



Vincotech

80-M1066PA030SA-K543F10

datasheet

MiniSKiiP® PACK 1

600 V / 30 A

Features

- Sixpack topology
- Open emitter configuration
- Solder-free spring contact technology
- Integrated thermal sensor

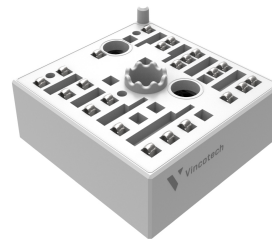
Target applications

- Embedded Drives
- Industrial Drives

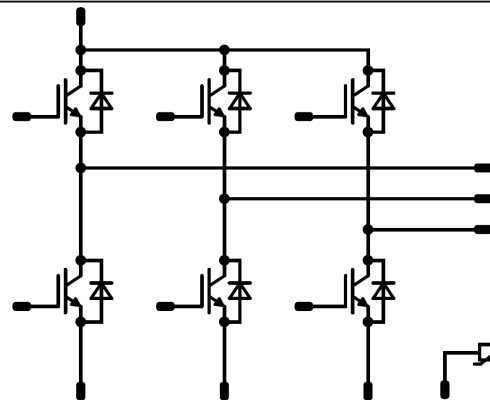
Types

- 80-M1066PA030SA-K543F10

MiniSKiiP® 1 16 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		600	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	35	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	90	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	79	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	μs
Maximum junction temperature	T_{jmax}		175	$^{\circ}\text{C}$

Inverter Diode

Peak repetitive reverse voltage	V_{RRM}		600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	29	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	60	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	53	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
Isolation voltage	V_{isol}	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		≥ 600	

*100 % tested in production



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Characteristic Values

Parameter	Symbol	Conditions					Values			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	

Inverter Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00043	25	5	5,8	6,5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		30	25 125 150	1,1	1,76 1,88 1,95	1,9 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	600		25			1,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		1630		pF
Output capacitance	C_{oes}							108		pF
Reverse transfer capacitance	C_{res}							50		pF

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						1,2		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16 \Omega$ $R_{goff} = 16 \Omega$	± 15	350	30	25 125 150		114,4 113,6 113,44		ns
Rise time	t_r					25 125 150		35,04 38,08 38,56		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		172,64 196,48 202,72		ns
Fall time	t_f					25 125 150		82,54 99,8 116,32		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		0,781 1,1 1,18		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,917 1,28 1,38		mWs



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Characteristic Values

Parameter	Symbol	Conditions					Values			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	

Inverter Diode

Static

Forward voltage	V_F				30	25 125 150	1,25	1,95 1,89 1,89	1,95 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 600$ V				25			27	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 2,5$ W/mK (HPTP)						1,78		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=724$ A/µs $di/dt=675$ A/µs $di/dt=664$ A/µs	± 15	350	30	25 125 150		9,93 15,94 17,63		A
Reverse recovery time	t_{rr}					25 125 150		221,06 294,92 323,32		ns
Recovered charge	Q_r					25 125 150		1,01 2,2 2,64		µC
Reverse recovered energy	E_{rec}					25 125 150		0,245 0,524 0,636		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		34,91 118,52 121,19		A/µs



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Characteristic Values

Parameter	Symbol	Conditions					Values			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	

Thermistor

Static

Rated resistance	R					25		1		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1670 \Omega$				100	-2		2	%
Maximum Current	I_{max}							3		mA
Power dissipation constant	d					25		0,76		mW/K
A-value	A							$7,635 \times 10^{-3}$		1/K
B-value	B							$1,73 \times 10^{-5}$		1/K ²
Vincotech Thermistor Reference									E	

⁽¹⁾ Value at chip level

⁽²⁾ Only valid with pre-applied Vincotech thermal interface material.



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Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

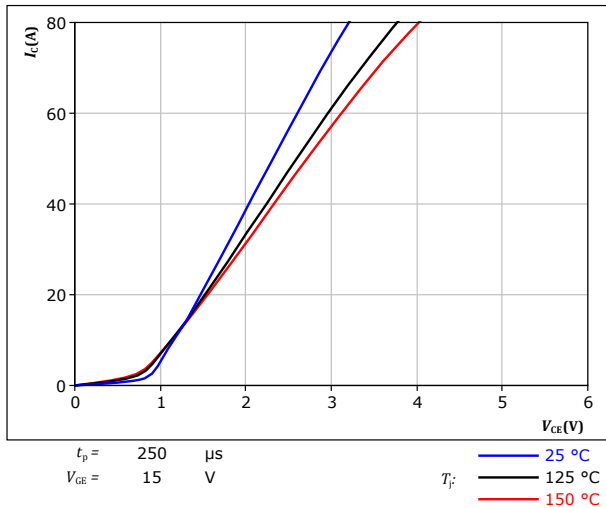


figure 2. IGBT

Typical output characteristics

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

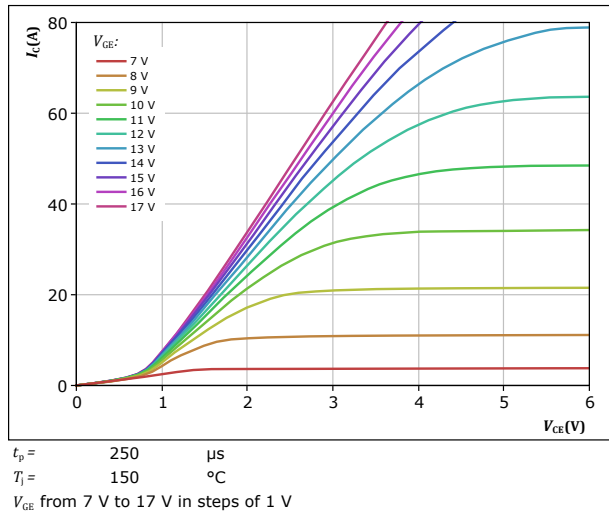


figure 3. IGBT

Typical transfer characteristics

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

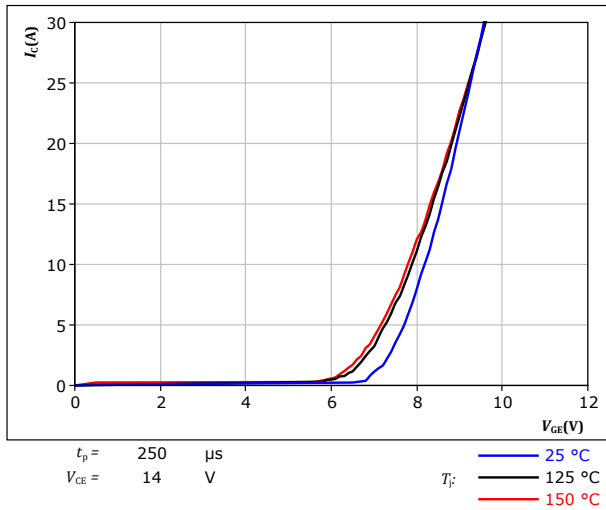
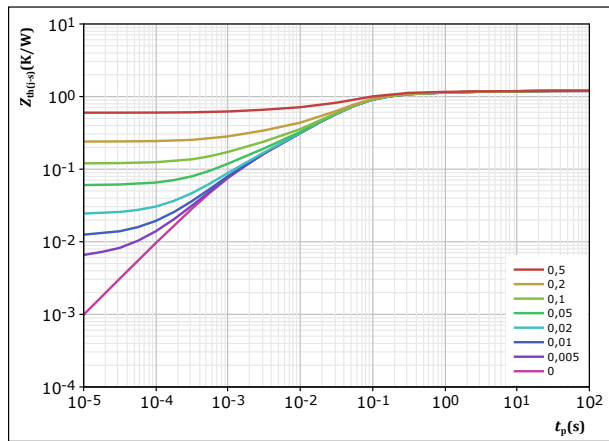


figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



IGBT thermal model values	
R (K/W)	τ (s)
4,46E-02	8,76E+00
8,37E-02	7,46E-01
2,22E-01	1,33E-01
6,43E-01	4,45E-02
1,20E-01	8,66E-03
8,04E-02	1,33E-03
5,54E-03	6,42E-04



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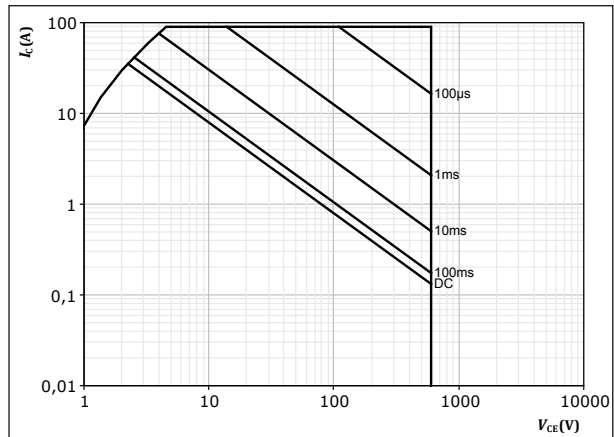
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Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

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



$D =$ single pulse

$T_s = 80$ °C

$V_{GE} = 15$ V

$T_j = T_{jmax}$



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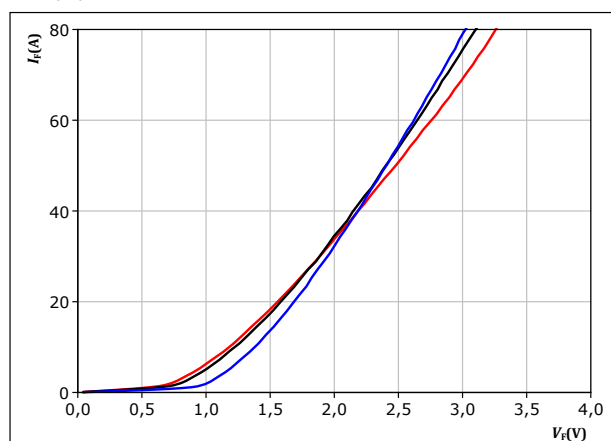
datasheet

Inverter Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

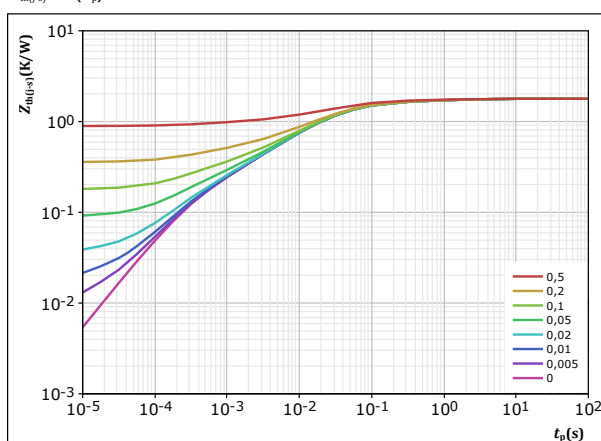
$T_j:$

- 25 °C
- 125 °C
- 150 °C

figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)} = 1,783 \text{ K/W}$

FWD thermal model values

R (K/W)	τ (s)
7,80E-02	2,71E+00
1,55E-01	3,62E-01
5,82E-01	5,21E-02
5,83E-01	1,60E-02
2,54E-01	3,00E-03
1,31E-01	3,17E-04



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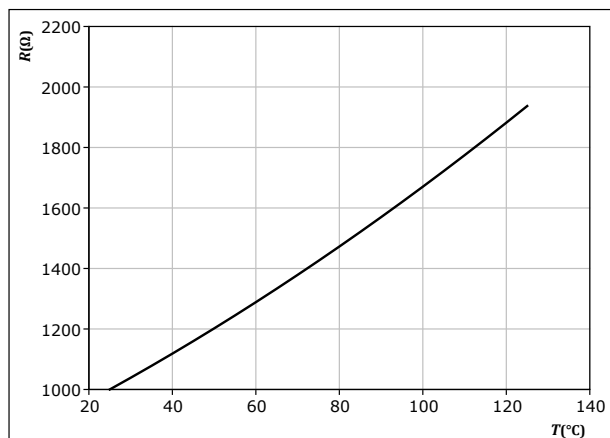
Thermistor Characteristics

figure 8.

Thermistor

Typical PTC characteristic as function of temperature

$$R_T = f(T)$$





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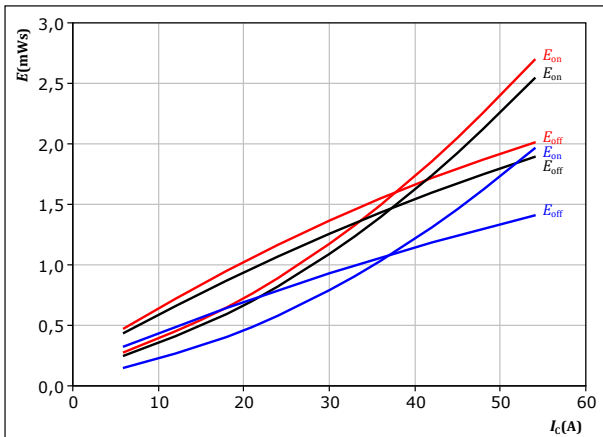
Inverter Switching Characteristics

figure 9.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

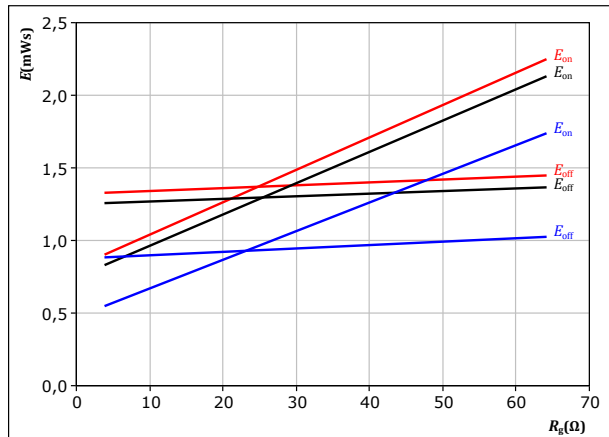
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 10.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A

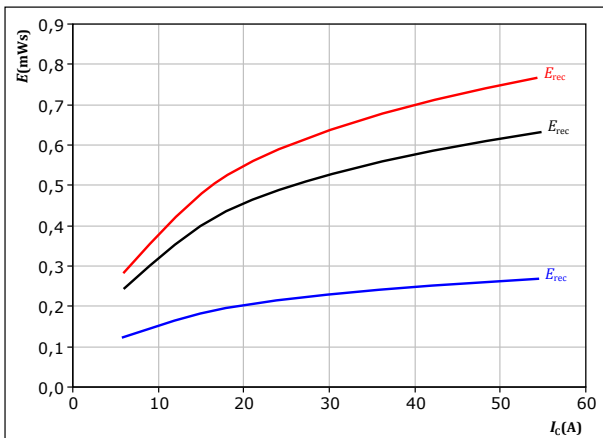
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 11.

FWD

Typical reverse recovered energy loss as a function of collector current

$$E_{rec} = f(I_c)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω

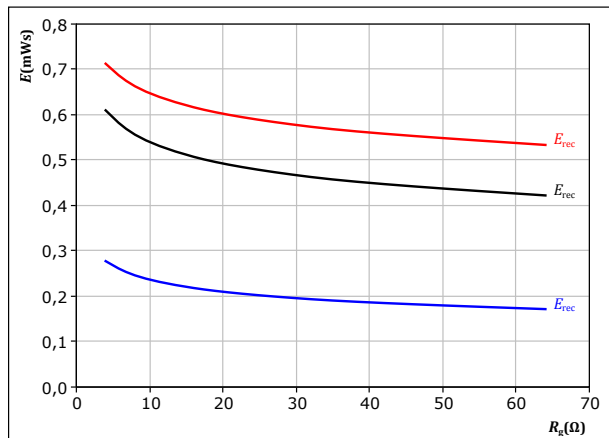
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 12.

FWD

Typical reverse recovered energy loss as a function of gate resistor

$$E_{rec} = f(R_g)$$



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



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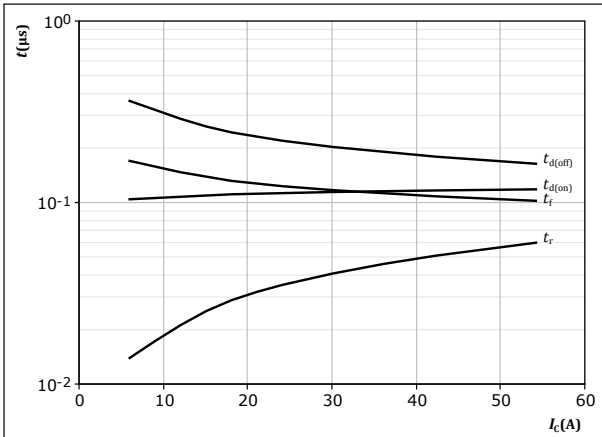
Inverter Switching Characteristics

figure 13.

IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



With an inductive load at

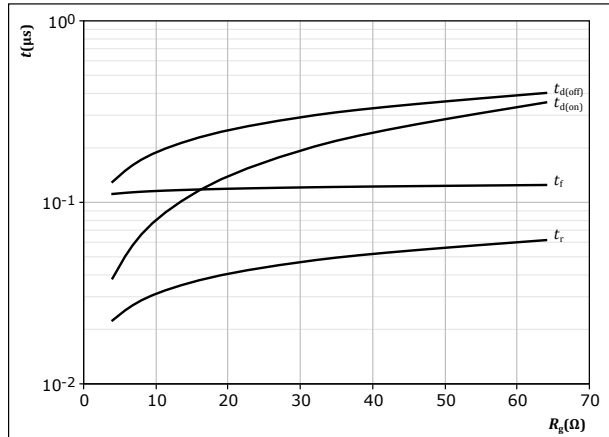
$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $R_{goff} = 16$ Ω

figure 14.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



With an inductive load at

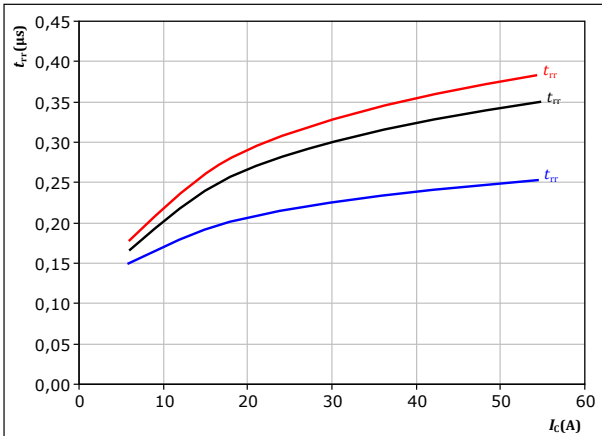
$T_j = 150$ °C
 $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A

figure 15.

FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$



With an inductive load at

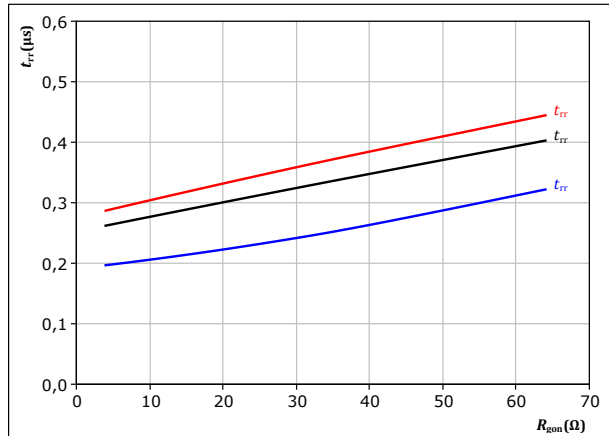
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 $T_j: 25$ °C (blue), 125 °C (black), 150 °C (red)

figure 16.

FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A
 $T_j: 25$ °C (blue), 125 °C (black), 150 °C (red)



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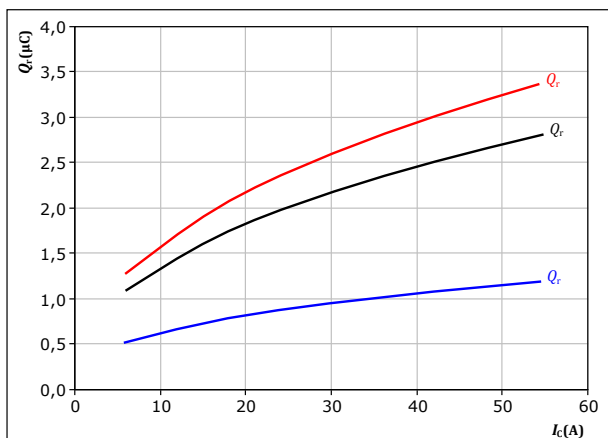
Inverter Switching Characteristics

figure 17.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

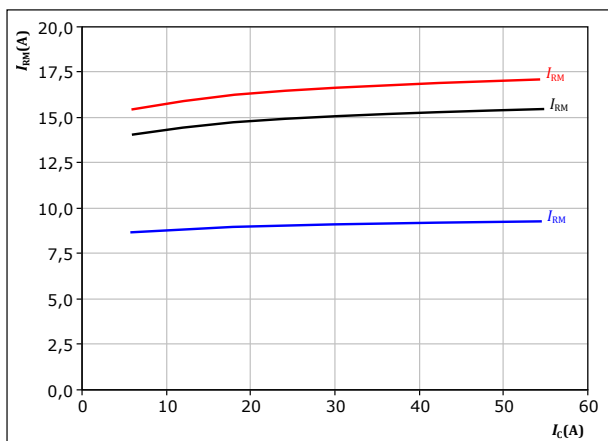
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 19.

FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$



With an inductive load at

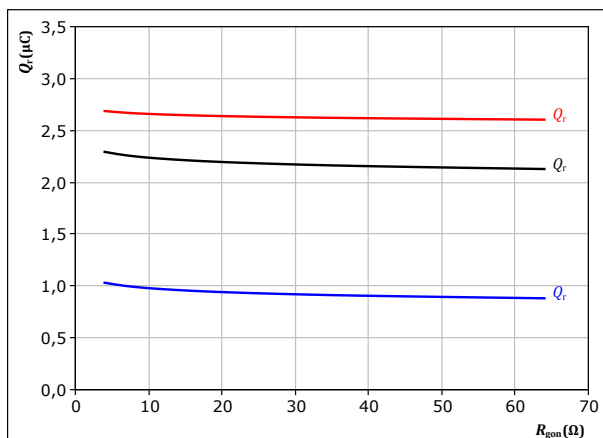
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 16$ Ω
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 18.

FWD

Typical recovered charge as a function of turn on gate resistor

$$Q_r = f(R_{gon})$$



With an inductive load at

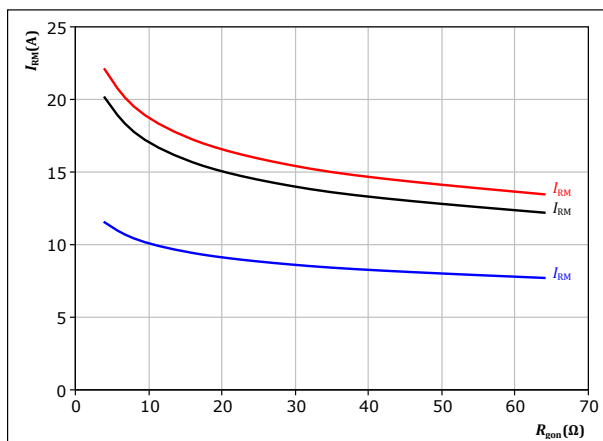
$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)

figure 20.

FWD

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

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



With an inductive load at

$V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_c = 30$ A
 T_j : 25 °C (blue), 125 °C (black), 150 °C (red)



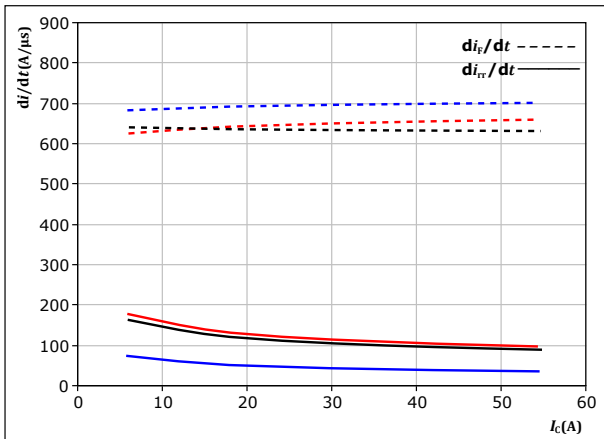
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Inverter Switching Characteristics

figure 21. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_r/dt = f(I_C)$



With an inductive load at

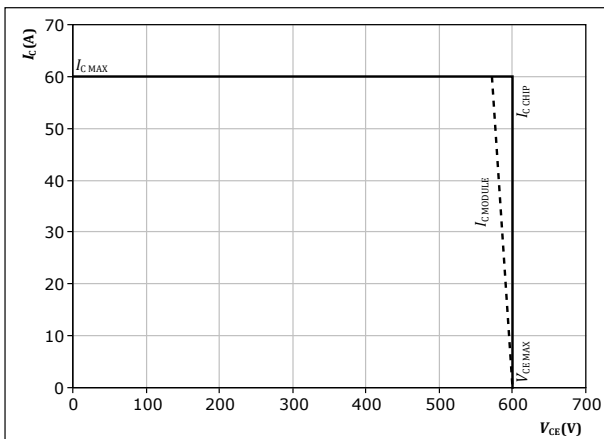
$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 23. IGBT

Reverse bias safe operating area

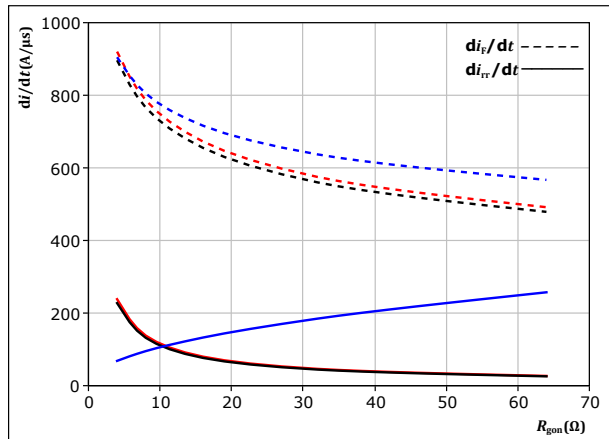
$I_C = f(V_{CE})$



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 16 \text{ } \Omega$
 $R_{goff} = 16 \text{ } \Omega$

figure 22. FWD

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



With an inductive load at

$V_{CE} = 350 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 30 \text{ A}$

T_j :
— 25 °C
— 125 °C
— 150 °C



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Inverter Switching Definitions

figure 24. IGBT

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

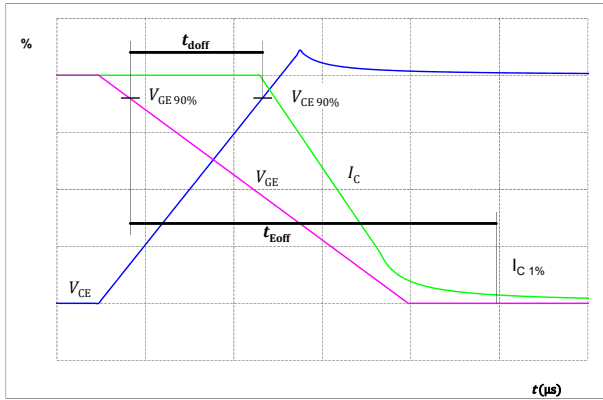


figure 25. IGBT

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

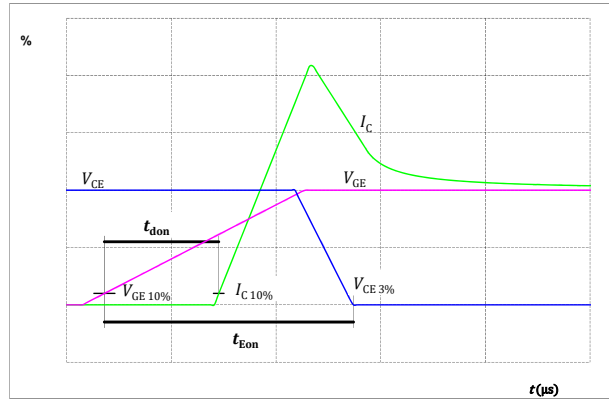


figure 26. IGBT

Turn-off Switching Waveforms & definition of t_f

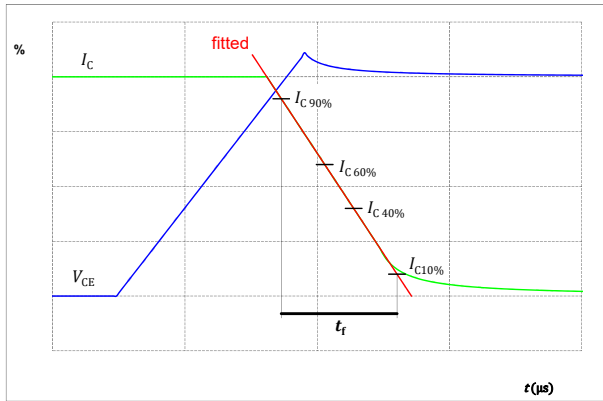
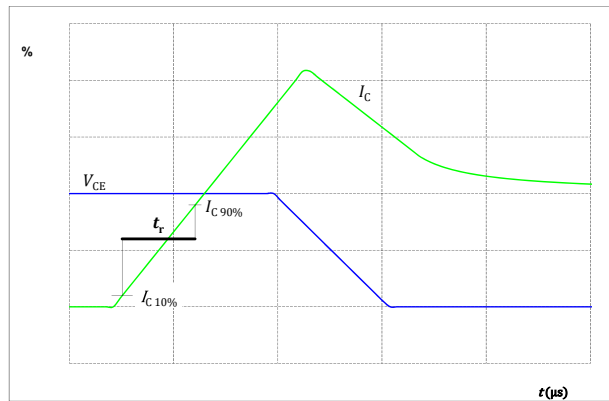


figure 27. IGBT

Turn-on Switching Waveforms & definition of t_r





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Inverter Switching Definitions

figure 28.

FWD

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

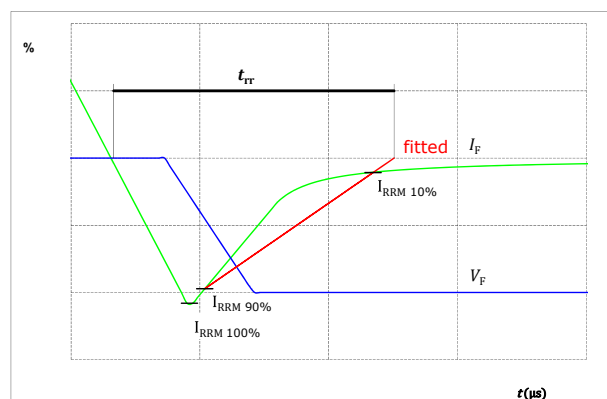
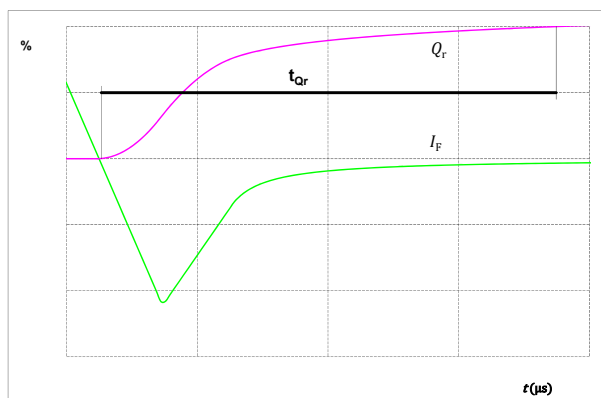


figure 29.

FWD

Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)





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datasheet

Ordering Code	
Version	Ordering Code
With std lid (6.5mm height) + no thermal grease	80-M1066PA030SA-K543F10-/0A/
With thin lid (2.8mm height) + no thermal grease	80-M1066PA030SA-K543F10-/0B/
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M1066PA030SA-K543F10-/1A/
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M1066PA030SA-K543F10-/1B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M1066PA030SA-K543F10-/4A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M1066PA030SA-K543F10-/4B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M1066PA030SA-K543F10-/5A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M1066PA030SA-K543F10-/5B/

Marking						
Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNNNN- TTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTVV	LLLLL	SSSS	WWYY		

Outline			
Pin table [mm]			
Pin	X	Y	Function
1	15,93	-14,6	G16
2	15,93	-9,8	Ph3
3	15,93	-5	Ph3
4	not assembled		
5	15,93	7,62	G15
6	15,93	12,62	Therm1
7	15,93	15,8	Therm2
8	not assembled		
9	8,23	12,62	DC-3
10	8,23	15,8	DC-3
11	7,73	-14,6	G14
12	not assembled		
13	not assembled		
14	0,53	9,45	G13
15	0,53	12,62	DC-2
16	0,53	15,8	DC-2
17	-0,47	-14,6	Ph2
18	-0,47	-9,8	Ph2
19	not assembled		
20	not assembled		
21	-7,17	12,62	DC-1
22	-7,17	15,8	DC-1
23	-8,07	-14,6	DC+
24	-8,07	-9,8	DC+
25	-15,02	-15,8	G12
26	-15,02	-9,8	Ph1
27	-15,02	0	Ph1
28	not assembled		
29	-15,02	15,8	G11

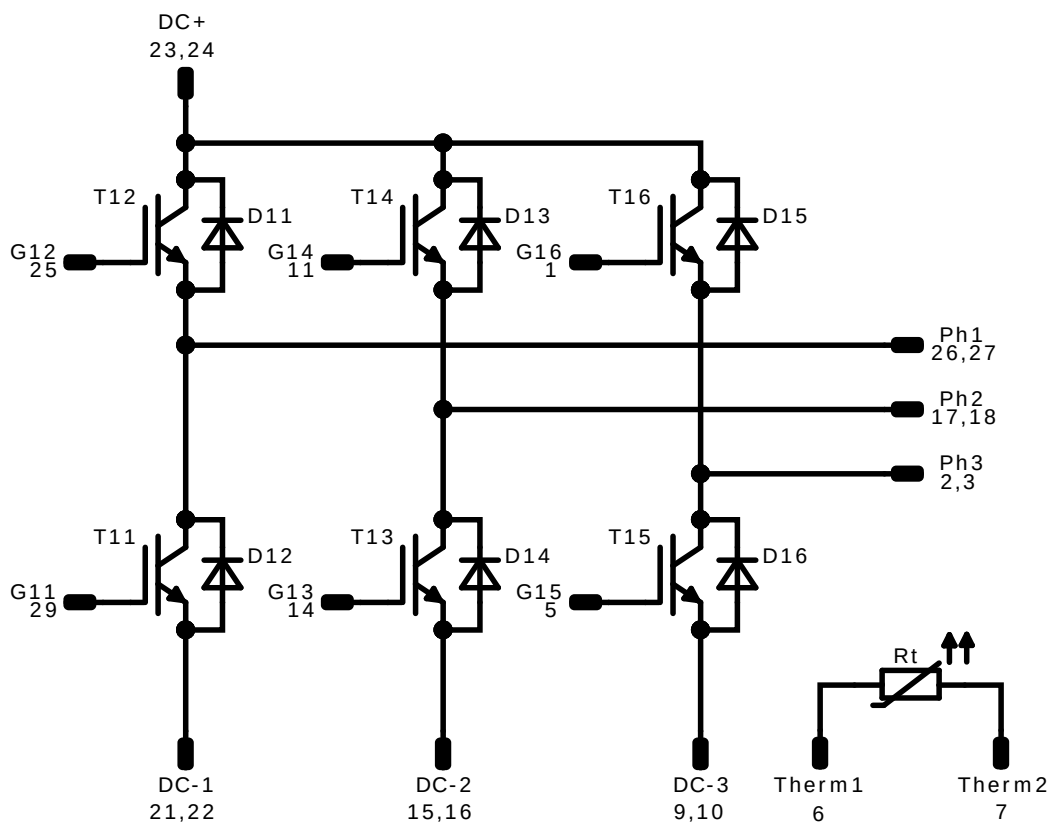
Pad positions refers to center point. For more informations on pad design please see package data



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	600 V	30 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	600 V	30 A	Inverter Diode	
Rt	Thermistor			Thermistor	



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Packaging instruction				
Standard packaging quantity (SPQ) 120	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for MiniSKiiP® 1 packages see vincotech.com website.

Package data
Package data for MiniSKiiP® 1 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at 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
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