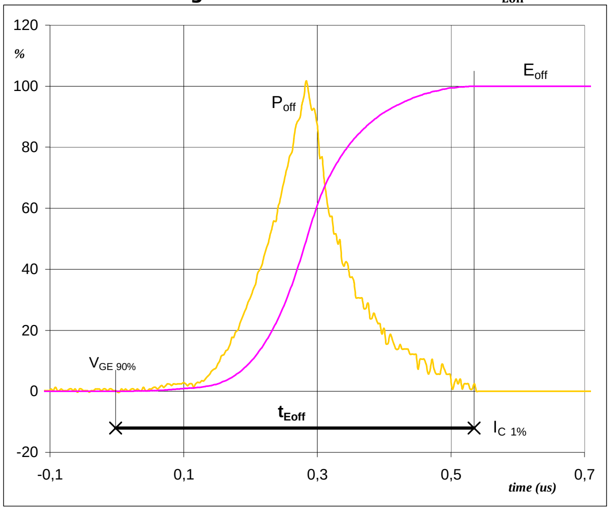


V_C (100%) =	600	V
I_C (100%) =	35	A
t_r =	0,02	μs

Switching Definitions Inverter

figure 5. **IGBT**

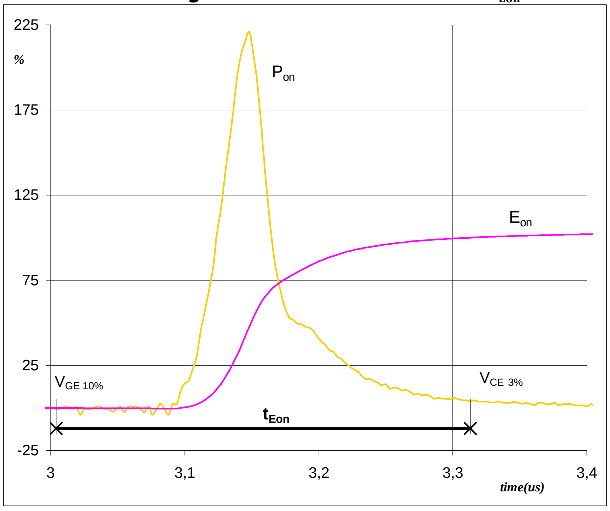
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	21,01	kW
E_{off} (100%) =	2,82	mJ
$t_{E\ off}$ =	0,54	μs

figure 6. **IGBT**

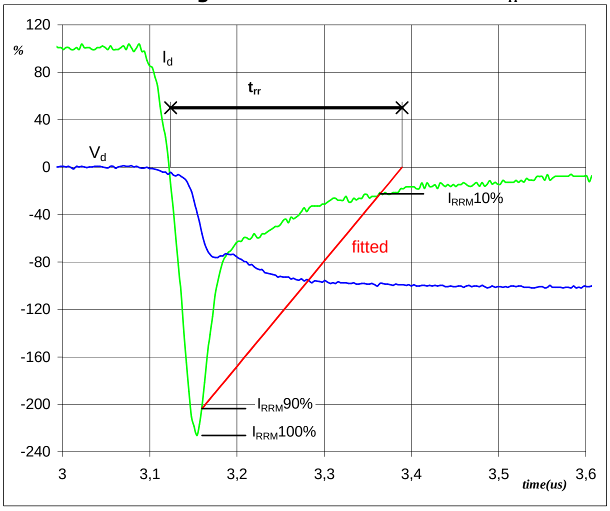
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	21,01	kW
E_{on} (100%) =	2,49	mJ
$t_{E\ on}$ =	0,31	μs

figure 7. **IGBT**

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

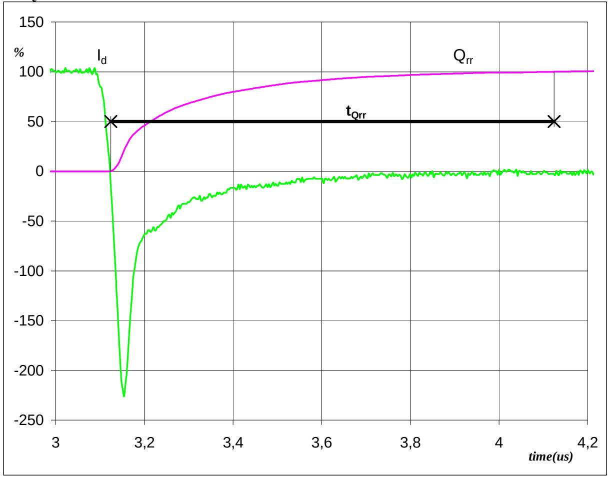


V_d (100%) =	600	V
I_d (100%) =	35	A
I_{RRM} (100%) =	-79	A
t_{rr} =	0,28	μs

Switching Definitions Inverter

figure 8.	FWD

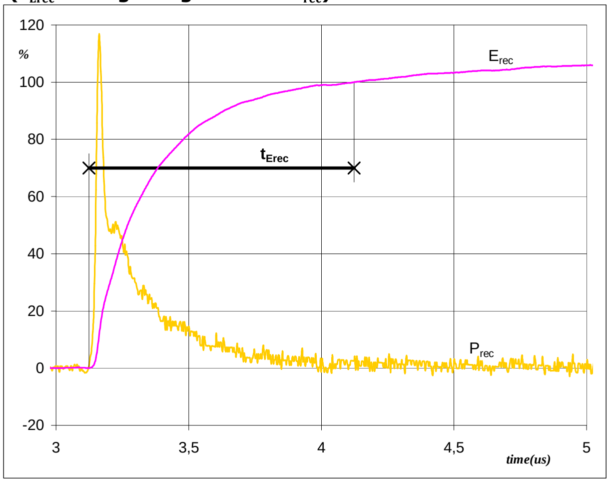
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	35	A
Q_{rr} (100%) =	7,47	µC
$t_{Q\,rr}$ =	1,00	µs

figure 9.	FWD

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



P_{rec} (100%) =	21,01	kW
E_{rec} (100%) =	3,31	mJ
$t_{E\,rec}$ =	1,00	µs

Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

Version	Ordering Code
without thermal paste 17mm housing solder pins	V23990-P580-A41-PM
with thermal paste 17mm housing solder pins	V23990-P580-A41-/3/-PM
without thermal paste 17mm housing press-fit pins	V23990-P580-A41Y-PM
with thermal paste 17mm housing press-fit pins	V23990-P580-A41Y-/3/-PM
without thermal paste 12mm housing solder pins	V23990-P580-A418-PM
with thermal paste 12mm housing solder pins	V23990-P580-A418-/3/-PM
without thermal paste 12mm housing press-fit pins	V23990-P580-A418Y-PM
with thermal paste 12mm housing press-fit pins	V23990-P580-A418Y-/3/-PM
without thermal paste 17mm housing solder pins without brake	V23990-P580-C41-PM
with thermal paste 17mm housing solder pins without brake	V23990-P580-C41-/3/-PM
without thermal paste 17mm housing press-fit pins without brake	V23990-P580-C41Y-PM
with thermal paste 17mm housing press-fit pins without brake	V23990-P580-C41Y-/3/-PM
without thermal paste 12mm housing press-fit pins without brake	V23990-P580-C418Y-PM
with thermal paste 12mm housing press-fit pins without brake	V23990-P580-C418Y-/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

module	whitout pins
P589-C41	1, 31, 32
P589-C418	1, 31, 32

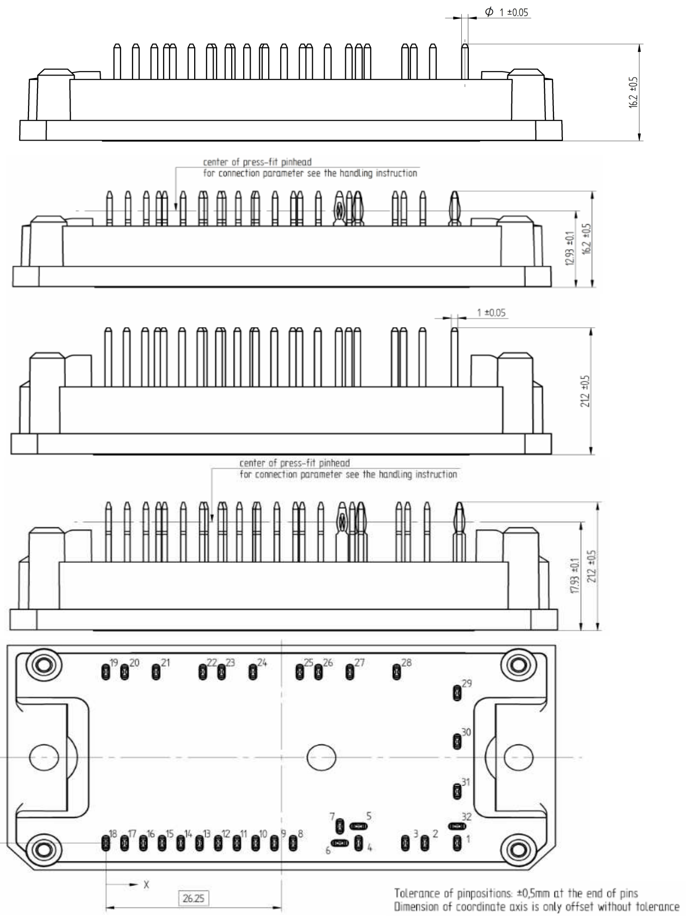
Pin	X	Y	Function
1	52,55	0	BrG
2	47,7	0	DC-
3	44,8	0	DC-
4	37,8	0	DC+
5	37,8	2,8	DC+
6	35	0	Inv+
7	35	2,8	Inv+
8	28	0	R1
9	25,2	0	R2
10	22,4	0	N6
11	19,6	0	G6
12	16,8	0	S6
13	14	0	N4
14	11,2	0	G4
15	8,4	0	S4
16	5,6	0	N2
17	2,8	0	G2
18	0	0	S2
19	0	28,5	U
20	2,8	28,5	G1
21	7,5	28,5	S1
22	14,5	28,5	V
23	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

12 mm solder pin

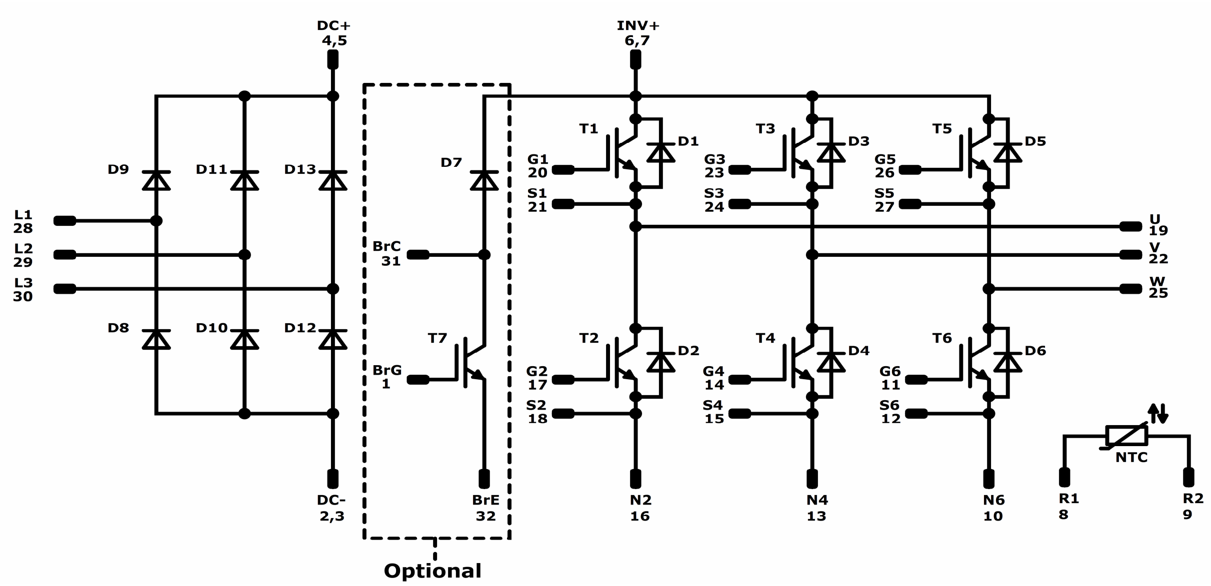
12 mm press-fit pin

17 mm solder pin

17 mm press-fit pin



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	1200 V	35 A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	1200 V	35 A	Inverter Diode	
T7	IGBT	1200 V	25 A	Brake Switch	
D7	FWD	1200 V	10 A	Brake Diode	
D8,D9,D10,D11,D12,D13	Rectifier	1600 V	35 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-P580-x4x-D9-14	18 Dec. 2018	Isolation Voltage updated	2

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.