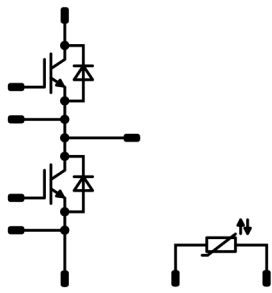




Vincotech

80-M2072PA150SA-K704F30

datasheet

MiniSkiip®DUAL 2		650 V / 150 A
Features • Half-Bridge topology • Trench IGBT and CAL diode chip technology • Integrated NTC sensor • Solderless spring contact mountig system	MiniSkiip®2 housing 	
Target applications • Charging Stations • Industrial Drives • Solar Inverters • UPS • Welding & Cutting	Schematic 	
Types • 80-M2072PA150SA-K704F30		

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Half-Bridge Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	148	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	266	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$ $V_{CE} = 360\text{ V}$ $T_j = 150\text{ °C}$	6	µs
Maximum junction temperature	T_{jmax}		175	°C



Vincotech

80-M2072PA150SA-K704F30
datasheet

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
Half-Bridge Diode				
Peak repetitive reverse voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	114	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave. $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	920	A
Surge current capability	I^2t		4232	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	181	W
Maximum junction temperature	T_{jmax}		175	°C

Module Properties

Thermal Properties

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

Half-Bridge Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0024	25	5,1	5,8	6,4	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150	0,93	1,64 1,70 1,74	1,77	V
Collector-emitter cut-off current	I_{CES}		0	650		25			7,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			1200	nA
Internal gate resistance	r_g							2		Ω
Input capacitance	C_{ies}	$f = 1 \text{ Mhz}$	0	25		25		9240		pF
Reverse transfer capacitance	C_{res}							274		

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,36		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \text{ } \Omega$ $R_{goff} = 2 \text{ } \Omega$	± 15	350	150	25 125 150		160 167 169		ns
Rise time	t_r					25 125 150		25 27 27		
Turn-off delay time	$t_{d(off)}$					25 125 150		234 261 268		
Fall time	t_f					25 125 150		53 89 96		
Turn-on energy (per pulse)*	E_{on}					25 125 150		2,19 3,10 3,48		mWs
Turn-off energy (per pulse)*	E_{off}					25 125 150		4,08 5,52 5,91		

* $L_s = 12 \text{ nH}$



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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	

Half-Bridge Diode

Static

Forward voltage	V_F				100	25 125 150		1,51 1,55 1,52		V
Reverse leakage current	I_R			650		25 150			120 40000	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 2,5 \text{ W/mK}$ (HPTP)						0,52		K/W
-------------------------------------	---------------	--	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$di/dt = 7119 \text{ A/}\mu\text{s}$ $di/dt = 7148 \text{ A/}\mu\text{s}$ $di/dt = 6617 \text{ A/}\mu\text{s}$	± 15	350	150	25 125 150		172 199 217		A
Reverse recovery time	t_{rr}					25 125 150		50 132 147		ns
Recovered charge	Q_r					25 125 150		6,06 10,93 13,85		μC
Reverse recovered energy	E_{rec}					25 125 150		1,38 2,60 3,38		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		10898 7689 7091		A/μs

Thermistor

Rated resistance	R					25		5		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 493 \Omega$				100	-5		+5	%
Power dissipation	P					25		245		mW
Power dissipation constant						25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 2 \%$				25		3375		K
B-value	$B_{(25/100)}$	Tol. $\pm 2 \%$				25		3437		K
Vincotech NTC Reference									K	



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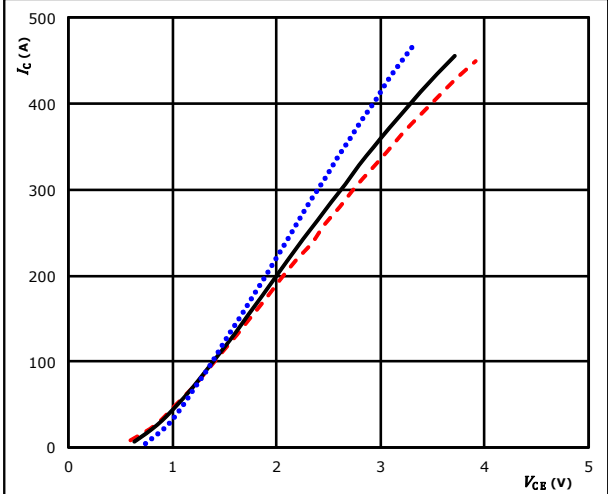
80-M2072PA150SA-K704F30 datasheet

Half-Bridge Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

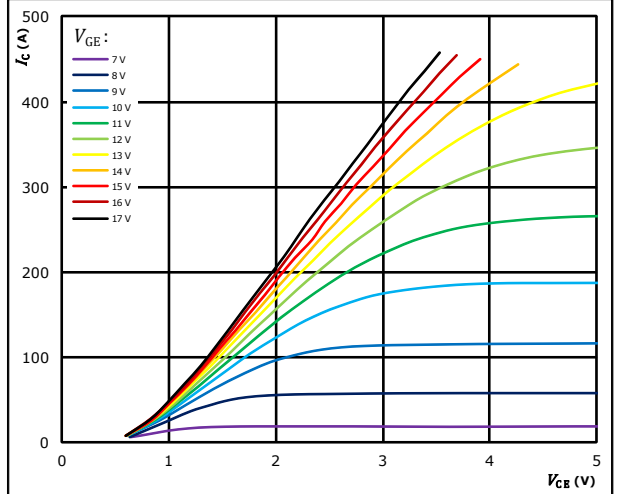


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 2. IGBT

Typical output characteristics

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

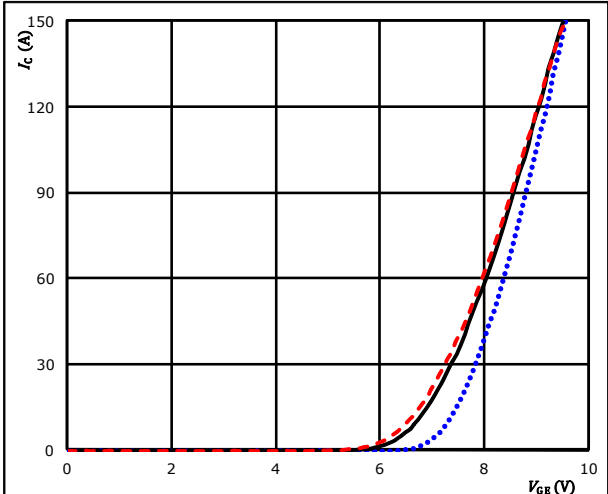


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

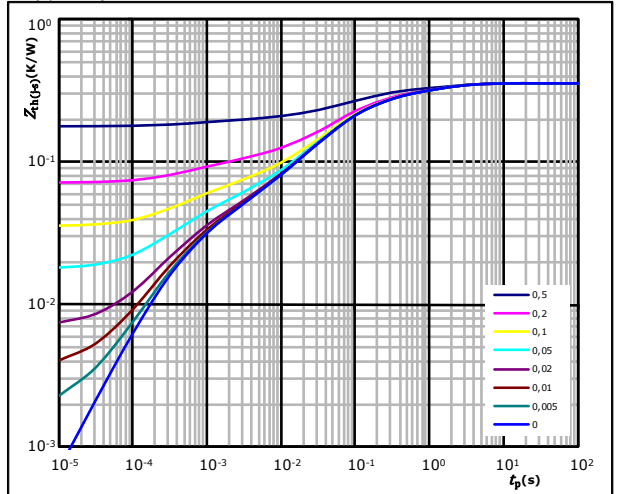


$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 0,36 \text{ K/W}$

IGBT thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
6,46E-02	2,37E+00
6,53E-02	4,48E-01
1,51E-01	9,95E-02
3,60E-02	1,90E-02
2,06E-02	2,61E-03
1,91E-02	5,17E-04



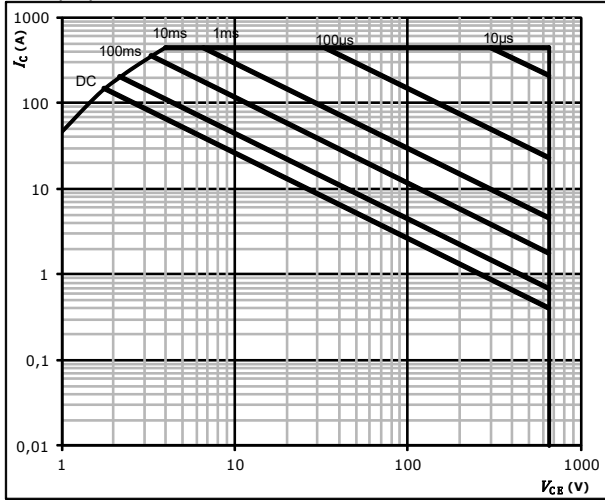
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Half-Bridge Switch Characteristics

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} °C



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Half-Bridge Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

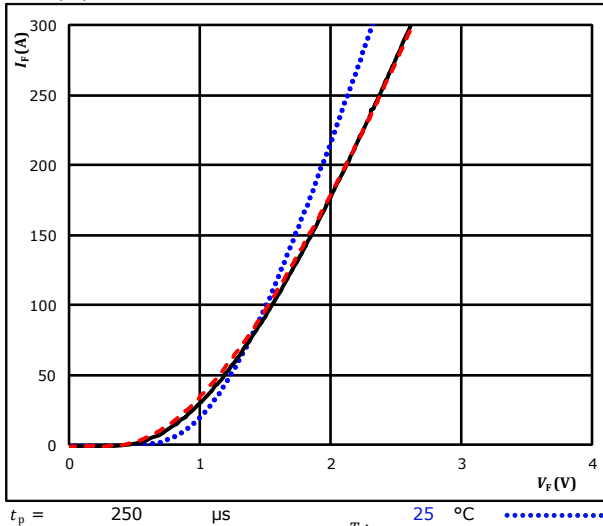
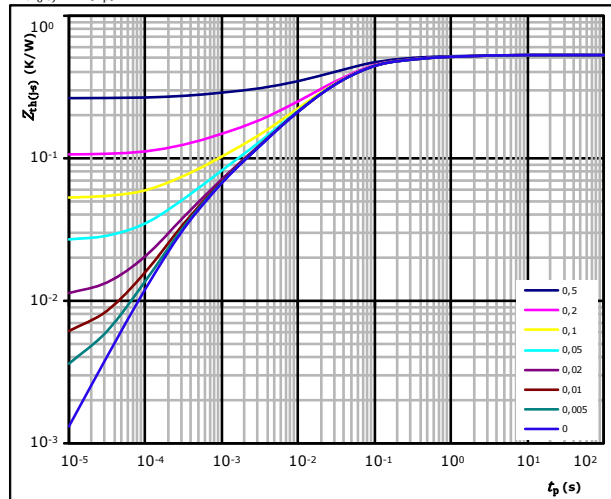


figure 2. FWD

Transient thermal impedance as a function of pulse width

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



FWD thermal model values

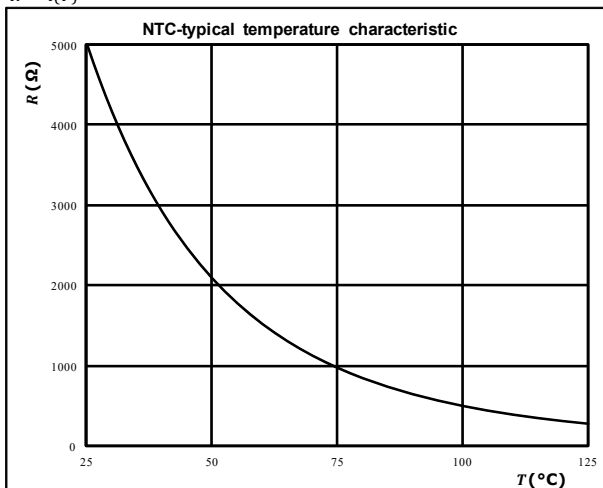
$R \text{ (K/W)}$	$\tau \text{ (s)}$
2,58E-02	4,86E-01
5,12E-02	7,54E-02
2,42E-01	1,38E-02
1,24E-01	3,08E-03
4,74E-02	6,63E-04
3,33E-02	1,11E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
as a function of temperature

$$R = f(T)$$





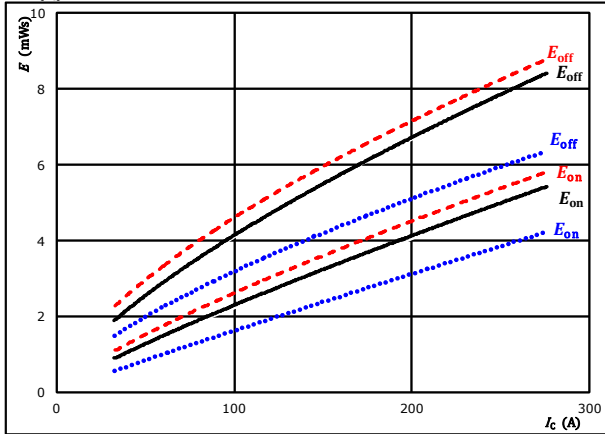
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Half-Bridge Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$$V_{CE} = 350 \text{ V}$$

$$V_{GE} = \pm 15 \text{ V}$$

$$R_{gon} = 2 \text{ } \Omega$$

$$R_{goff} = 2 \text{ } \Omega$$

T_j :

25 °C

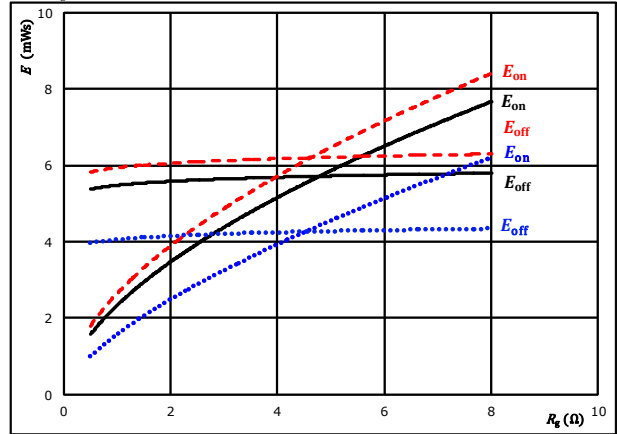
125 °C

150 °C

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$$V_{CE} = 350 \text{ V}$$

$$V_{GE} = \pm 15 \text{ V}$$

$$I_C = 150 \text{ A}$$

T_j :

25 °C

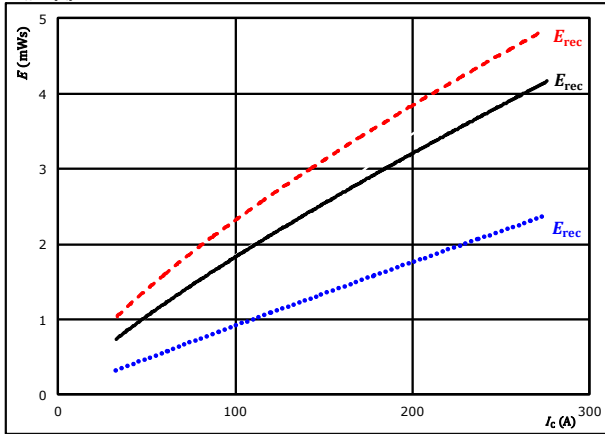
125 °C

150 °C

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$$V_{CE} = 350 \text{ V}$$

$$V_{GE} = \pm 15 \text{ V}$$

$$R_{gon} = 2 \text{ } \Omega$$

T_j :

25 °C

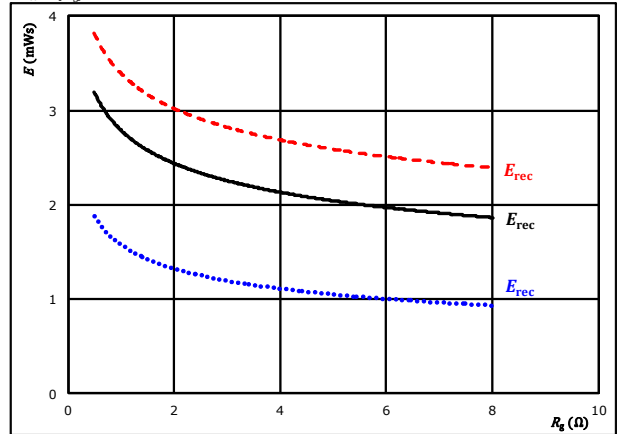
125 °C

150 °C

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$$V_{CE} = 350 \text{ V}$$

$$V_{GE} = \pm 15 \text{ V}$$

$$I_C = 150 \text{ A}$$

T_j :

25 °C

125 °C

150 °C



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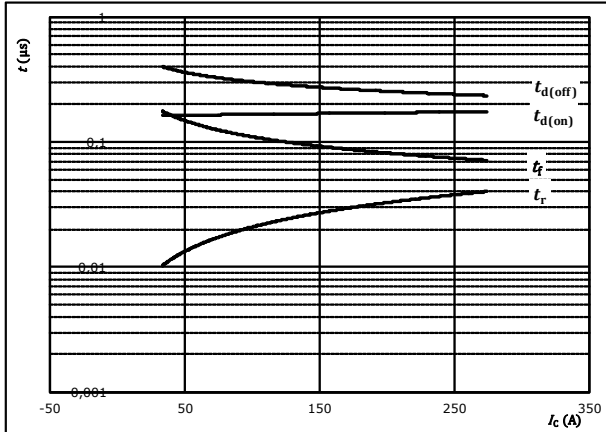
datasheet

Half-Bridge Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



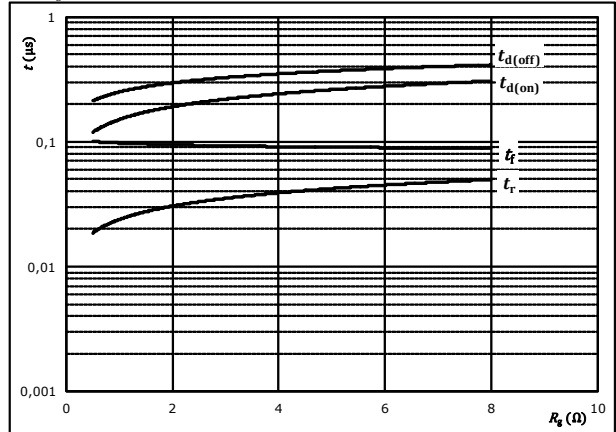
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$R_{gon} =$	2	Ω
$R_{goff} =$	2	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



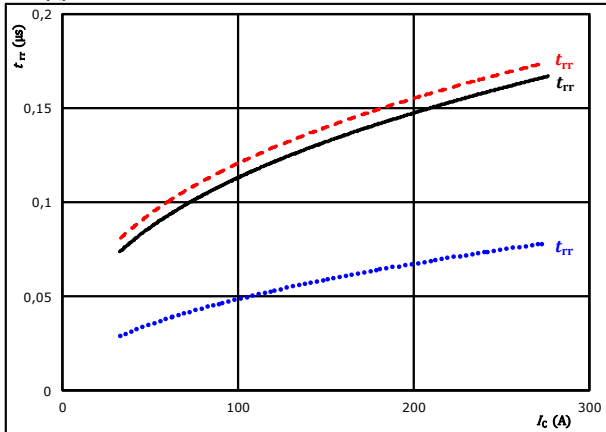
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	350	V
$V_{GE} =$	±15	V
$I_C =$	150	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

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

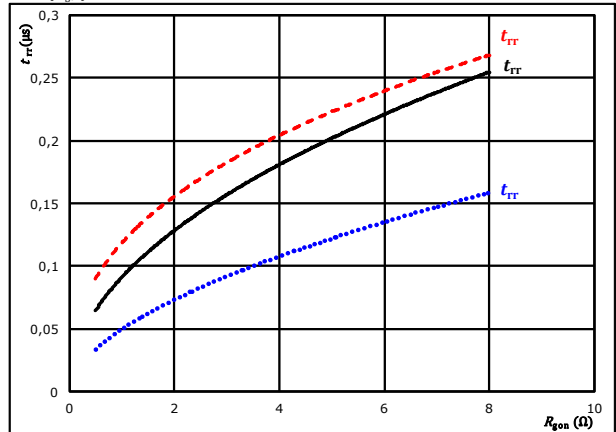


At	$V_{CE} =$	350	V	$T_j:$	25 °C	
	$V_{GE} =$	±15	V		125 °C	————
	$R_{gon} =$	2	Ω		150 °C	-----

figure 8. FWD

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

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



At	$V_{CE} =$	350	V	$T_j:$	25 °C	
	$V_{GE} =$	±15	V		125 °C	————
	$I_C =$	150	A		150 °C	-----



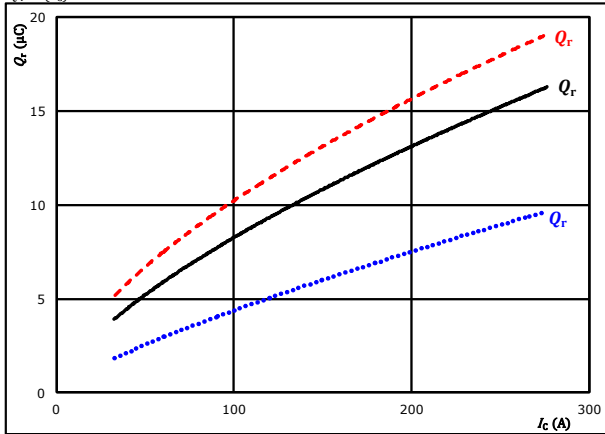
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Half-Bridge Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

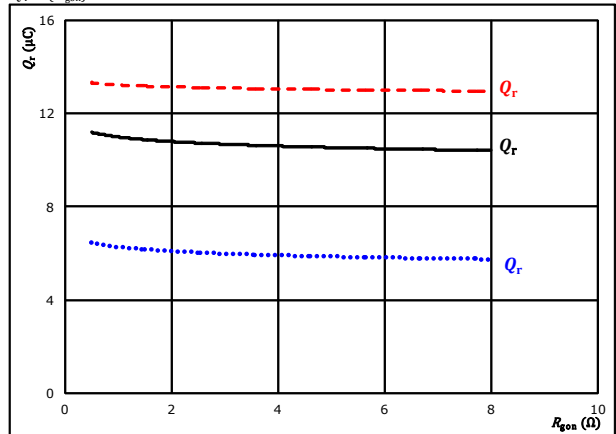


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_j = 25$ °C
125 °C
150 °C

figure 10. FWD

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

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

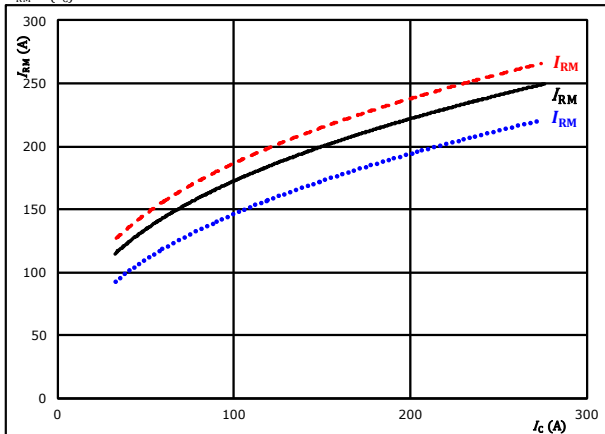


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 150$ A
 $T_j = 25$ °C
125 °C
150 °C

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

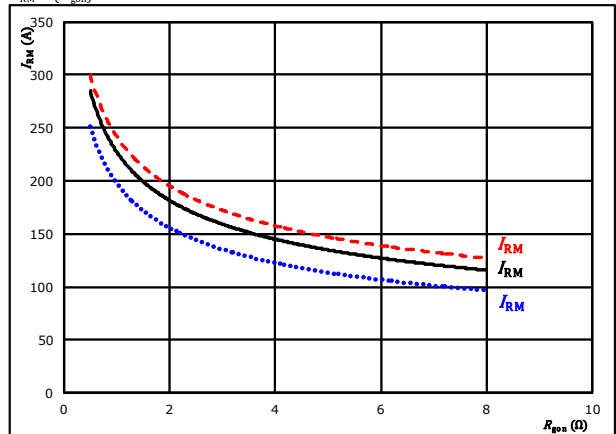


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_j = 25$ °C
125 °C
150 °C

figure 12. FWD

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

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



At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 150$ A
 $T_j = 25$ °C
125 °C
150 °C

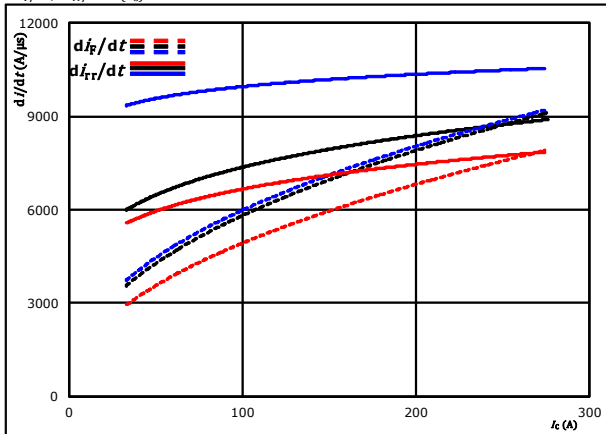


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Half-Bridge Switching Characteristics

figure 13. FWD

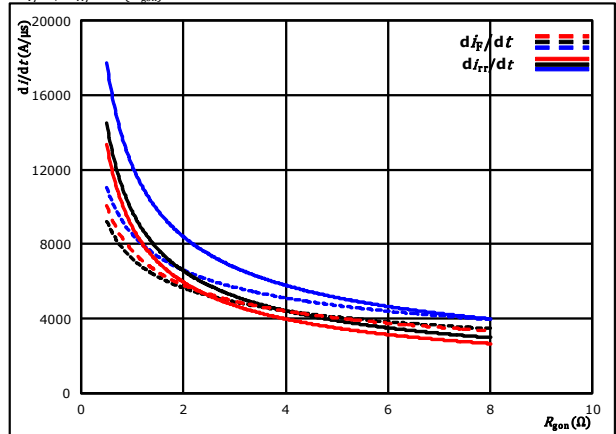
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_C)$



At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 2$ Ω
 $T_j = 25$ °C
125 °C
150 °C

figure 14. FWD

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

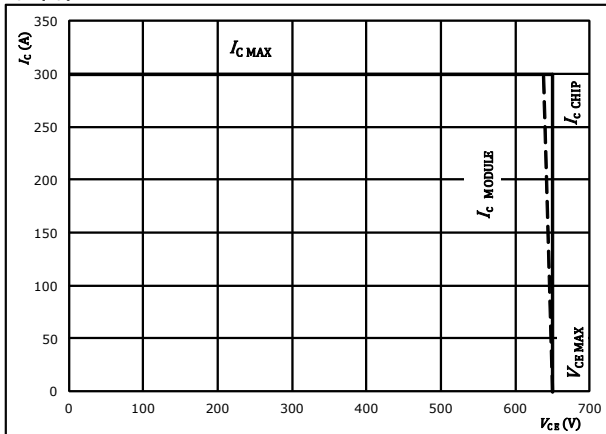


At $V_{CE} = 350$ V
 $V_{GE} = \pm 15$ V
 $I_C = 150$ A
 $T_j = 25$ °C
125 °C
150 °C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 125$ °C
 $R_{gon} = 2$ Ω
 $R_{goff} = 2$ Ω



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datasheet

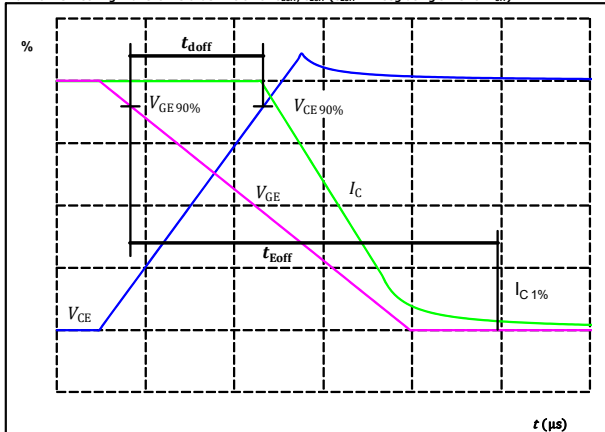
Half-Bridge Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. IGBT

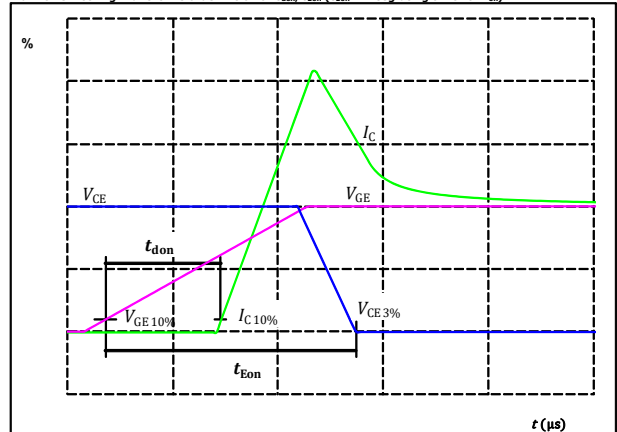
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	150	A
$t_{doff} =$	261	ns

figure 2. IGBT

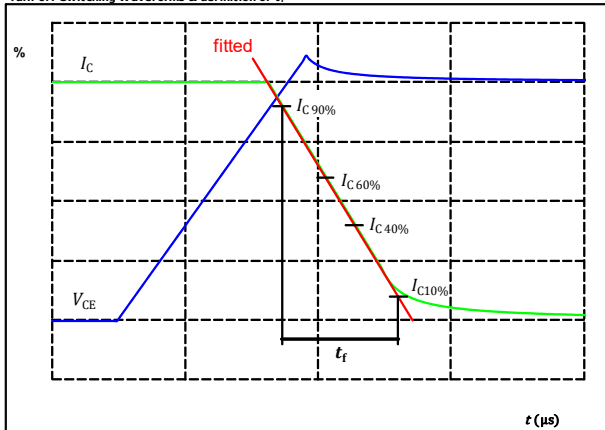
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	350	V
$I_C(100\%) =$	150	A
$t_{don} =$	167	ns

figure 3. IGBT

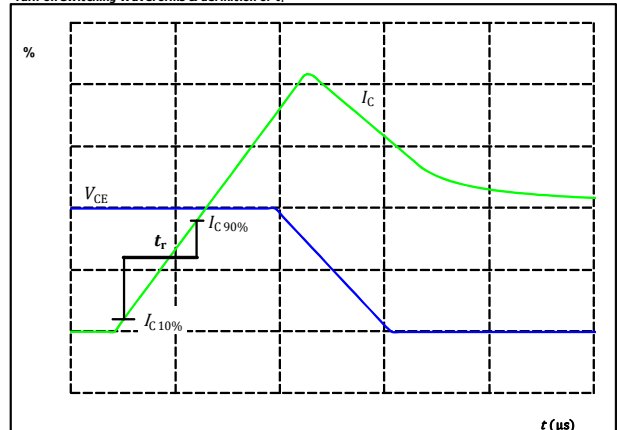
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	350	V
$I_C(100\%) =$	150	A
$t_f =$	89	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%) =$	350	V
$I_C(100\%) =$	150	A
$t_r =$	27	ns

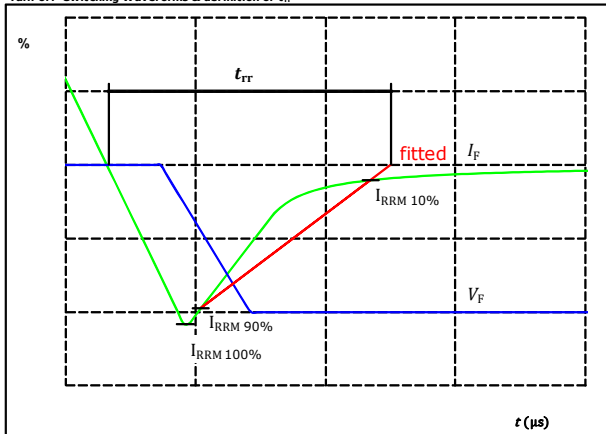


Vincotech

Half-Bridge Switching Characteristics

figure 5. FWD

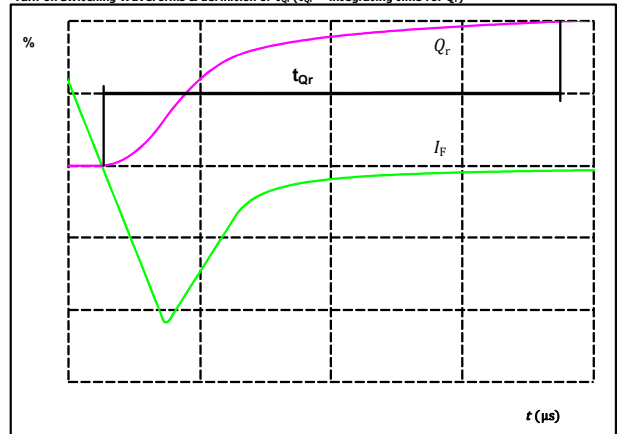
Turn-off Switching Waveforms & definition of t_{rr}



$V_F(100\%) =$	350	V
$I_F(100\%) =$	150	A
$I_{RRM}(100\%) =$	199	A
$t_{rr} =$	132	ns

figure 6. FWD

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



$I_F(100\%) =$	150	A
$Q_r(100\%) =$	10,93	μC

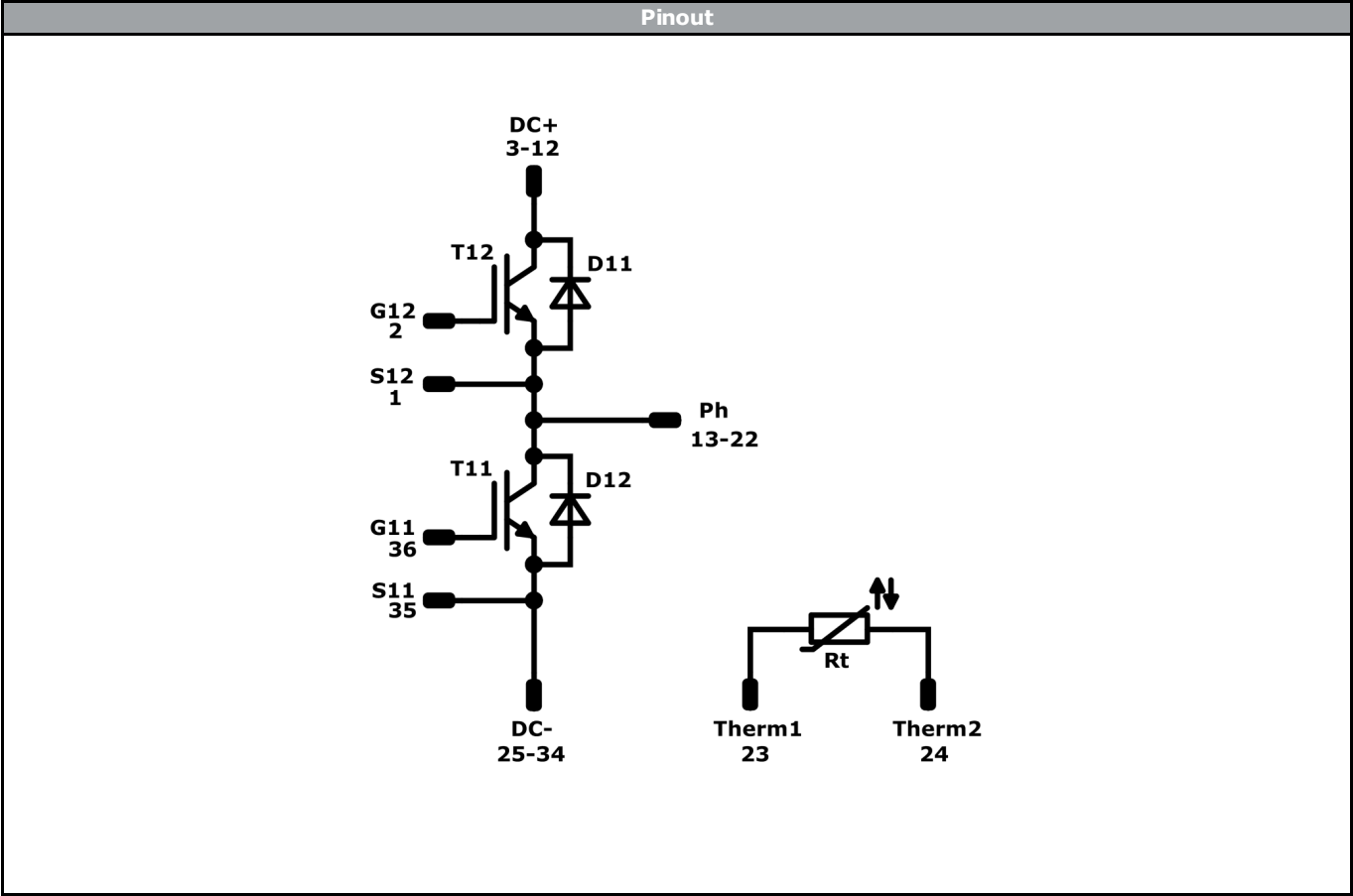
Ordering Code & Marking							
Version			Ordering Code				
With std lid (6.5mm height) + no thermal grease			80-M2072PA150SA-K704F30-/0A/				
With thin lid (2.8mm height) + no thermal grease			80-M2072PA150SA-K704F30-/0B/				
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M2072PA150SA-K704F30-/1A/				
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)			80-M2072PA150SA-K704F30-/1B/				
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M2072PA150SA-K704F30-/4A/				
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)			80-M2072PA150SA-K704F30-/4B/				
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M2072PA150SA-K704F30-/5A/				
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)			80-M2072PA150SA-K704F30-/5B/				
NN-NNNNNNNNNNNNNN TTTTTIVVWYYY UL VIN LLLLL SSSS 	Text	Name		Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN-TTTTTIV		W WYY	UL VIN	LLLLL	SSSS
		Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTIVV	LLLLL	SSSS	W WYY		

PCB pad table			
Pin	X	Y	Function
1	-7,6	21,9	S12
2	4,7	21,9	G12
3	18,6	21,8	DC+
4	18,6	18,6	DC+
5	18,6	15,4	DC+
6	18,6	12,2	DC+
7	18,6	9	DC+
8	22,5	21,8	DC+
9	22,5	18,6	DC+
10	22,5	15,4	DC+
11	22,5	12,2	DC+
12	22,5	9	DC+
13	-22,5	7,8	Ph
14	-22,5	4,6	Ph
15	-22,5	1,4	Ph
16	-22,5	-1,8	Ph
17	-22,5	-5	Ph
18	-18,6	7,8	Ph
19	-18,6	4,6	Ph
20	-18,6	1,4	Ph
21	-18,6	-1,8	Ph
22	-18,6	-5	Ph
23	-6,8	1,6	Therm1
24	-6,8	-1,6	Therm2
25	18,6	-9	DC-
26	18,6	-12,2	DC-
27	18,6	-15,4	DC-
28	18,6	-18,6	DC-
29	18,6	-21,8	DC-
30	22,5	-9	DC-
31	22,5	-12,2	DC-
32	22,5	-15,4	DC-
33	22,5	-18,6	DC-
34	22,5	-21,8	DC-
35	4,6	-18,7	S11
36	1,7	-21,9	G11

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



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Identification					
ID	Component	Voltage	Current	Function	Comment
T11 , T12	IGBT	650 V	150 A	Half-Bridge Switch	
D11 , D12	FWD	650 V	100 A	Half-Bridge Diode	
Rt	NTC			Thermistor	



Vincotech

80-M2072PA150SA-K704F30
datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 72	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for MiniSkiiP® 2 packages see vincotech.com website.

Package data
Package data for MiniSkiiP® 2 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
80-M2072PA150SA-K704F30-D2-14	20 Mar. 2019	Correction of I _c /I _r values	2

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