Vincotech

flow PIM 1	600 V / 30 A

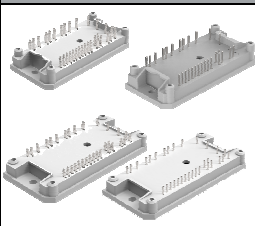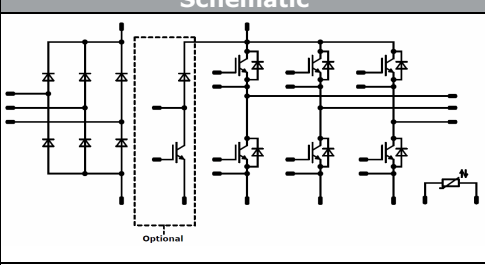### Features

- 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-P585-A20-PM
- V23990-P585-A20Y-PM
- V23990-P585-A208-PM
- V23990-P585-A208Y-PM
- V23990-P585-C20-PM
- V23990-P585-C20Y-PM

flow 1 housing

17 mm housing
Press-fit pin
/ Solder pin

12 mm housing
Press-fit pin
/ Solder pin

Schematic

Optional

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	33	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms 50 Hz half sine wave		250	A
I2t-value	I^2t			310	A^2s
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	37	W
Maximum Junction Temperature	T_{jmax}			150	°C
Inverter Switch					
Collector-emitter breakdown voltage	V_{CE}			600	V
DC collector current	I_C			30	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		90	A
Turn off safe operating area		$V_{CE} \leq 1200V$, $T_j \leq T_{op}$ max		90	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	55	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq 150$ °C V_{GE} = 15 V		6 360	µs V
Maximum Junction Temperature	T_{jmax}			175	°C

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Maximum Ratings

T$_j$ = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	$T_s = 80\ °C$	25	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		60	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80\ °C$	46	W
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Switch					
Collector-emitter breakdown voltage	V_{CE}			600	V
DC collector current	I_C			20	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		60	A
Turn off safe operating area		$V_{CE} \le 1200V,\ T_j \le T_{op}$ max		65	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80\ °C$	45	W
Gate-emitter peak voltage	V_{GE}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \le 150\ °C$ $V_{GE} = 15\ V$		6 360	µs V
Maximum Junction Temperature	T_{jmax}			175	°C
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	$T_s = 80\ °C$	14	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		40	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80\ °C$	20	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 Test Voltage		4000	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

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Characteristic Values

Parameter	Symbol	V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	Unit
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}			30	25 125		0,90 0,78		V
Slope resistance (for power loss calc. only)	r_t			30	25 125		8 11		mΩ
Reverse current	I_r		1500		25 150			2	mA
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 0,8 W/mK (P12)					1,89		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)					1,17		K/W
Inverter Switch									
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$		0,00043	25	4,1	4,9	5,7	V
Collector-emitter saturation voltage	V_{CEsat}	15		30	25 125	1,1	1,70 1,77	1,9	V
Collector-emitter cut-off current incl. Diode	I_{CES}	0	600		25 125		0,04 1		mA
Gate-emitter leakage current	I_{GES}	20	0		25			300	nA
Integrated Gate resistor	R_{gint}						-		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	15	300	30	25 125	93 93,5		ns
Rise time	t_r				25 125	15 17,5			ns
Turn-off delay time	$t_{d(off)}$				25 125	141 159,5			ns
Fall time	t_f				25 125	67,1 86,7			ns
Turn-on energy loss	E_{on}				25 125	0,42 0,63			mWs
Turn-off energy loss	E_{off}				25 125	0,59 0,80			mWs
Input capacitance	C_{ies}	f = 1 MHz	0	25	25		1630		pF
Output capacitance	C_{oss}						108		pF
Reverse transfer capacitance	C_{rss}						50		pF
Gate charge	Q_G	15	480	30	25		167		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 0,8 W/mK (P12)					1,6		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)					1,37		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	
Inverter Diode									
Diode forward voltage	V_F	R_{gon} = 16 Ω	-15	300	30	25	1,25	1,75	1,95	V
						125		1,70		
Peak reverse recovery current	I_{RRM}					25		29		A
						125		34		
Reverse recovery time	t_{rr}					25		35		ns
						125		183		
Reverse recovered charge	Q_{rr}					25		1,20		µC
						125		2,16		
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25		2200		A/µs
						125		1576		
Reverse recovered energy	E_{rec}					25		0,23		mWs
						125		0,45		
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 0,8 W/mK (P12)						2,07		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,78		K/W
Brake Switch									
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$		0,00029	25		5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}	15		20	25	1,1	1,55	1,9	V
					125		1,75		
Collector-emitter cut-off incl diode	I_{CES}	0	600		25			0,04	mA
					125			1	
Gate-emitter leakage current	I_{GES}	20	0		25			300	nA
Integrated Gate resistor	R_{gint}						-		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 32 Ω R_{gon} = 32 Ω	±15	300	20	25		126		ns
						125		128		
Rise time	t_r					25		18		
						125		21		
Turn-off delay time	$t_{d(off)}$					25		161		
						125		179		
Fall time	t_f					25		105		
						125		114		
Turn-on energy loss	E_{on}					25		0,44		mWs
						125		0,59		
Turn-off energy loss	E_{off}					25		0,49		
						125		0,63		
Input capacitance	C_{ies}	f = 1 MHz	0	25	20	25		1100		pF
Output capacitance	C_{oss}							71		
Reverse transfer capacitance	C_{rss}							32		
Gate charge	Q_G	15	480	20	25		120		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 0,8 W/mK (P12)						2,12		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,83		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 Diode									
Diode forward voltage	V_F			20	25 125	1,25	1,43 1,29	1,95	V
Reverse leakage current	I_r		600		25			27	µA
Peak reverse recovery current	I_{RRM}	R_{gon} = 32 Ω R_{gon} = 32 Ω	300	20	25 125		10 11		A
Reverse recovery time	t_{rr}				25 125		28 134		ns
Reverse recovered charge	Q_{rr}	-15			25 125		0,29 0,29		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$				25 125		1247 443		A/µs
Reverse recovery energy	E_{rec}				25 125		0,051 0,100		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 0,8 W/mK (P12)					3,53		K/W
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)					3,07		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					25			B	

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Output Inverter

figure 1. **IGBT**

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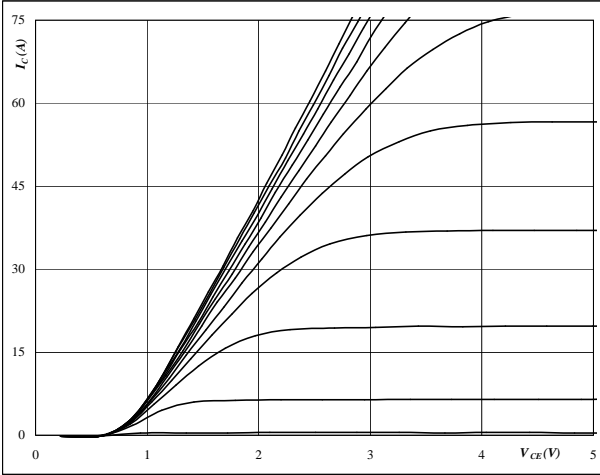
$I_C = f(V_{CE})$

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
$T_j =$ 125 °C
V_{GE} from 7 V to 17 V in steps of 1 V
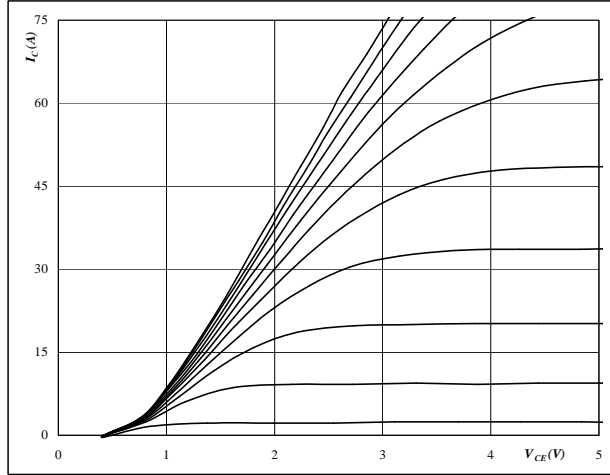
figure 3. **IGBT**

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

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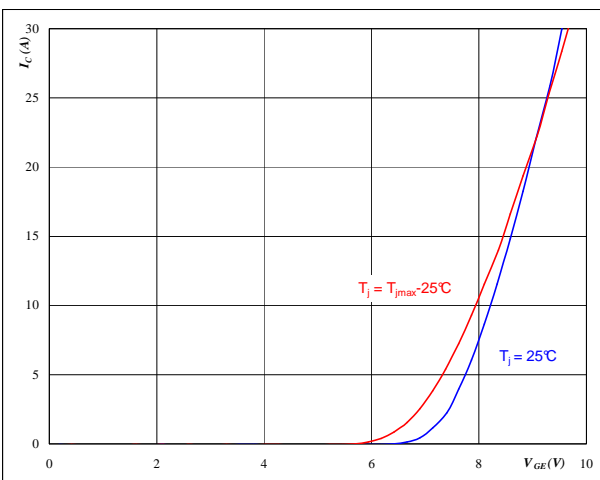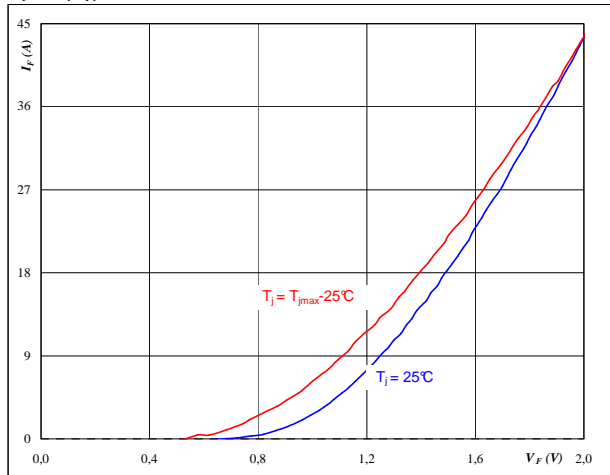
Output Inverter

figure 5.	IGBT

**Typical switching energy losses
as a function of collector current**

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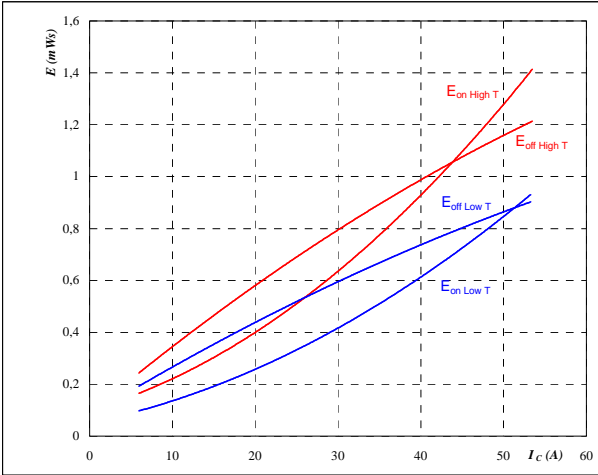
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	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**

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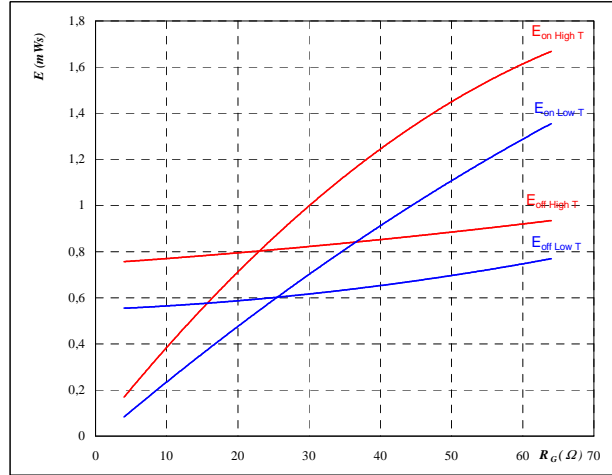
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	30	A

figure 7.	FWD

**Typical reverse recovery energy loss
as a function of collector current**

$E_{rec} = f(I_C)$
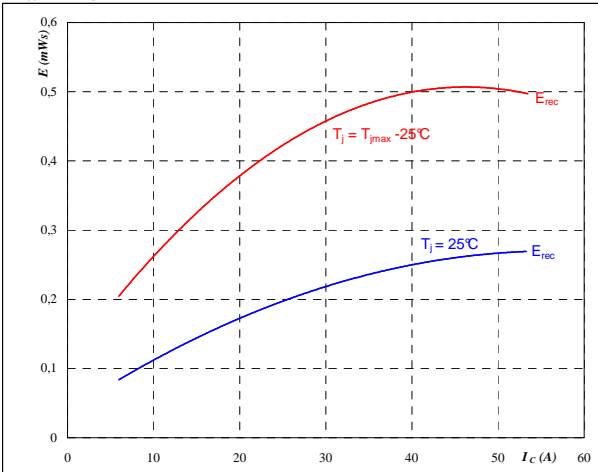
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

figure 8.	FWD

**Typical reverse recovery energy loss
as a function of gate resistor**

$E_{rec} = f(R_G)$
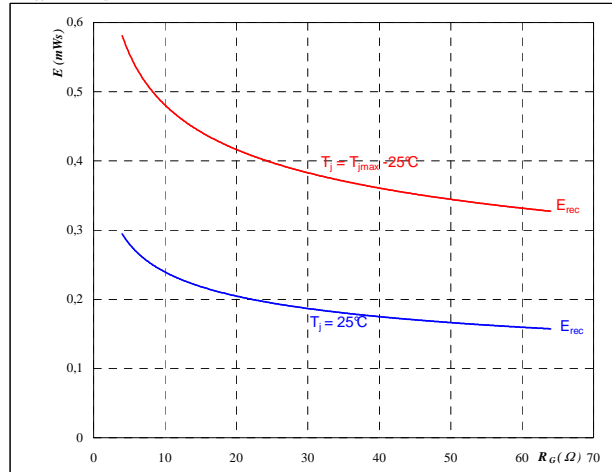
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	30	A

Output Inverter

figure 9.	IGBT

Typical switching times as a function of collector current

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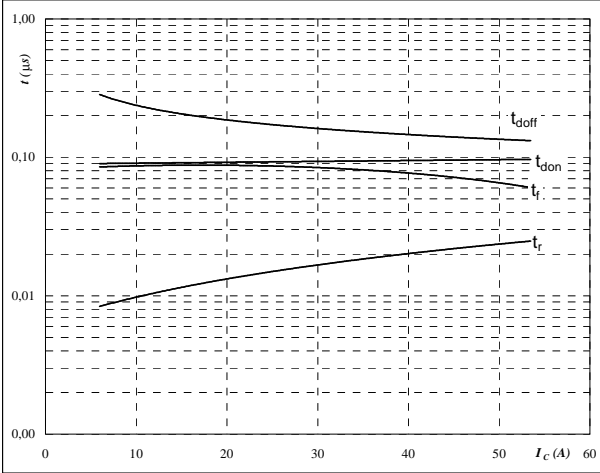
With an inductive load at

$T_j =$	125	°C
$V_{CE} =$	300	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

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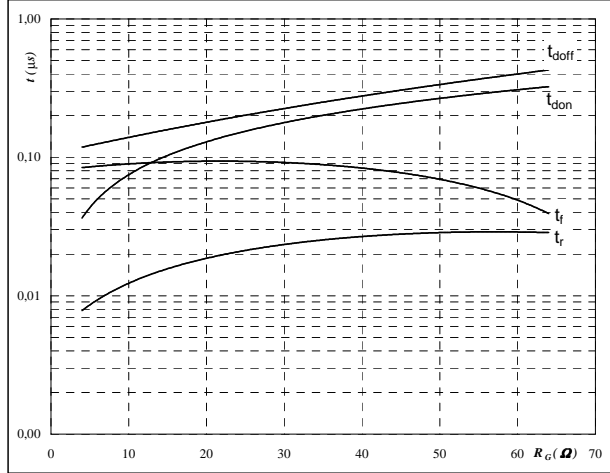
With an inductive load at

$T_j =$	125	°C
$V_{CE} =$	300	V
$V_{GE} =$	±15	V
$I_C =$	30	A

figure 11.	FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

At
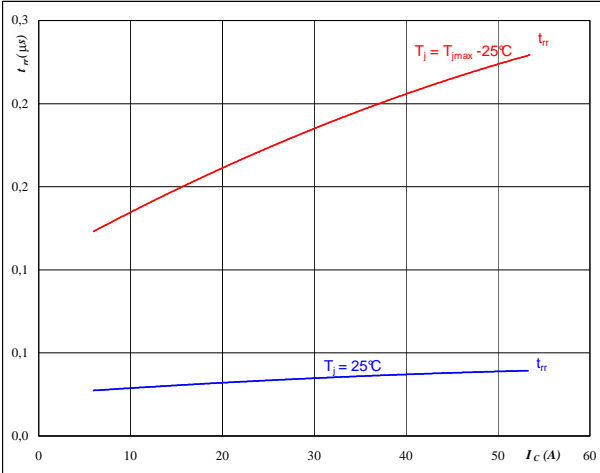
$T_j =$	25/125	°C
$V_{CE} =$	300	V
$V_{GE} =$	±15	V
$R_{gon} =$	16	Ω

figure 12.	FWD

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

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

At
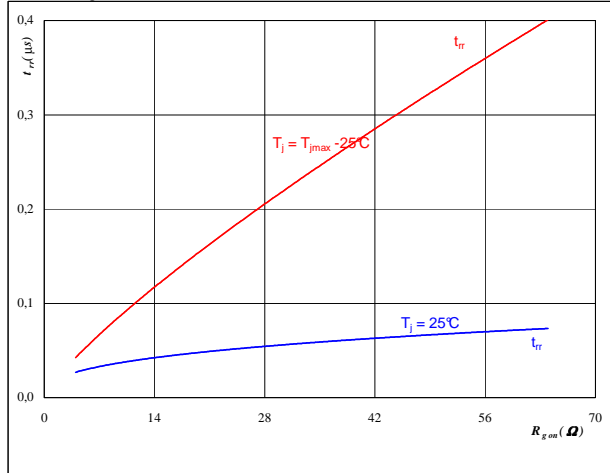
$T_j =$	25/125	°C
$V_R =$	300	V
$I_F =$	30	A
$V_{GE} =$	±15	V

Output Inverter

figure 13.   **FWD**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$

At
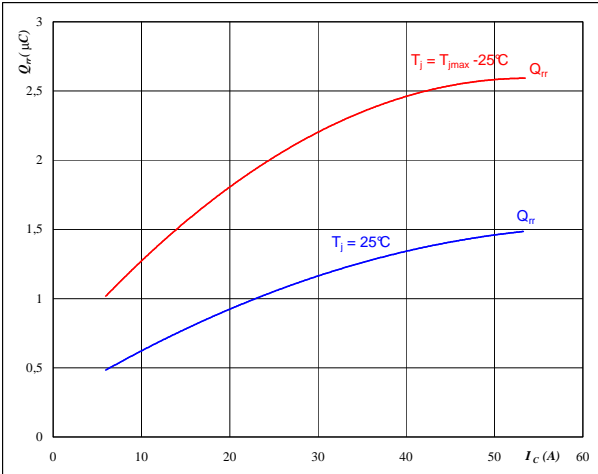
$T_j =$	25/125	°C
$V_{CE} =$	300	V
$V_{GE} =$	±15	V
$R_{gon} =$	16	Ω

figure 14.   **FWD**

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

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

At
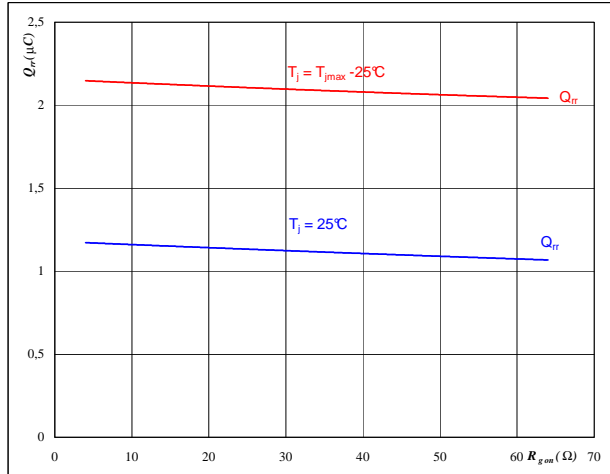
$T_j =$	25/125	°C
$V_R =$	300	V
$I_F =$	30	A
$V_{GE} =$	±15	V

figure 15.   **FWD**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$

At
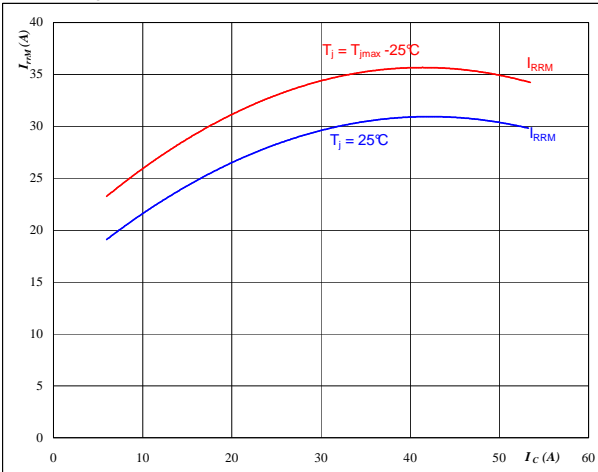
$T_j =$	25/125	°C
$V_{CE} =$	300	V
$V_{GE} =$	±15	V
$R_{gon} =$	16	Ω

figure 16.   **FWD**

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

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

At
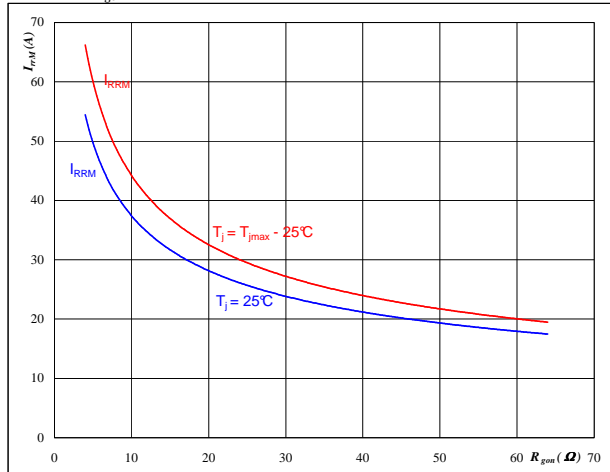
$T_j =$	25/125	°C
$V_R =$	300	V
$I_F =$	30	A
$V_{GE} =$	±15	V

Output Inverter

figure 17. FWD

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

$\mathrm{d}I_0/\mathrm{d}t, \mathrm{d}I_{rec}/\mathrm{d}t = \mathrm{f}(I_C)$

At
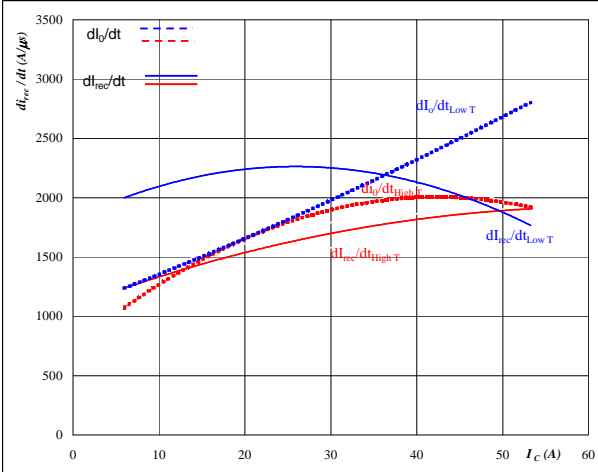
T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	16	Ω

figure 18. FWD

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

$\mathrm{d}I_0/\mathrm{d}t, \mathrm{d}I_{rec}/\mathrm{d}t = \mathrm{f}(R_{gon})$

At
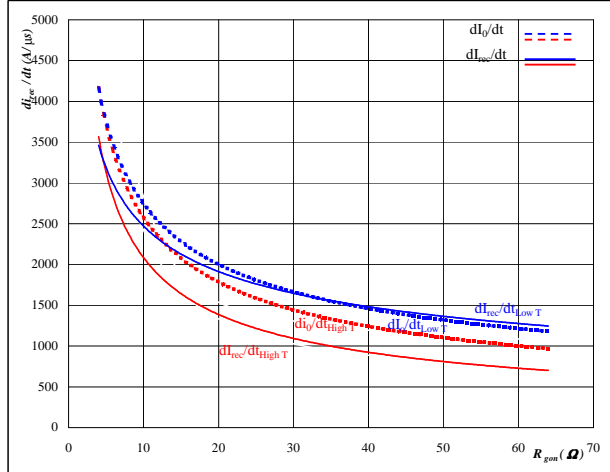
T_j =	25/125	°C
V_R =	300	V
I_F =	30	A
V_{GE} =	±15	V

figure 19. IGBT

IGBT transient thermal impedance as a function of pulse width

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

At
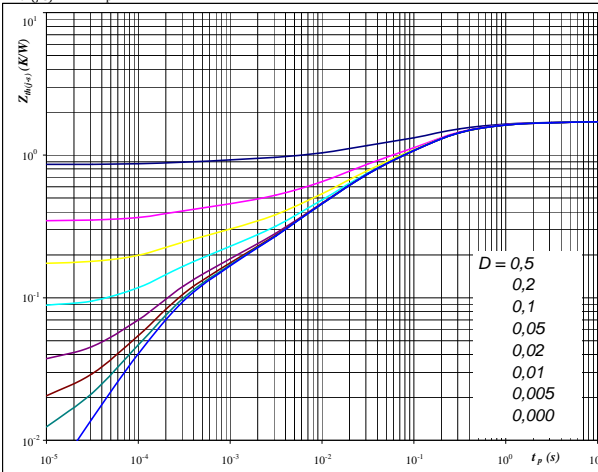
D =	t_p / T		Phase change material		
$R_{th(j\text{-}s)}$ =	1,60	K/W	$R_{th(j\text{-}s)}$ =	1,37	K/W

IGBT thermal model values

		Phase change material	
R (K/W)	Tau (s)	R (K/W)	Tau (s)
7,97E-02	2,79E+00	8,08E-02	1,65E+00
3,32E-01	3,84E-01	1,77E-01	2,46E-01
6,25E-01	1,06E-01	7,50E-01	6,44E-02
3,61E-01	1,55E-02	1,99E-01	1,77E-02
1,04E-01	2,61E-03	9,61E-02	4,57E-03
9,94E-02	2,47E-04	7,05E-02	6,56E-04

figure 20. FWD

FWD transient thermal impedance as a function of pulse width

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

At
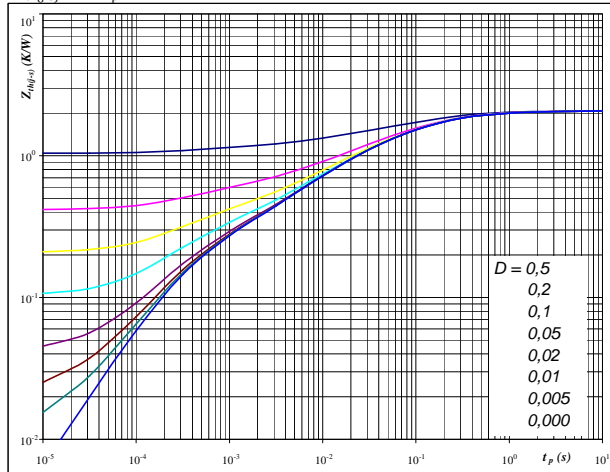
D =	t_p / T		Phase change material		
$R_{th(j\text{-}s)}$ =	2,07	K/W	$R_{th(j\text{-}s)}$ =	1,78	K/W

FWD thermal model values

		Phase change material	
R (K/W)	Tau (s)	R (K/W)	Tau (s)
9,03E-02	2,69E+00	2,34E+00	2,69E+00
3,61E-01	3,13E-01	2,72E-01	3,13E-01
7,18E-01	7,88E-02	6,83E-02	7,88E-02
5,19E-01	1,60E-02	1,39E-02	1,60E-02
2,11E-01	2,84E-03	2,47E-03	2,84E-03
1,77E-01	3,27E-04	2,84E-04	3,27E-04

Vincotech

Output Inverter

figure 21.	IGBT

Power dissipation as a
function of heatsink temperature
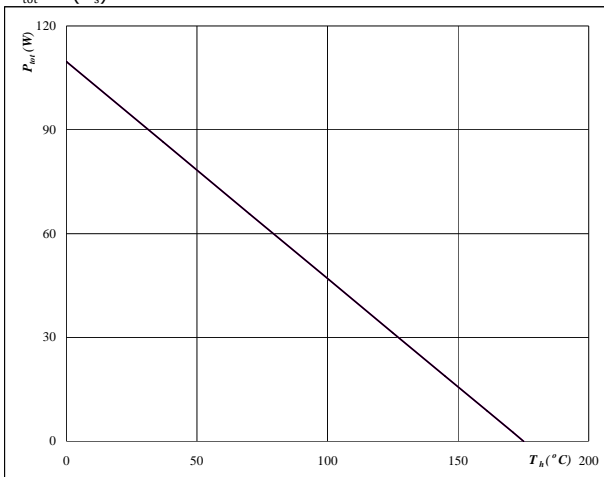
$P_{tot} = f(T_s)$

At

T_j = 175 °C

figure 22.	IGBT

Collector current as a
function of heatsink temperature

$I_C = f(T_s)$
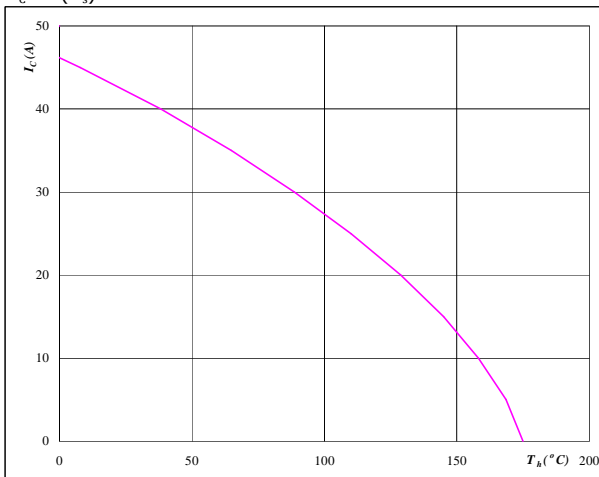
At

T_j = 175 °C
V_{GE} = 15 V

figure 23.	FWD

Power dissipation as a
function of heatsink temperature

$P_{tot} = f(T_s)$
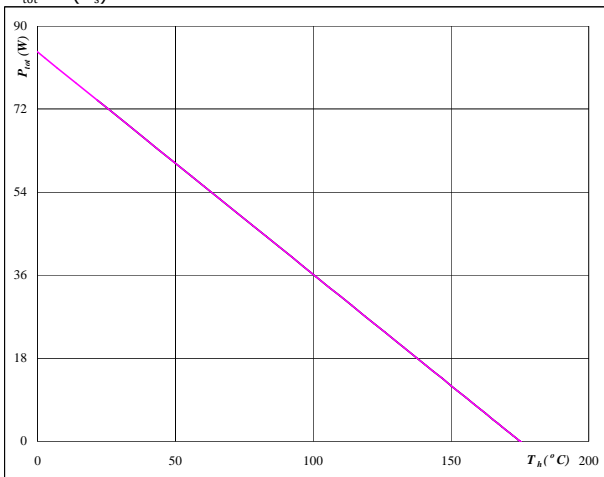
At

T_j = 175 °C

figure 24.	FWD

Forward current as a
function of heatsink temperature

$I_F = f(T_s)$
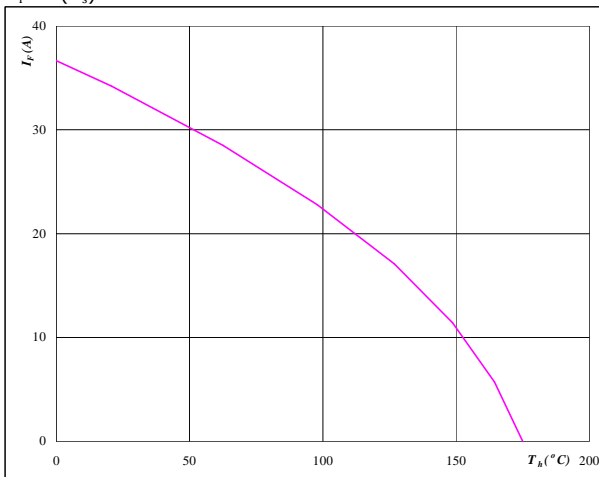
At

T_j = 175 °C

Output Inverter

figure 25.   IGBT

**Safe operating area as a function
of collector-emitter voltage**

$I_C = f(V_{CE})$
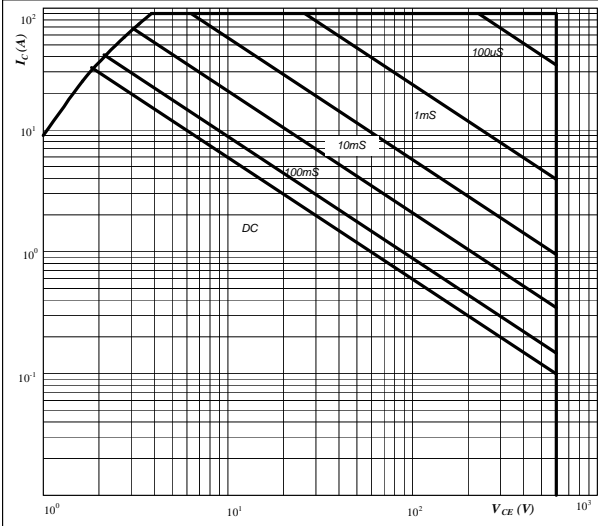
At

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

figure 26.   IGBT

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$
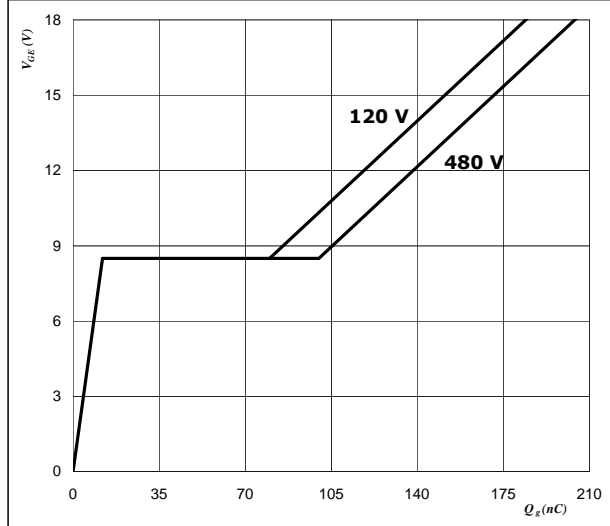
At

I_C =	30	A

figure 27.   IGBT

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

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

At
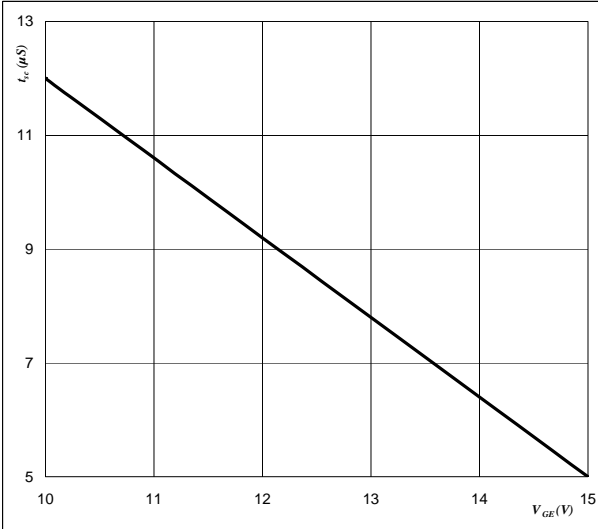
V_{CE} =	600	V
$T_j \leq$	175	ºC

figure 28.   IGBT

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

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

At
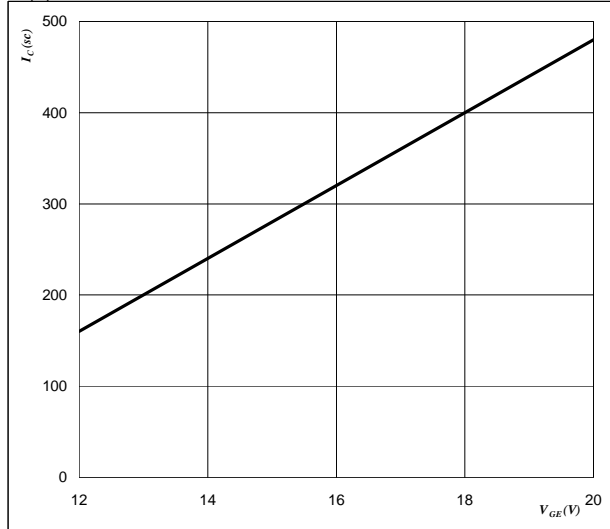
$V_{CE} \leq$	600	V
T_j =	175	ºC

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figure 29.   **IGBT**
Reverse bias safe operating area

$I_C = f(V_{CE})$

At
$T_j = \quad T_{jmax}\text{-}25 \quad °C$

13

Brake

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
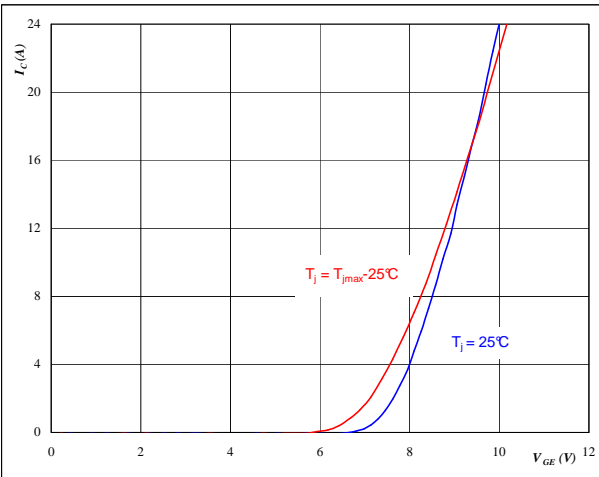
Typical output characteristics

$I_C = f(V_{CE})$

At

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

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

$T_j = T_{jmax}-25°C$

$T_j = 25°C$

At

$t_p =$ 250 µs
$V_{CE} =$ 10 V

figure 4. FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$

$T_j = T_{jmax}-25°C$

$T_j = 25°C$

At
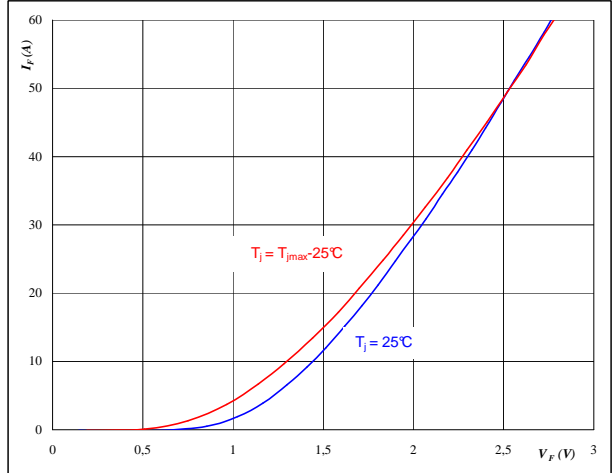
$t_p =$ 250 µs

Brake

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} =	300	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 =	25/125	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	20	A

figure 7. FWD

**Typical reverse recovery energy loss
as a function of collector current**

$E_{rec} = f(I_C)$
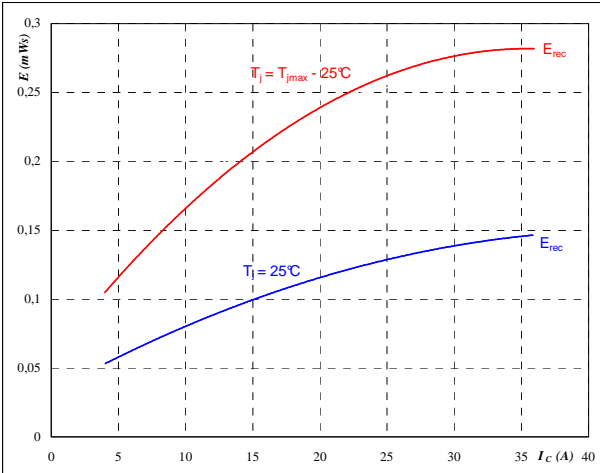
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

figure 8. FWD

**Typical reverse recovery energy loss
as a function of gate resistor**

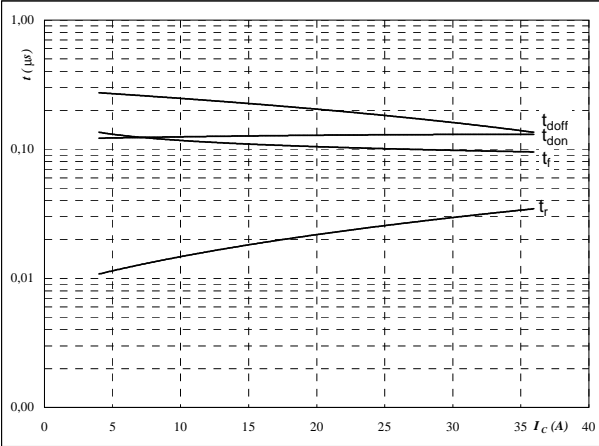$E_{rec} = f(R_G)$
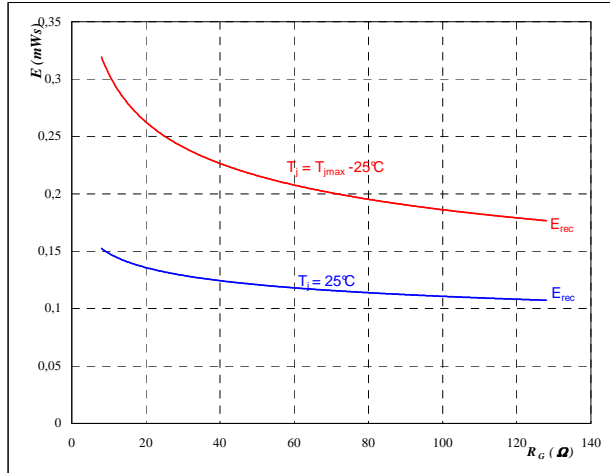
With an inductive load at

T_j =	25/125	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	20	A

Brake

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
$V_{CE} =$	300	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
$t = f(R_G)$
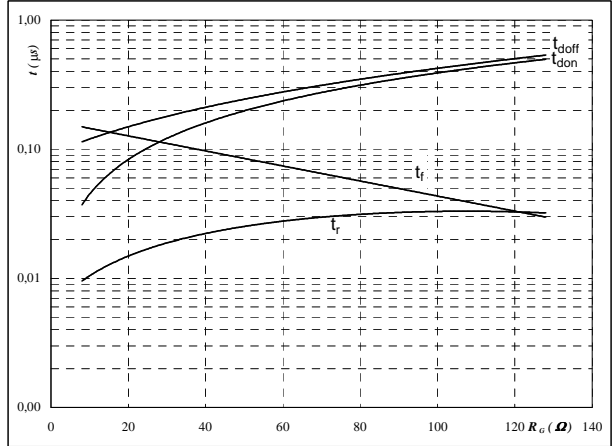
With an inductive load at

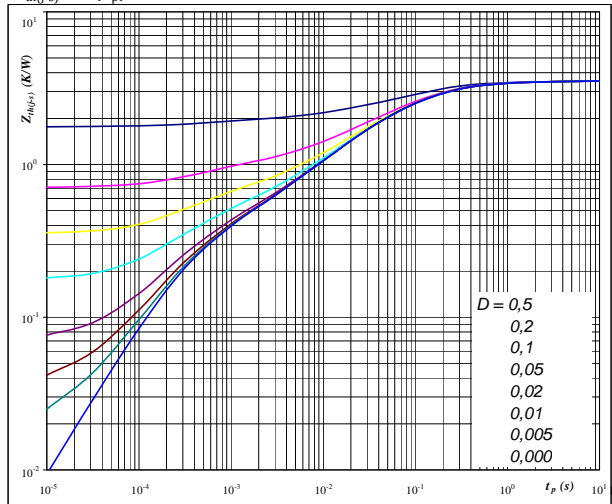|		
$T_j =$	125	°C
$V_{CE} =$	300	V
$V_{GE} =$	±15	V
$I_C =$	20	A

figure 11. IGBT
IGBT transient thermal impedance as a function of pulse width
$Z_{th(j-s)} = f(t_p)$
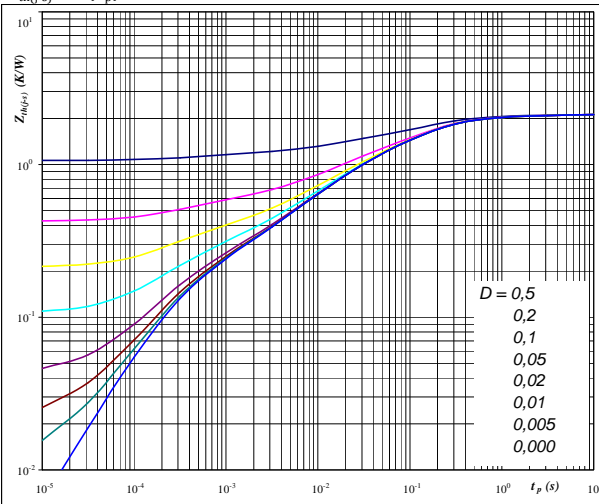
At $\quad D = t_p / T$
Phase change material
$R_{th(j-s)} =$ 2,12 K/W $\quad R_{th(j-s)} =$ 1,83 K/W

figure 12. FWD
FWD transient thermal impedance as a function of pulse width
$Z_{th(j-s)} = f(t_p)$

At $\quad D = t_p / T$
Phase change material
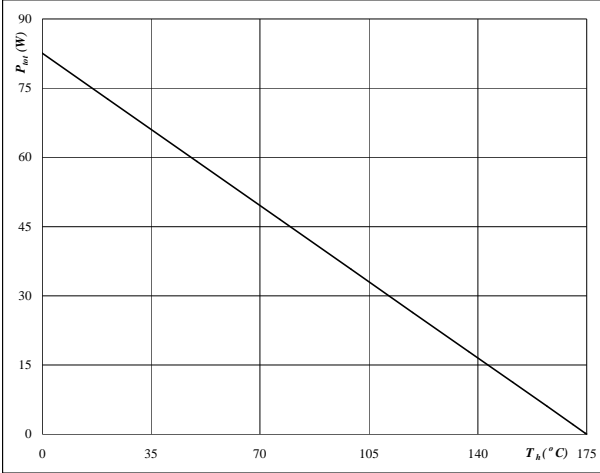$R_{th(j-s)} =$ 3,53 K/W $\quad R_{th(j-s)} =$ 3,07 K/W

Brake

figure 13. **IGBT**

Power dissipation as a function of heatsink temperature
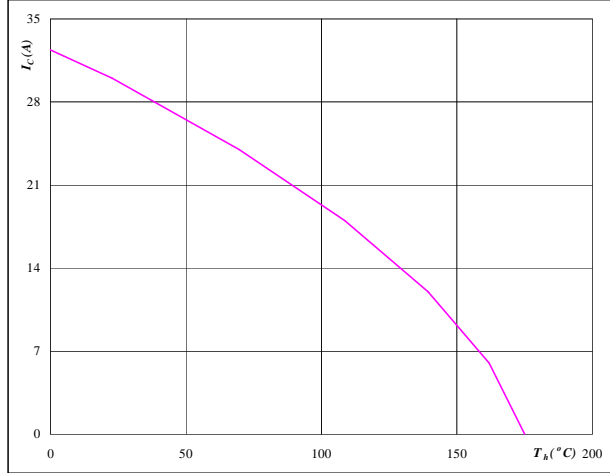
$P_{tot} = f(T_s)$

At

$T_j =$ 175 ºC

figure 14. **IGBT**

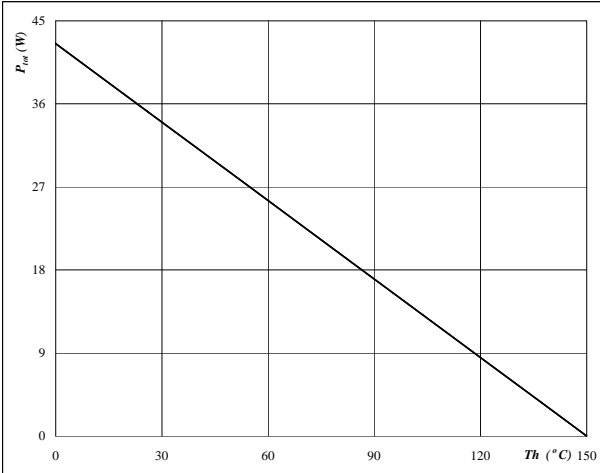**Collector current as a function of heatsink temperature**

$I_C = f(T_s)$

At

$T_j =$ 175 ºC
$V_{GE} =$ 15 V

figure 15. **FWD**

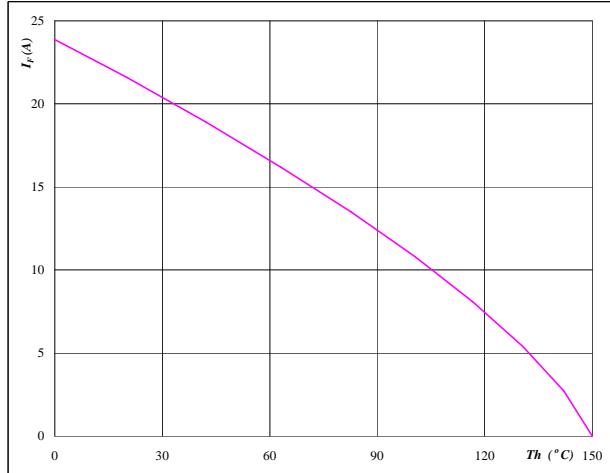**Power dissipation as a function of heatsink temperature**

$P_{tot} = f(T_s)$

At

$T_j =$ 150 ºC

figure 16. **FWD**

Forward current as a function of heatsink temperature

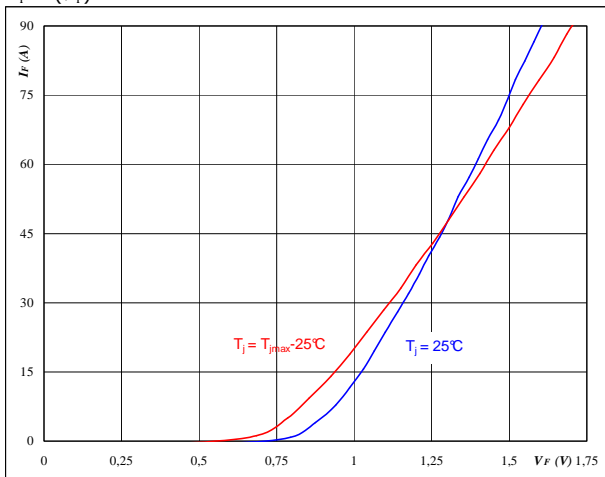$I_F = f(T_s)$

At

$T_j =$ 150 ºC

Input Rectifier Bridge

figure 1. Rectifier Diode
Typical diode forward current as a function of forward voltage
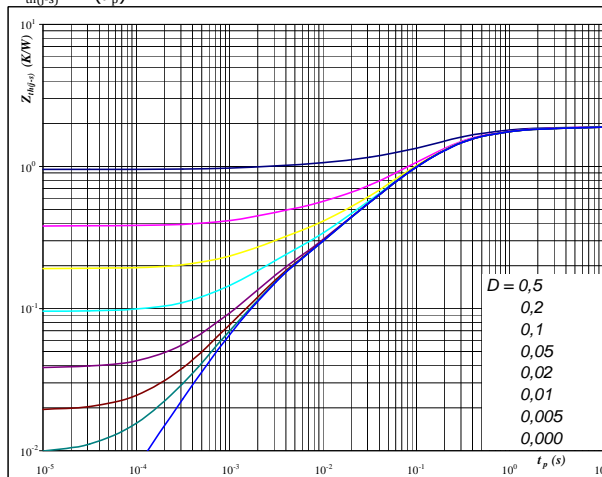$I_F = f(V_F)$

At
t_p = 250 µs

figure 2. Rectifier Diode
Diode transient thermal impedance as a function of pulse width
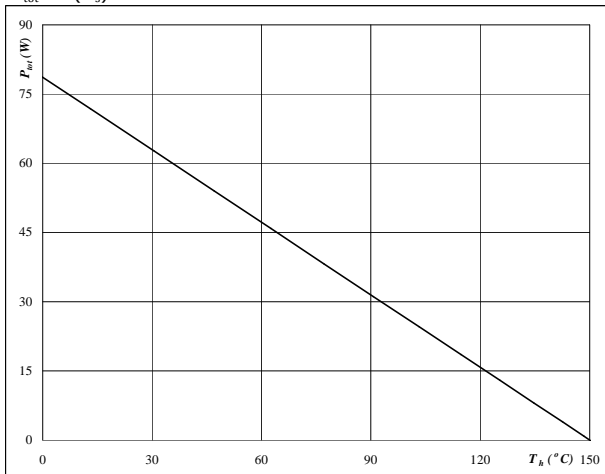$Z_{th(j-s)} = f(t_p)$

$D = 0,5$ / $0,2$ / $0,1$ / $0,05$ / $0,02$ / $0,01$ / $0,005$ / $0,000$

At
$D = t_p / T$
Phase change material
$R_{th(j-s)}$ = 1,89 K/W $R_{th(j-s)}$ = 1,62 K/W

figure 3. Rectifier Diode
Power dissipation as a function of heatsink temperature
$P_{tot} = f(T_s)$

At
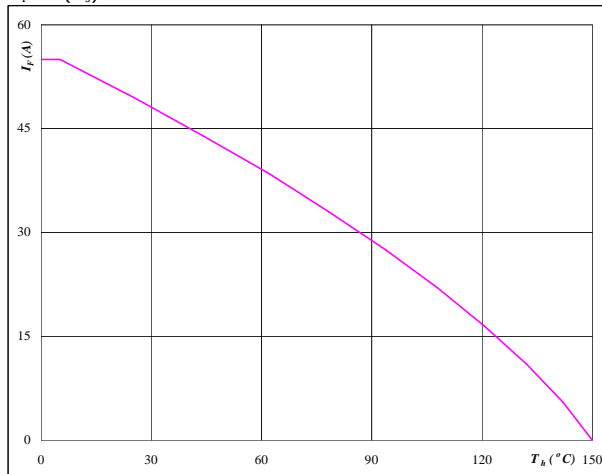T_j = 150 ºC

figure 4. Rectifier Diode
Forward current as a function of heatsink temperature
$I_F = f(T_s)$

At
T_j = 150 ºC

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Switching Definitions Output Inverter

General conditions

T_j	=	125 °C
R_{gon}	=	4Ω
R_{goff}	=	4Ω

figure 1.   IGBT

Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})
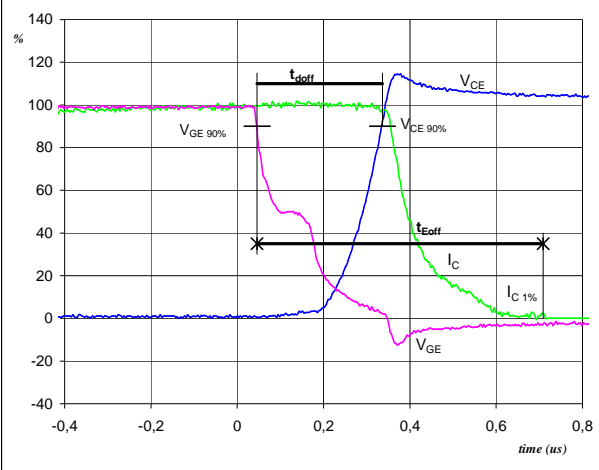
V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	100	A
t_{doff} =	0,29	µs
t_{Eoff} =	0,66	µs

figure 2.   IGBT

Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})
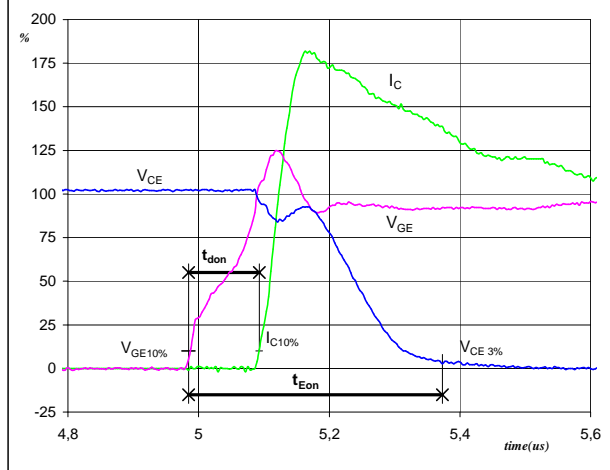
V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	100	A
t_{don} =	0,11	µs
t_{Eon} =	0,39	µs

figure 3.   IGBT

Turn-off Switching Waveforms & definition of t_f
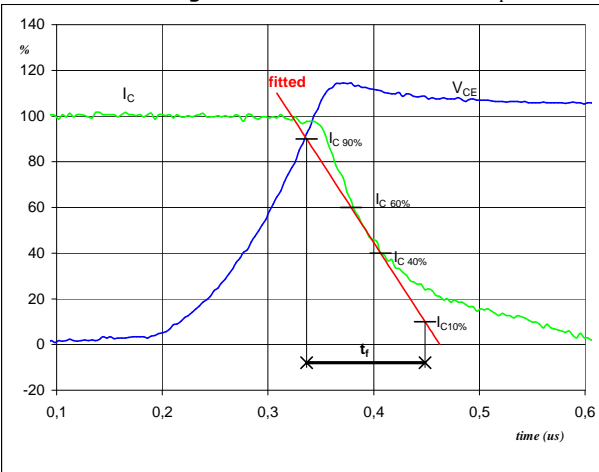
V_C (100%) =	600	V
I_C (100%) =	100	A
t_f =	0,11	µs

figure 4.   IGBT

Turn-on Switching Waveforms & definition of t_r
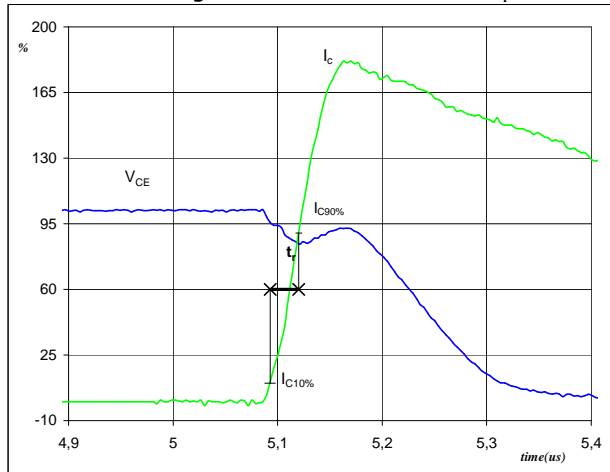
V_C (100%) =	600	V
I_C (100%) =	100	A
t_r =	0,03	µs

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Switching Definitions Output Inverter

figure 5. **IGBT**

Turn-off Switching Waveforms & definition of t_{Eoff}
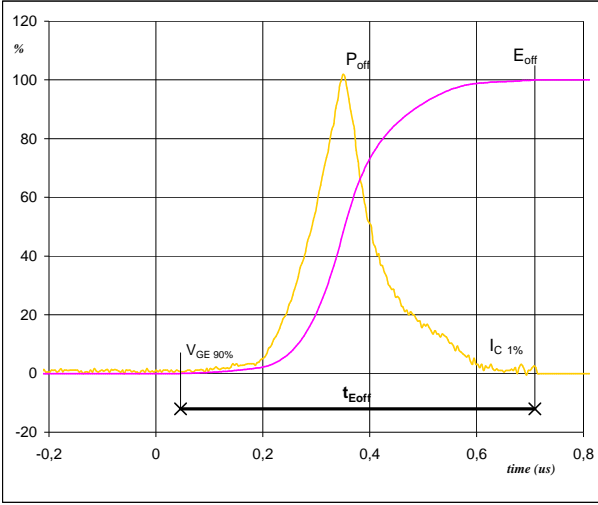
P_{off} (100%) =	59,91	kW
E_{off} (100%) =	8,87	mJ
t_{Eoff} =	0,66	µs

figure 6. **IGBT**

Turn-on Switching Waveforms & definition of t_{Eon}
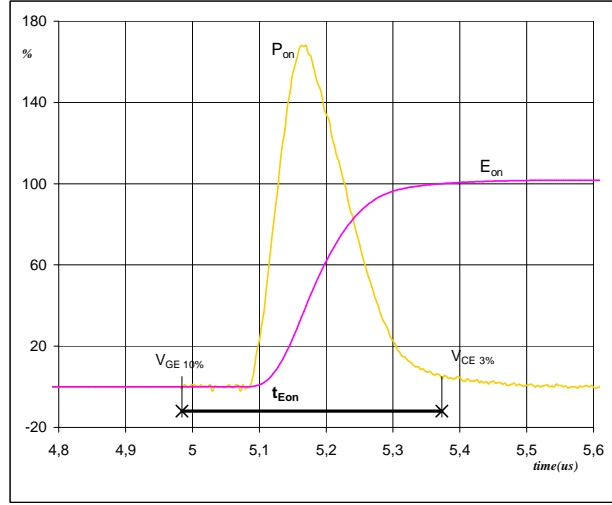
P_{on} (100%) =	59,91	kW
E_{on} (100%) =	12,48	mJ
t_{Eon} =	0,39	µs

figure 7. **IGBT**

Turn-off Switching Waveforms & definition of t_{rr}
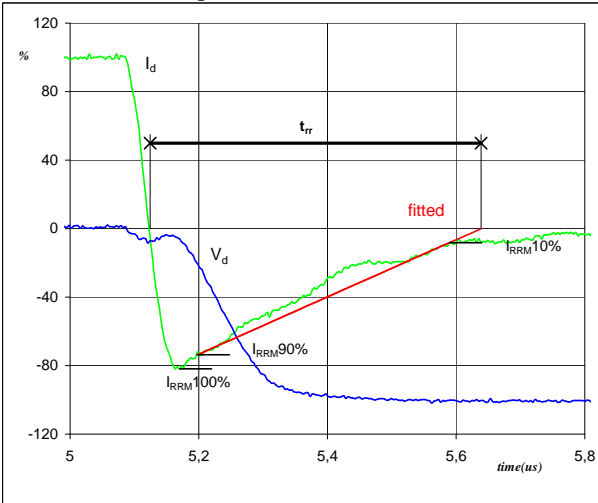
V_d (100%) =	600	V
I_d (100%) =	100	A
I_{RRM} (100%) =	-83	A
t_{rr} =	0,51	µs

Switching Definitions Output Inverter

figure 8.   **FWD**
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})
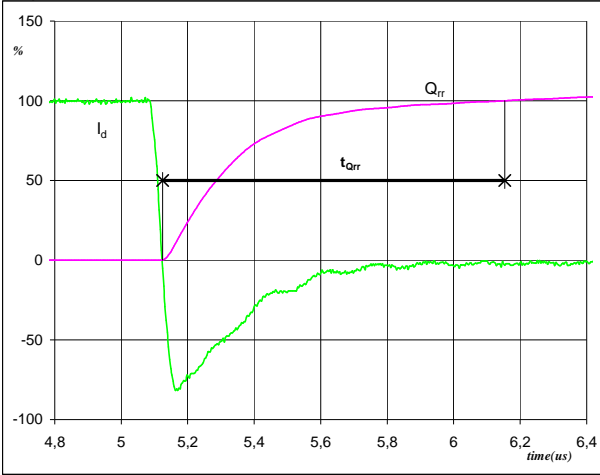
I_d (100%) =	100	A
Q_{rr} (100%) =	20,73	µC
t_{Qrr} =	1,03	µs

figure 9.   **FWD**
Turn-on Switching Waveforms & definition of t_{Erec}
(t_{Erec} = integrating time for E_{rec})
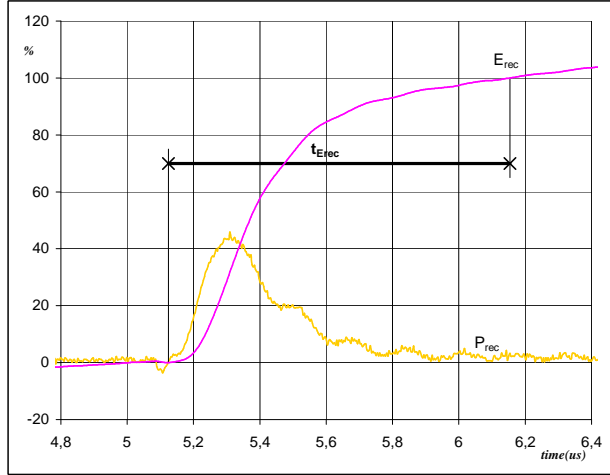
P_{rec} (100%) =	59,91	kW
E_{rec} (100%) =	7,85	mJ
t_{Erec} =	1,03	µs

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Ordering Code & Marking

Version	Ordering Code
without thermal paste 17 mm housing with solder pins	V23990-P585-A20-PM
without thermal paste 17 mm housing with pressfit pins	V23990-P585-A20Y-PM
without thermal paste 12 mm housing with solder pins	V23990-P585-A208-PM
without thermal paste 12 mm housing with pressfit pins	V23990-P585-A208Y-PM
with thermal paste 12 mm housing with pressfit pins	V23990-P585-A208Y-/3/-PM
without thermal paste 17 mm housing with solder pins	V23990-P585-C20-PM
without thermal paste 17 mm housing with pressfit pins	V23990-P585-C20Y-PM

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

Outline

	Pin table			module	whitout pins
Pin	X	Y	Function	P585-C20	1, 31, 32
1	52,6	0	BrG	P585-C20Y	1, 31, 32
2	47,7	0	DC-		
3	44,8	0	DC-		
4	37,8	0	DC+	12 mm solder pin	
5	37,8	2,8	DC+		
6	35	0	Inv+		
7	35	2,8	Inv+		
8	28	0	R1		
9	25,2	0	R2	12 mm press-fit pin	
10	22,4	0	N6		
11	19,6	0	G6		
12	16,8	0	S6		
13	14	0	N4		
14	11,2	0	G4	17 mm solder pin	
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	17 mm press-fit pin	
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	52,6	25	L2		
30	52,6	16,9	L3		
31	52,6	8,6	BrC		
32	52,6	2,8	BrE		

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Pinout

DC+ 4,5   INV+ 6,7

D9   D11   D13   D7

T1   D1   T3   D3   T5   D5
G1 20   G3 23   G5 26
S1 21   S3 24   S5 27

L1 28
L2 29
L3 30

BrC 31

U 19
V 22
W 25

D8   D10   D12

T7

BrG 1

T2   D2   T4   D4   T6   D6
G2 17   G4 14   G6 11
S2 18   S4 15   S6 12

DC- 2,3   BrE 32

N2 16   N4 13   N6 10   R1 8   R2 9

NTC

Optional
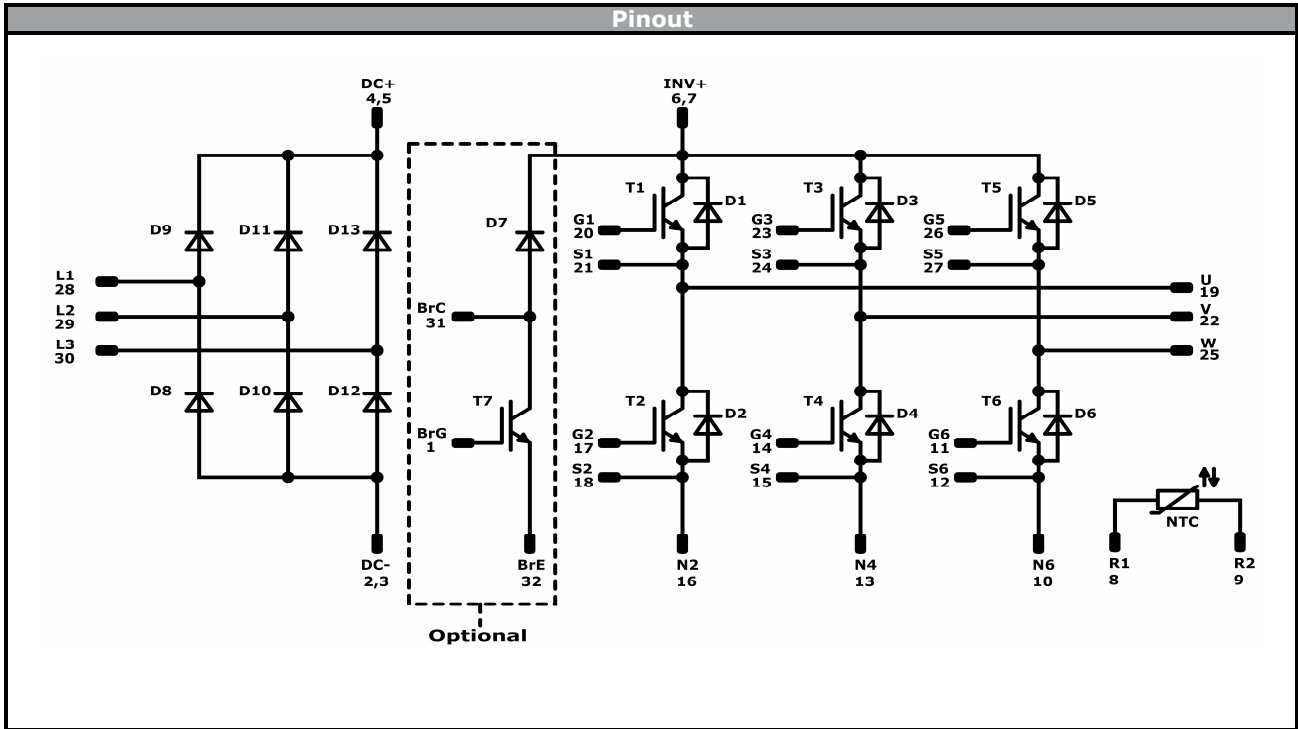
Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	1200 V	30 A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	1200 V	30 A	Inverter Diode	
T7	IGBT	1200 V	20 A	Brake Switch	
D7	FWD	1200 V	20 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-P585-x2x-D3-14	08 Dec. 2017		

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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.