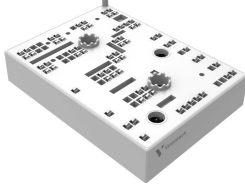
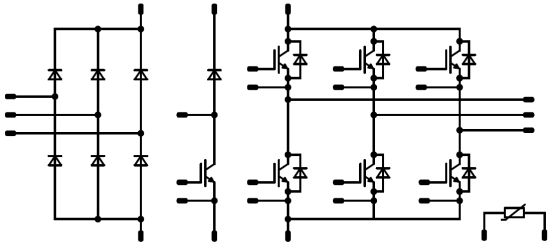




# Vincotech

MiniSkiip® PIM 3	600 V / 100 A
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;"><b>Features</b></div> <ul style="list-style-type: none"> <li>IGBT3 technology for low saturation losses</li> <li>Solderless spring contact mounting system</li> </ul>	<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;"><b>MiniSkiip® 3 housing</b></div> <div style="text-align: center;">  </div>
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;"><b>Target applications</b></div> <ul style="list-style-type: none"> <li>Industrial motor drives</li> </ul>	<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;"><b>Schematic</b></div> <div style="text-align: center;">  </div>
<div style="background-color: #eee; padding: 5px; margin-bottom: 5px;"><b>Types</b></div> <ul style="list-style-type: none"> <li>V23990-K243-A-PM</li> </ul>	

## Maximum Ratings

$T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
<b>D8,D9,D10,D11,D12,D13</b>				
Peak repetitive reverse voltage	$V_{RRM}$		1600	V
Continuous (direct) forward current	$I_F$		50	A
Surge (non-repetitive) forward current	$I_{FSM}$	$t_p = 10\text{ ms}$ $T_j = 25\text{ °C}$	700	A
Surge current capability	$I^2t$		2450	A <sup>2</sup> s
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	93	W
Maximum junction temperature	$T_{jmax}$		150	°C



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## Maximum Ratings

$T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
<b>T1,T2,T3,T4,T5,T6,T7</b>				
Collector-emitter voltage	$V_{CES}$		600	V
Collector current	$I_C$		100	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	300	A
Turn off safe operating area		$V_{CE} \leq 1200\text{ V}$ , $T_j \leq T_{op\ max}$	300	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	201	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ $V_{CC} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	$\mu\text{s}$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## D1,D2,D3,D4,D5,D6,D7

Peak repetitive reverse voltage	$V_{RRM}$		600	V
Continuous (direct) forward current	$I_F$		100	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	985	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	147	W
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Module Properties

### Thermal Properties

Storage temperature	$T_{stg}$		-40...+125	$^{\circ}\text{C}$
Operation temperature under switching condition	$T_{jop}$		-40...( $T_{jmax} - 25$ )	$^{\circ}\text{C}$

### Isolation Properties

Isolation voltage	$V_{isol}$	DC Test Voltage* $t_p = 2\text{ s}$	5500	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance		With std lid For more informations see handling instructions	6,3	mm
Clearance		With std lid For more informations see handling instructions	6,3	mm
Comparative Tracking Index	CTI		> 200	

\*100 % tested in production



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## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V] $V_{GS}$ [V]	$V_{CE}$ [V] $V_{DS}$ [V] $V_F$ [V]	$I_C$ [A] $I_D$ [A] $I_F$ [A]	$T_j$ [°C]	Min	Typ	Max		

### D8,D9,D10,D11,D12,D13

#### Static

Forward voltage	$V_F$				35	25 125	0,8	1,02 0,94	1,35	V
Reverse leakage current	$I_R$			1500		25 125			100 2000	$\mu$ A

#### Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						0,75		K/W
-------------------------------------	---------------	--	--	--	--	--	--	------	--	-----

### T1,T2,T3,T4,T5,T6,T7

#### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0016	25	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CESat}$		15		100	25 125	1,05	1,58 1,78	1,85	V
Collector-emitter cut-off current	$I_{CES}$		0	600		25			5,2	$\mu$ A
Gate-emitter leakage current	$I_{GES}$		$\pm 25$	0		25			1200	nA
Internal gate resistance	$r_g$							none		$\Omega$
Input capacitance	$C_{ies}$							6280		pF
Output capacitance	$C_{oes}$	$f = 1$ Mhz	0	25		25		400		
Reverse transfer capacitance	$C_{res}$							186		
Gate charge	$Q_g$		$\pm 15$	480	100	25		620		nC

#### Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						0,47		K/W
-------------------------------------	---------------	--	--	--	--	--	--	------	--	-----

#### Dynamic

Turn-on delay time	$t_{d(on)}$					25 125		187 187		ns
Rise time	$t_r$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$				25 125		31,5 32,8		
Turn-off delay time	$t_{d(off)}$		$\pm 15$	300	100	25 125		223 242		
Fall time	$t_f$					25 125		53,3 86,9		
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 5,9 \mu$ C $Q_{tFWD} = 10,5 \mu$ C				25 125		2,29 2,92		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125		2,43 3,08		



## Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		$V_{GE}$ [V] $V_{GS}$ [V]	$V_{CE}$ [V] $V_{DS}$ [V] $V_F$ [V]	$I_C$ [A] $I_D$ [A] $I_F$ [A]	$T_j$ [°C]	Min	Typ	Max		
<b>D1,D2,D3,D4,D5,D6,D7</b>										
<b>Static</b>										
Forward voltage	$V_F$			100	25 125	1	1,38 1,4	1,9		V
Reverse leakage current	$I_R$		600		25			200		µA
<b>Thermal</b>										
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						0,64		K/W
<b>Dynamic</b>										
Peak recovery current	$I_{RRM}$				25 125		93 113			A
Reverse recovery time	$t_{rr}$				25 125		168 248			ns
Recovered charge	$Q_r$	$di/dt = 2890$ A/µs $di/dt = 2940$ A/µs	±15	300	100	25 125	5,85 10,5			µC
Reverse recovered energy	$E_{rec}$				25 125		1,1 2,15			mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$				25 125		3180 2580			A/µs
<b>Thermistor</b>										
Rated resistance	$R$				25		1			kΩ
Deviation of $R_{100}$	$\Delta_{R/R}$	$R_{100} = 1670$ Ω			100	-2		+2		%
$R_{100}$	$R$				100		1670			Ω
Power dissipation constant					25		0,76			mW/K
A-value	$A_{(25/50)}$				25		$7,635 \cdot 10^{-3}$			1/K
B-value	$B_{(25/100)}$				25		$1,731 \cdot 10^{-5}$			1/K <sup>2</sup>
Vincotech PTC Reference								E		



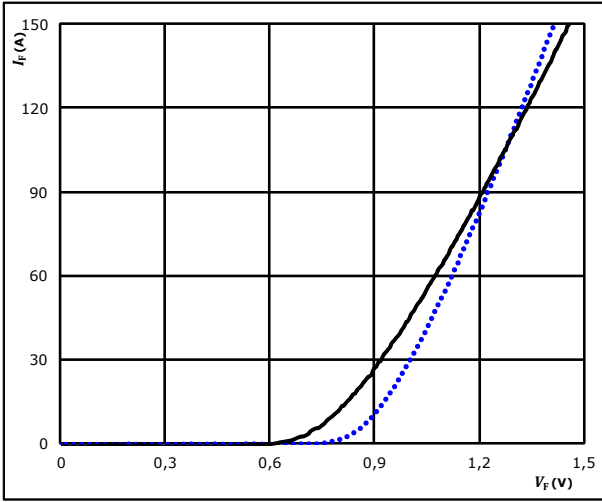
Vincotech

### D8,D9,D10,D11,D12,D13

**figure 1. Rectifier**

Typical forward characteristics

$$I_F = f(V_F)$$

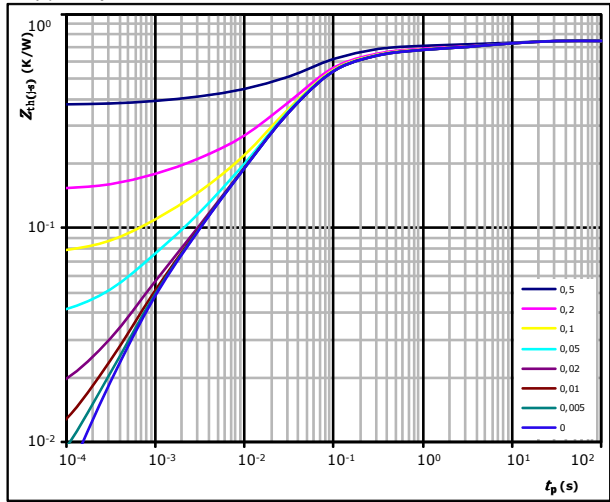


$t_p = 250 \mu s$   $T_j: 25 \text{ } ^\circ\text{C}$  (dotted blue line)  
 $125 \text{ } ^\circ\text{C}$  (solid black line)

**figure 2. Rectifier**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,75 \text{ K/W}$



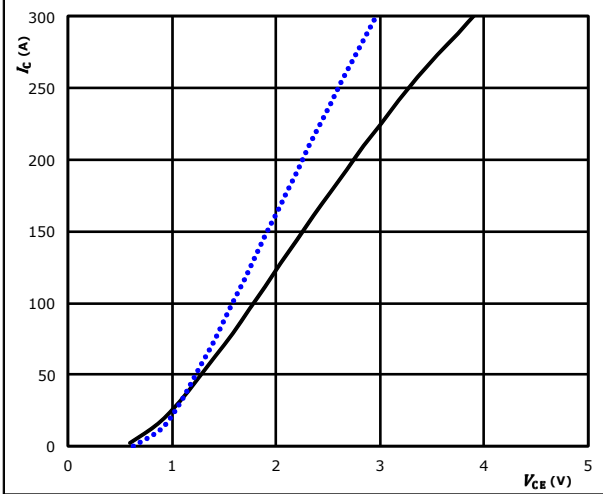
Vincotech

T1,T2,T3,T4,T5,T6,T7

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

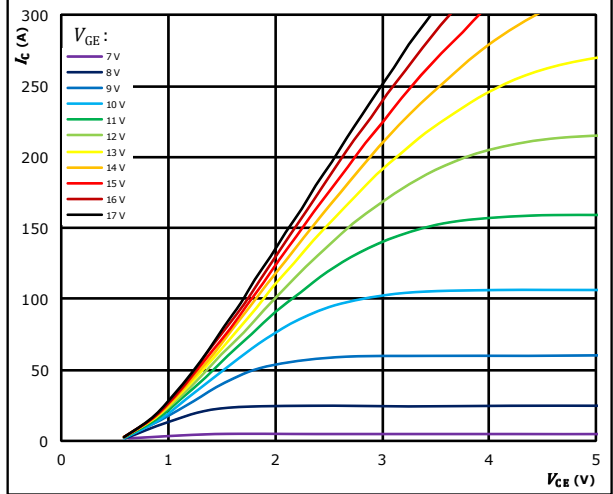


$t_p = 250 \mu s$   $T_j: 25 \text{ }^\circ C$  (dotted blue line)  
 $V_{GE} = 15 V$   $T_j: 125 \text{ }^\circ C$  (solid black line)

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

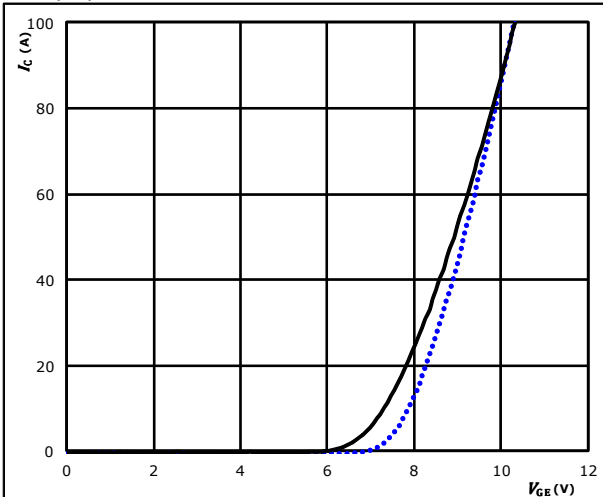


$t_p = 250 \mu s$   
 $T_j = 125 \text{ }^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

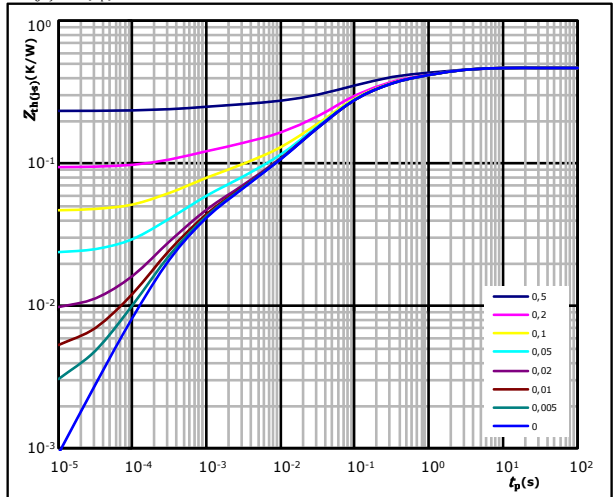


$t_p = 100 \mu s$   $T_j: 25 \text{ }^\circ C$  (dotted blue line)  
 $V_{CE} = 10 V$   $T_j: 125 \text{ }^\circ C$  (solid black line)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



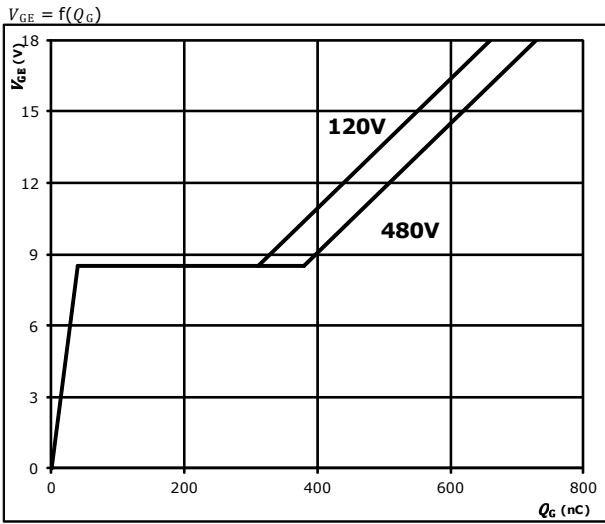
$D = t_p / T$   
 $R_{th(j-s)} = 0,47 \text{ K/W}$



T1,T2,T3,T4,T5,T6,T7

figure 5. IGBT

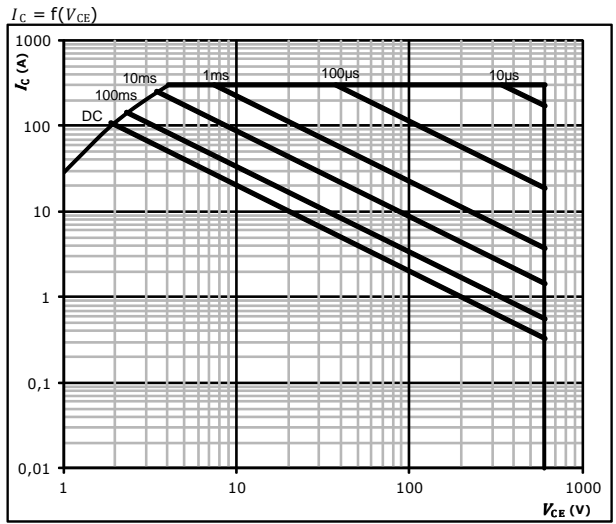
Gate voltage vs gate charge



$I_C = 100$  A

figure 6. IGBT

Safe operating area



$D =$  single pulse  
 $T_s = 80$  °C  
 $V_{GE} = \pm 15$  V  
 $T_j = T_{jmax}$

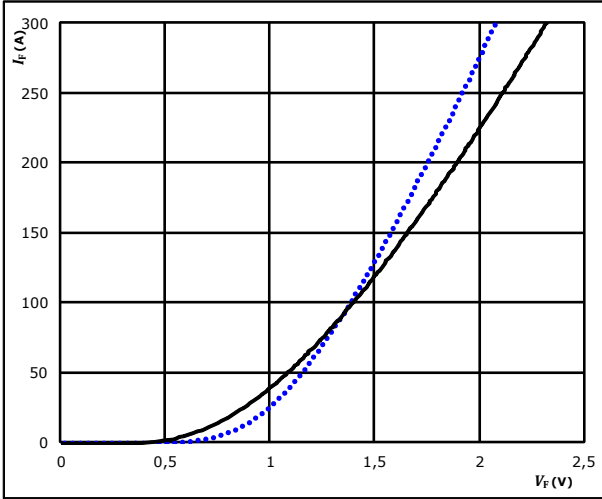


### D1,D2,D3,D4,D5,D6,D7

**figure 1.** FWD

Typical forward characteristics

$$I_F = f(V_F)$$

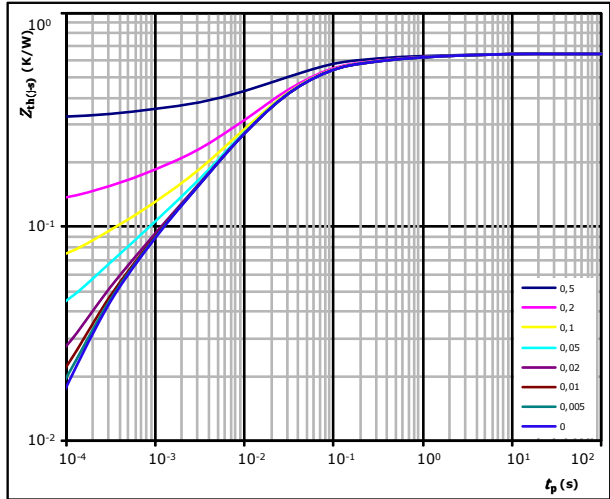


$t_p = 250 \mu s$   $T_j: 25 \text{ }^\circ\text{C}$  (dotted blue line)  $125 \text{ }^\circ\text{C}$  (solid black line)

**figure 2.** FWD

Transient thermal impedance as a function of pulse width

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



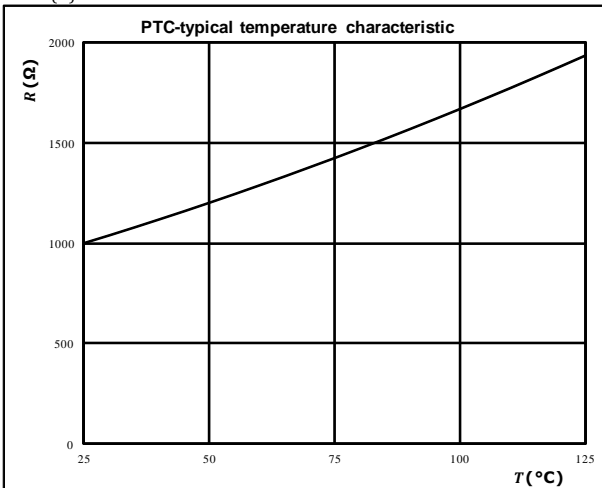
$D = t_p / T$   
 $R_{th(j-s)} = 0,64 \text{ K/W}$

### Thermistor Characteristics

**figure 1.** Thermistor

Typical PTC characteristic  
as a function of temperature

$$R = f(T)$$







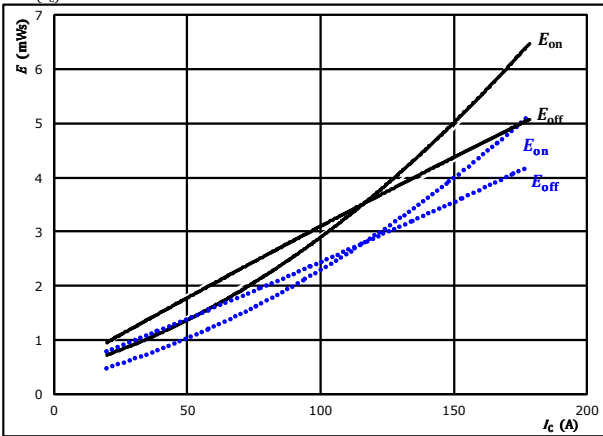
Vincotech

T1,T2,T3,T4,T5,T6,T7/D1,D2,D3,D4,D5,D6,D7

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_c)$



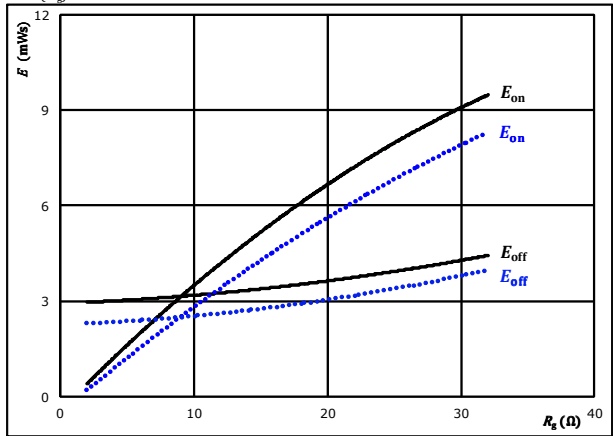
With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 8$  Ω  
 $R_{goff} = 8$  Ω

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



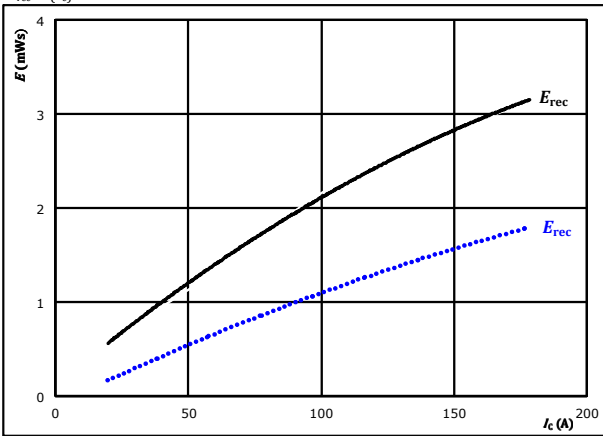
With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



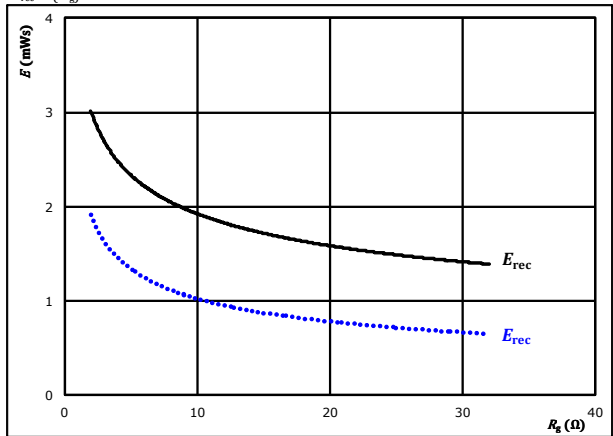
With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 8$  Ω

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at  $T_j$ : 25 °C (dotted blue line) / 125 °C (solid black line)

$V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A



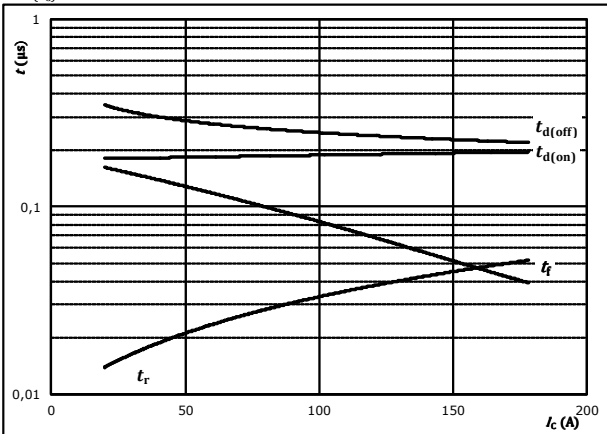
Vincotech

T1,T2,T3,T4,T5,T6,T7/D1,D2,D3,D4,D5,D6,D7

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_c)$



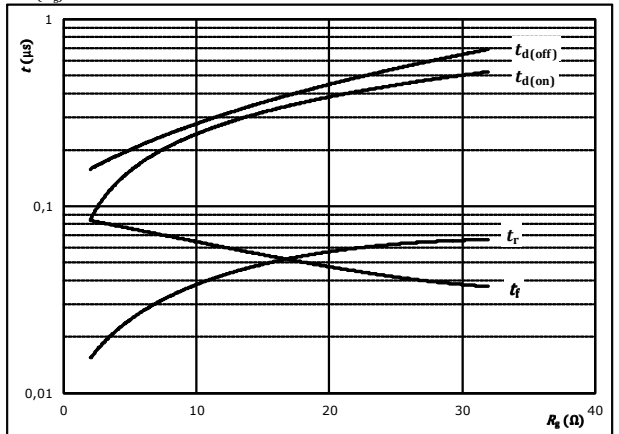
With an inductive load at

- $T_j = 125 \text{ } ^\circ\text{C}$
- $V_{CE} = 300 \text{ V}$
- $V_{GE} = \pm 15 \text{ V}$
- $R_{g\text{on}} = 8 \text{ } \Omega$
- $R_{g\text{off}} = 8 \text{ } \Omega$

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



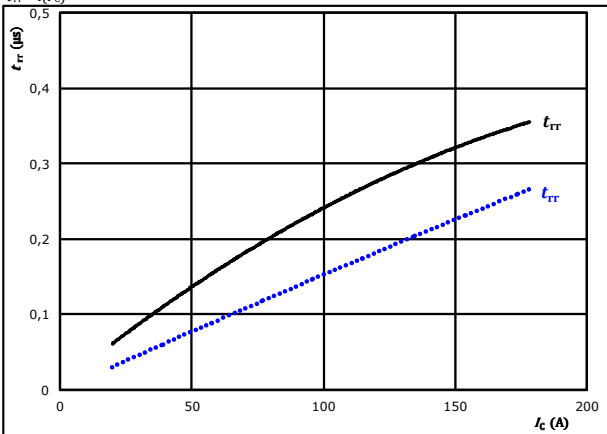
With an inductive load at

- $T_j = 125 \text{ } ^\circ\text{C}$
- $V_{CE} = 300 \text{ V}$
- $V_{GE} = \pm 15 \text{ V}$
- $I_c = 100 \text{ A}$

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$



With an inductive load at

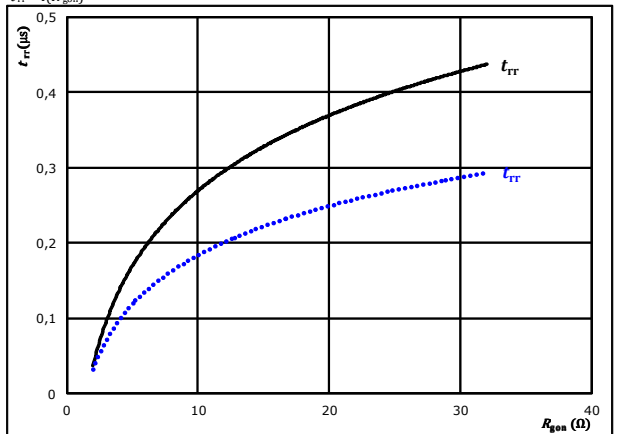
- $V_{CE} = 300 \text{ V}$
- $V_{GE} = \pm 15 \text{ V}$
- $R_{g\text{on}} = 8 \text{ } \Omega$

$T_j$ : 25 °C (solid line)  
125 °C (dotted line)

figure 8. FWD

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

$t_{rr} = f(R_{g\text{on}})$



With an inductive load at

- $V_{CE} = 300 \text{ V}$
- $V_{GE} = \pm 15 \text{ V}$
- $I_c = 100 \text{ A}$

$T_j$ : 25 °C (solid line)  
125 °C (dotted line)



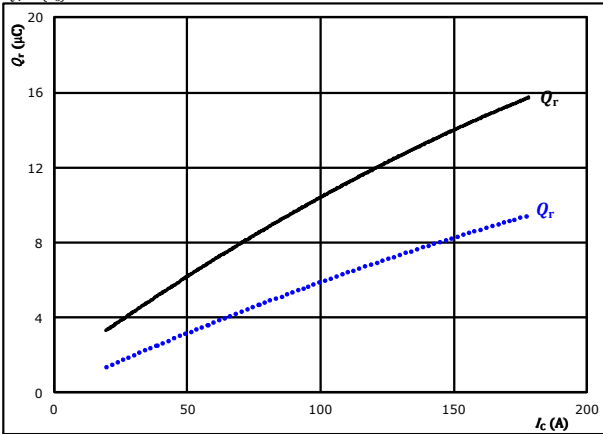
Vincotech

T1,T2,T3,T4,T5,T6,T7/D1,D2,D3,D4,D5,D6,D7

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_c)$

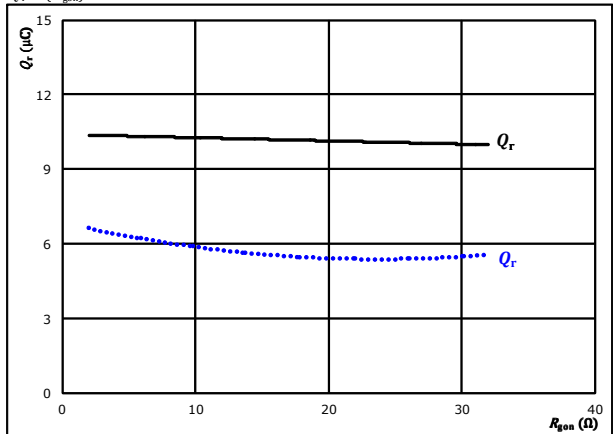


With an inductive load at  
 $V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gdn} = 8$  Ω  
 $T_j: 25$  °C (dotted blue line)  
 $125$  °C (solid black line)

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$Q_r = f(R_{gdn})$

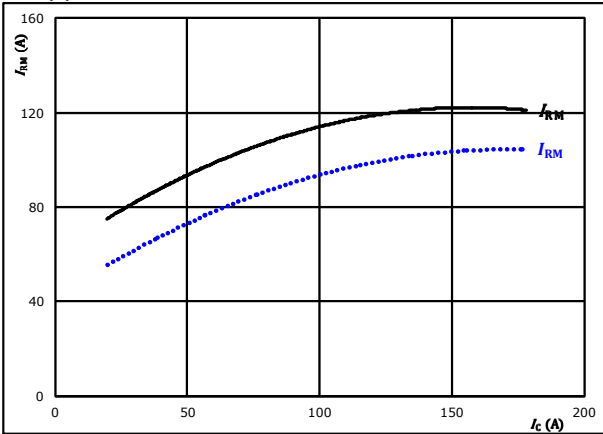


With an inductive load at  
 $V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A  
 $T_j: 25$  °C (dotted blue line)  
 $125$  °C (solid black line)

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_c)$

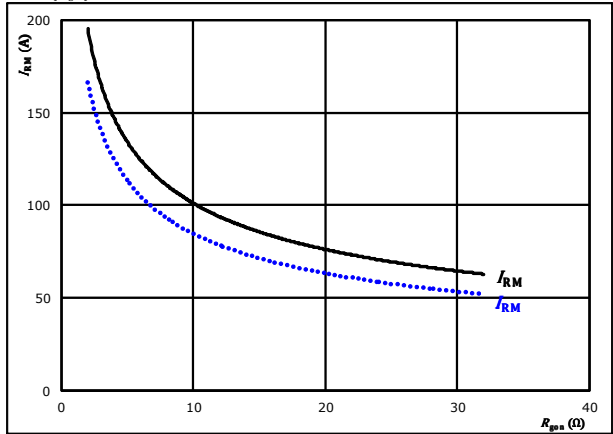


With an inductive load at  
 $V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gdn} = 8$  Ω  
 $T_j: 25$  °C (dotted blue line)  
 $125$  °C (solid black line)

figure 12. FWD

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

$I_{RM} = f(R_{gdn})$



With an inductive load at  
 $V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 100$  A  
 $T_j: 25$  °C (dotted blue line)  
 $125$  °C (solid black line)

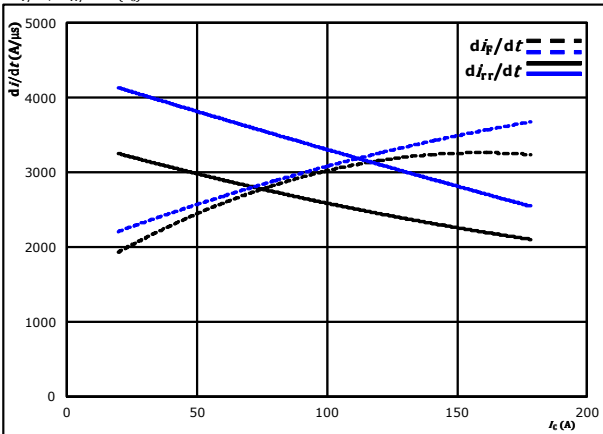


Vincotech

T1,T2,T3,T4,T5,T6,T7/D1,D2,D3,D4,D5,D6,D7

figure 13. FWD

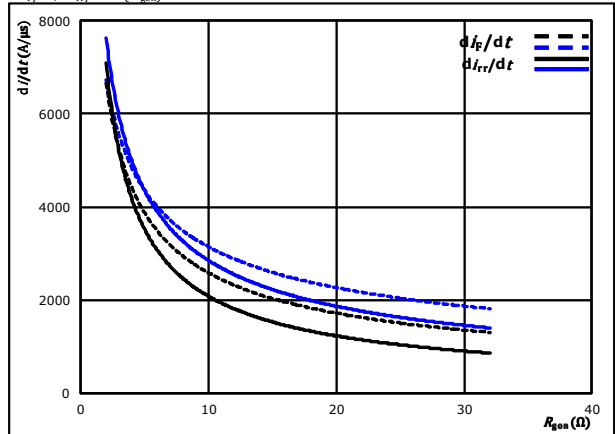
Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_f/dt, di_{rr}/dt = f(I_c)$



With an inductive load at  
 $V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 8$   $\Omega$   
 $T_j = 25$  °C  
 $125$  °C

figure 14. FWD

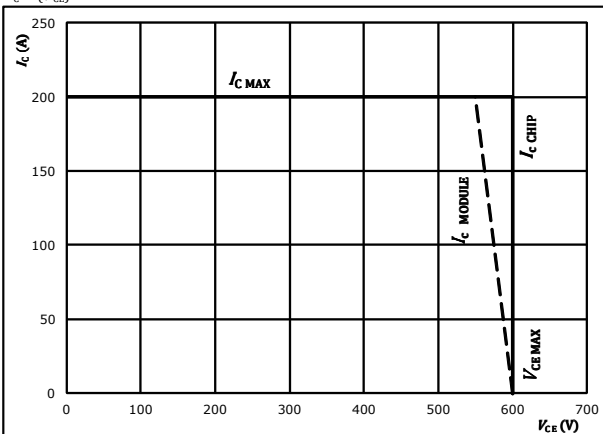
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor  
 $di_f/dt, di_{rr}/dt = f(R_{gon})$



With an inductive load at  
 $V_{CE} = 300$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 100$  A  
 $T_j = 25$  °C  
 $125$  °C

figure 15. IGBT

Reverse bias safe operating area  
 $I_C = f(V_{CE})$



At  
 $T_j = 125$  °C  
 $R_{gon} = 8$   $\Omega$   
 $R_{goff} = 8$   $\Omega$



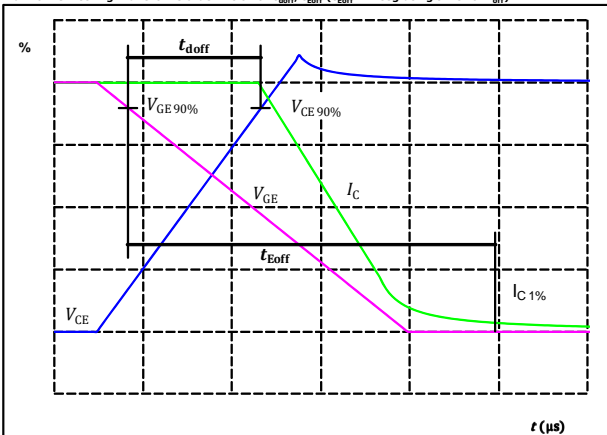
## Switching Definitions Output Inverter

**General conditions**

$T_j$	=	125 °C
$R_{gon}$	=	8 $\Omega$
$R_{goff}$	=	8 $\Omega$

**figure 1.** IGBT

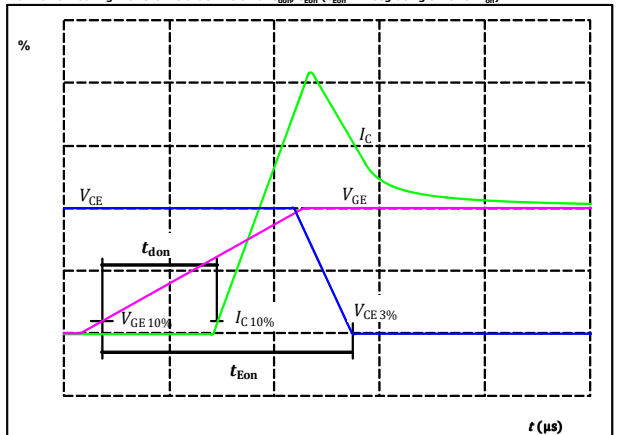
Turn-off Switching Waveforms & definition of  $t_{doff}$   $t_{Eoff}$  ( $t_{Eoff}$  = integrating time for  $E_{off}$ )



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	300	V
$I_C(100\%) =$	100	A
$t_{doff} =$	242	ns

**figure 2.** IGBT

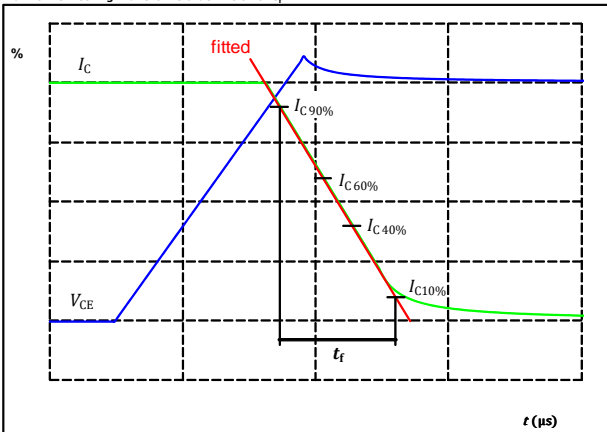
Turn-on Switching Waveforms & definition of  $t_{don}$   $t_{Eon}$  ( $t_{Eon}$  = integrating time for  $E_{on}$ )



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	300	V
$I_C(100\%) =$	100	A
$t_{don} =$	187	ns

**figure 3.** IGBT

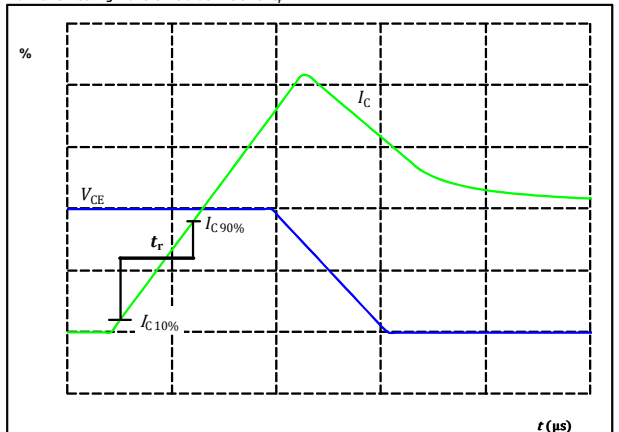
Turn-off Switching Waveforms & definition of  $t_f$



$V_C(100\%) =$	300	V
$I_C(100\%) =$	100	A
$t_f =$	87	ns

**figure 4.** IGBT

Turn-on Switching Waveforms & definition of  $t_r$

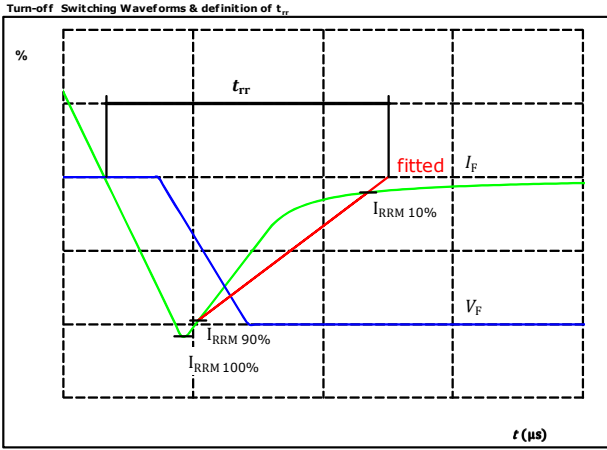


$V_C(100\%) =$	300	V
$I_C(100\%) =$	100	A
$t_r =$	33	ns



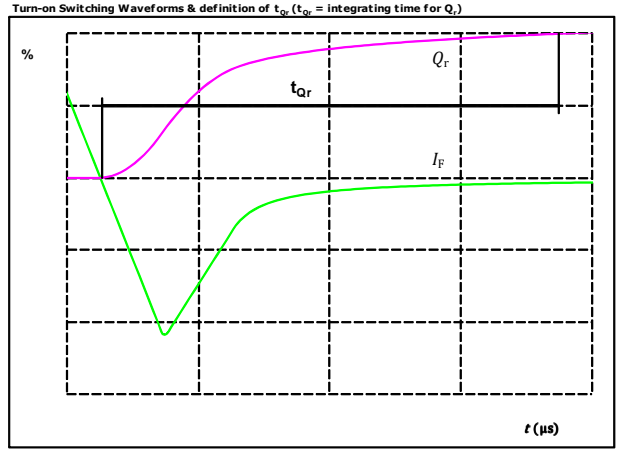
## Switching Definitions Output Inverter

figure 5. FWD



$V_F(100\%) =$	300	V
$I_F(100\%) =$	100	A
$I_{RRM}(100\%) =$	113	A
$t_{rr} =$	248	ns

figure 6. FWD



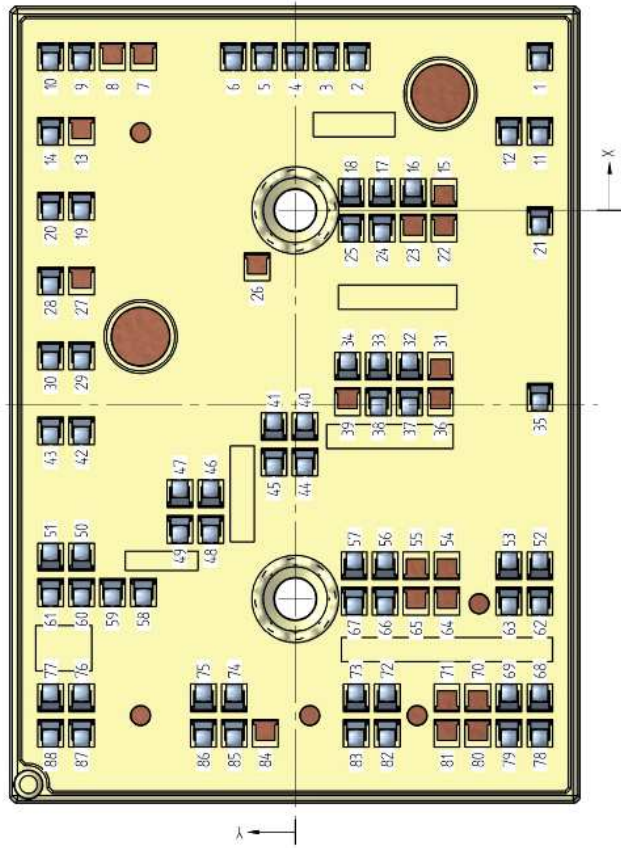
$I_F(100\%) =$	100	A
$Q_r(100\%) =$	10,50	$\mu\text{C}$



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Ordering Code & Marking							
Version				Ordering Code			
With std lid (6.5mm height) + no thermal grease				V23990-K243-A-/0A/-PM			
With thin lid (2.8mm height) + no thermal grease				V23990-K243-A-/0B/-PM			
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)				V23990-K243-A-/1A/-PM			
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)				V23990-K243-A-/1B/-PM			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)				V23990-K243-A-/4A/-PM			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)				V23990-K243-A-/4B/-PM			
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)				V23990-K243-A-/5A/-PM			
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)				V23990-K243-A-/5B/-PM			
	Text	VIN	Date code	Name&Ver	UL	Lot	Serial
		VIN	WWYY	NNNNNNVV	UL	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
		NNNNNNVV	LLLLL	SSSS	WWYY		

Outline							
PCB pad table				PCB pad table			
Pin	X	Y	Function	Pin	X	Y	Function
1	15,83	-25,3	G5	48	-32,82	8,74	B
2	15,83	-6,4	E5	49	-32,82	11,94	B
3	15,83	-3,2	W	50	4,32	22,1	-B
4	15,83	0	W	51	4,32	25,3	-B
5	15,83	3,2	W	52	3,42	-25,3	+rect
6	15,83	6,4	W	53	3,42	-22,1	+rect
7	Not assembled			54	Not assembled		
8	Not assembled			55	Not assembled		
9	15,83	22,1	G6	56	3,42	-9,3	+DC
10	15,83	25,3	E6	57	3,42	-6,1	+DC
11	8,13	-25,3	-T	58	-39,32	15,7	GB
12	8,13	-22,1	+T	59	-39,32	18,9	EB
13	Not assembled			60	-39,32	22,1	-B
14	8,13	25,3	-DC	61	-39,32	25,3	-B
15	Not assembled			62	-40,22	-25,3	+rect
16	41,82	-12,18	E3	63	-40,22	-22,1	+rect
17	41,82	-8,98	V	64	Not assembled		
18	41,82	-5,79	V	65	Not assembled		
19	0,43	22,1	G4	66	-40,22	-9,3	+DC
20	0,43	25,3	E4	67	-40,22	-6,09	+DC
21	-1,07	-25,3	G3	68	-10,18	-25,3	L1
22	Not assembled			69	-10,18	-22,1	L1
23	Not assembled			70	Not assembled		
24	-1,82	-8,98	V	71	Not assembled		
25	-1,82	-5,79	V	72	-10,18	-9,5	L2
26	Not assembled			73	-10,18	-6,3	L2
27	Not assembled			74	-10,18	6,3	-rect
28	-7,27	25,3	-DC	75	-10,18	9,5	-rect
29	-14,97	22,1	G2	76	-10,18	22,1	L3
30	-14,97	25,3	E2	77	-10,18	25,3	L3
31	Not assembled			78	-53,82	-25,3	L1
32	23,95	-11,82	U	79	-53,82	-22,1	L1
33	23,95	-8,63	U	80	Not assembled		
34	23,95	-5,42	E1	81	Not assembled		
35	-19,22	-25,3	G1	82	-53,82	-9,5	L2
36	Not assembled			83	-53,82	-6,3	L2
37	-19,7	-11,82	U	84	Not assembled		
38	-19,7	-8,62	U	85	-53,82	6,3	-rect
39	Not assembled			86	-53,82	9,5	-rect
40	17,74	-1	+B	87	-53,82	22,1	L3
41	17,74	2,2	+B	88	-53,82	25,3	L3
42	-22,67	22,1	-DC				
43	-22,67	25,3	-DC				
44	-25,9	-1	+B				
45	-25,9	2,2	+B				
46	10,82	8,74	B				
47	10,82	11,94	B				

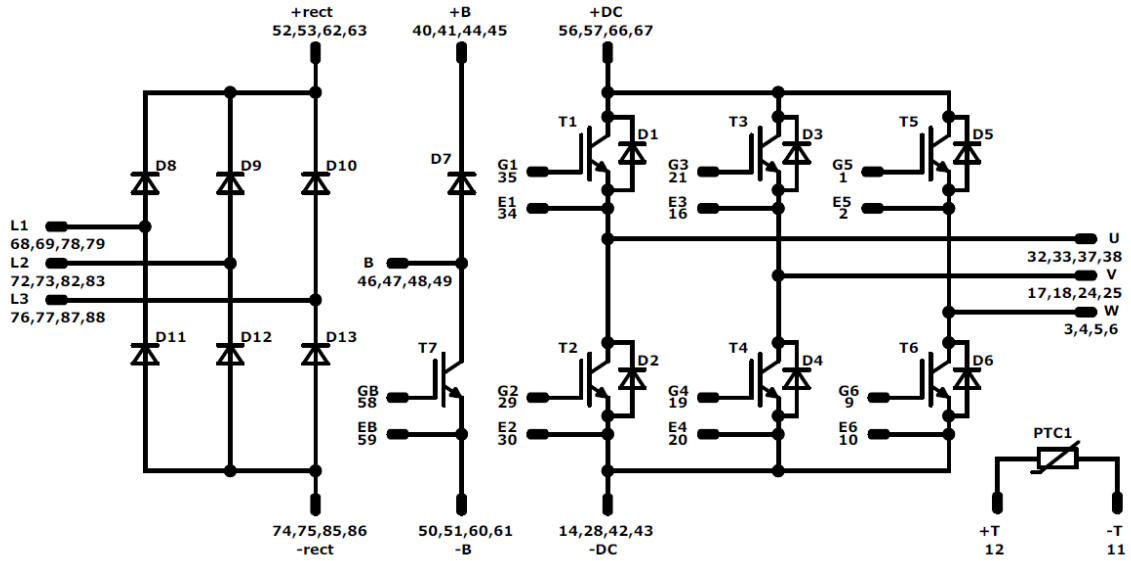


Pad positions refers to center point. For more informations on pad design please see package data



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**Pinout**



**Identification**

ID	Component	Voltage	Current	Function	Comment
D8, D9, D10, D11, D12, D13	Rectifier	1600 V	50 A	Rectifier Diode	
T1, T2, T3, T4, T5, T6	IGBT	600 V	100 A	Inverter Switch	
D1, D2, D3, D4, D5, D6	FWD	600 V	100 A	Inverter Diode	
T7	IGBT	600 V	100 A	Brake Switch	
D7	FWD	600 V	100 A	Brake Diode	
PTC1	PTC			Thermistor	






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Packaging instruction			
Standard packaging quantity (SPQ) 48	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for MiniSkiiP® 3 packages see vincotech.com website.

Package data
Package data for MiniSkiiP® 3 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-K243-A-D4-14	09 Oct. 2018	Thermal interface change to HPTP	All

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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.