flow PHASE0 — 600 V / 100 A

Features

- Trench Fieldstop IGBT[3] technology
- 2-clip housing in 12mm and 17mm height
- Compact and low inductance design

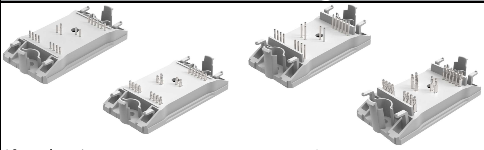
Target Applications

- Motor Drive
- UPS

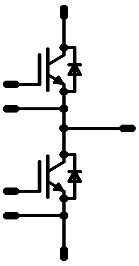
Types

- 10-FZ062PA100SA-P994F08
- 10-PZ062PA100SA-P994F08Y
- 10-F0062PA100SA-P994F09
- 10-P0062PA100SA-P994F09Y

flow 0 housing


12mm housing 17mm housing

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Half-Bridge Switch					
Collector-emitter break down voltage	V_{CE}			600	V
DC collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	87	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		300	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	152	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
Half-Bridge Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
DC forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	71	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		300	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	94	W
Maximum Junction Temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{is}	t = 2 s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance		12mm housing solder pins / Press-fit pins		9,88 / min 12,7	mm
		17mm housing solder pins / Press-fit pins		8,93 / min 12,7	mm

Characteristic Values

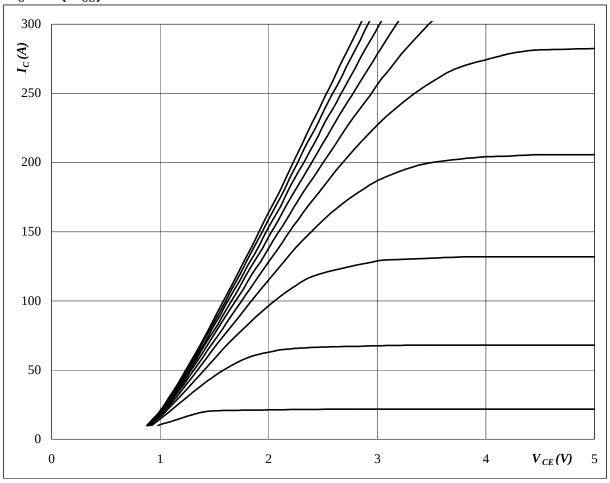
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Half-Bridge Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0016	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		100	25 150	1	1,63 1,84	2,1	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		25			0,66	mA
Gate-emitter leakage current	I_{GES}		20	0		25			700	nA
Integrated Gate resistor	R_{gint}							2		Ω
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 4\ \Omega$ $R_{gon} = 4\ \Omega$	±15	300	100	25 150		156 162		ns
Rise time	t_r					25 150		20 27		
Turn-off delay time	$t_{d(off)}$					25 150		212 242		
Fall time	t_f					25 150		99 116		
Turn-on energy loss	E_{on}					25 150		0,92 1,4		mWs
Turn-off energy loss	E_{off}					25 150		2,68 3,55		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		6160		pF
Output capacitance	C_{oss}							384		
Reverse transfer capacitance	C_{rss}							183		
Gate charge	Q_G		15	480	100	25		620		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,62		K/W
Half-Bridge Diode										
Diode forward voltage	V_F				100	25 150	1	1,58 1,53	2,2	V
Peak reverse recovery current	I_{RRM}	$R_{gon} = 4\ \Omega$	±15	300	100	25 150		105,29 131,1		A
Reverse recovery time	t_{rr}					25 150		116 138		ns
Reverse recovered charge	Q_{rr}					25 150		4,92 9,11		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		4869 3253		A/µs
Reverse recovered energy	E_{rec}					25 150		1,13 2,15		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,01		K/W

Half-Bridge Characteristics

Figure 1 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



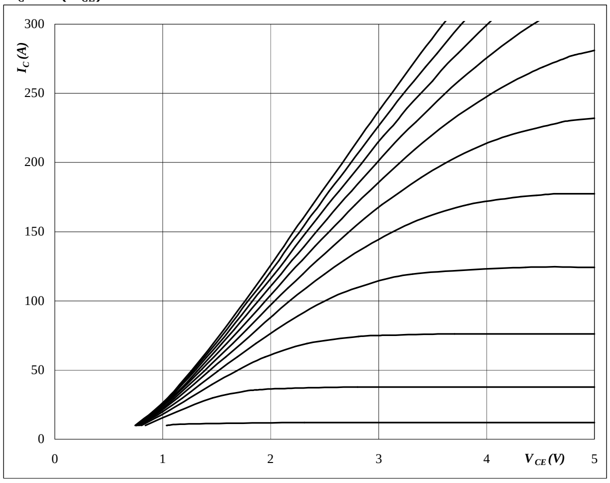
At

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

Figure 2 IGBT

Typical output characteristics

$I_C = f(V_{CE})$



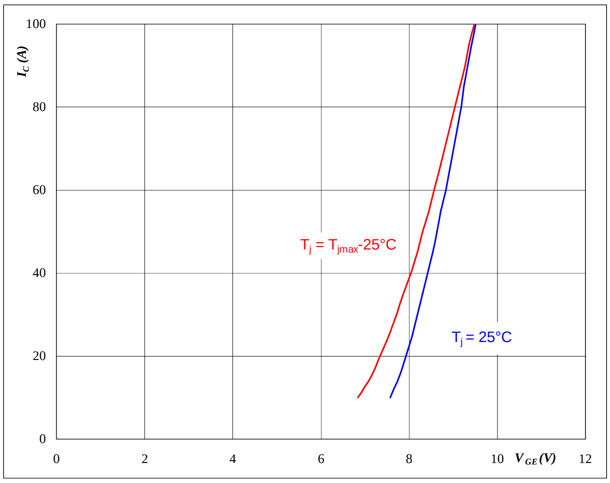
At

t_p =	350	μs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

Figure 3 IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$



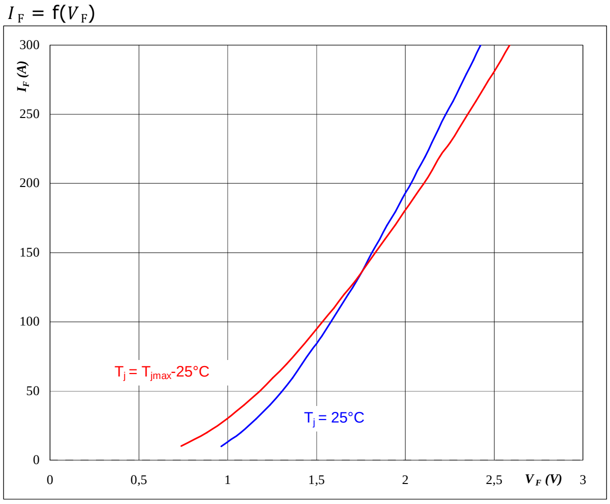
At

t_p =	350	μs
V_{CE} =	10	V

Figure 4 FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

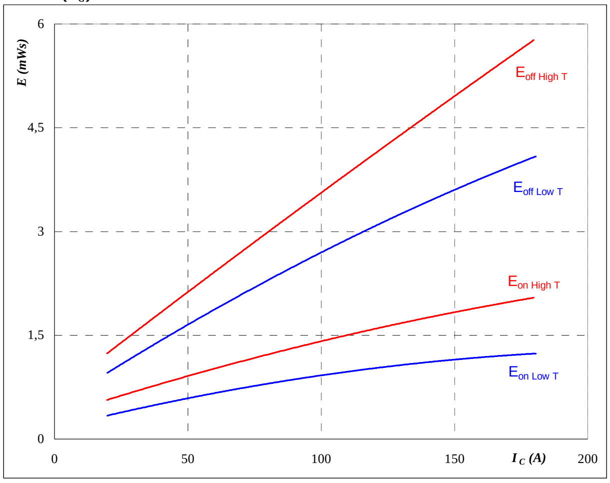
t_p =	350	μs

Half-Bridge Characteristics

Figure 5 IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



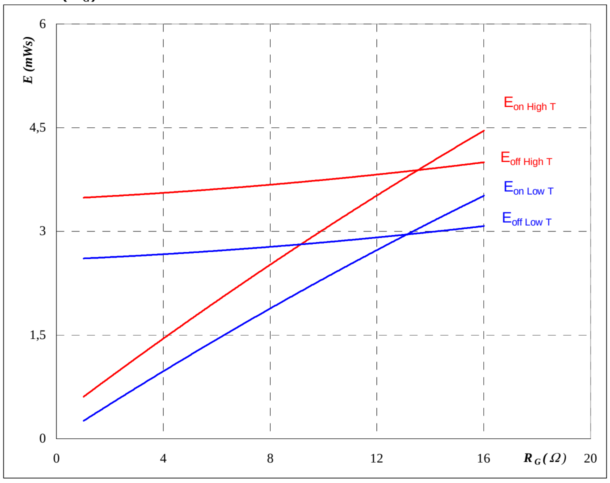
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 6 IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



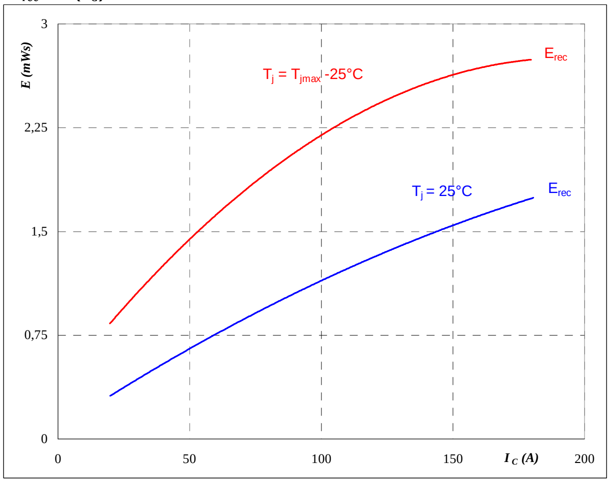
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	100	A

Figure 7 IGBT

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



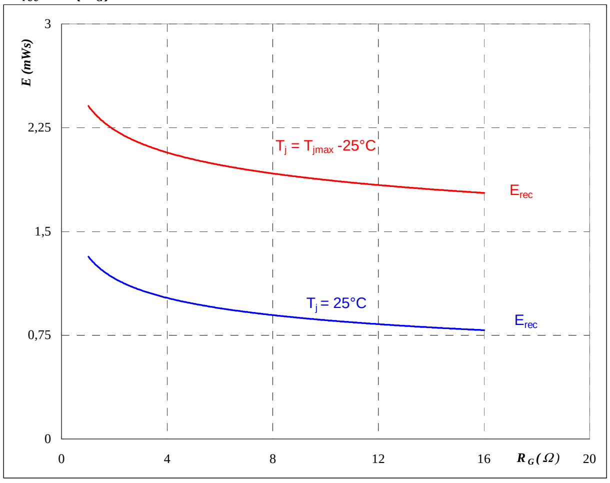
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 8 IGBT

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

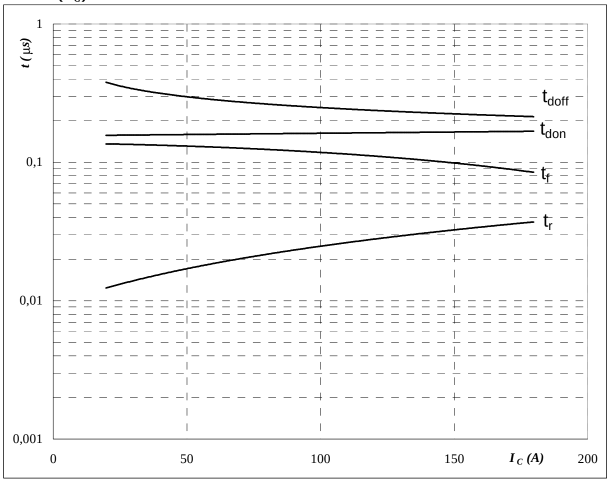
T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	100	A

Half-Bridge Characteristics

Figure 9 IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



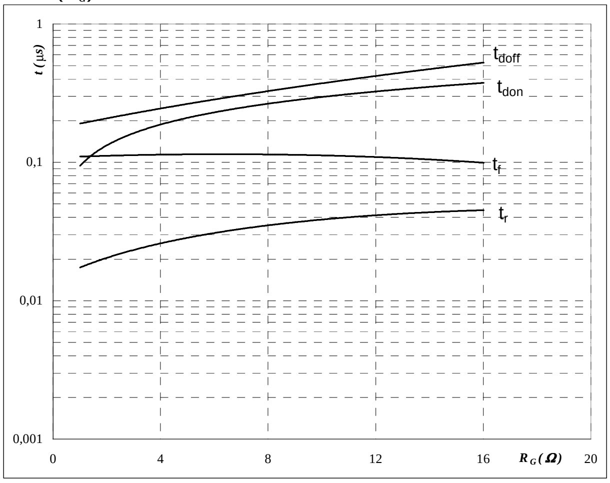
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Figure 10 IGBT

Typical switching times as a function of gate resistor

$t = f(R_G)$



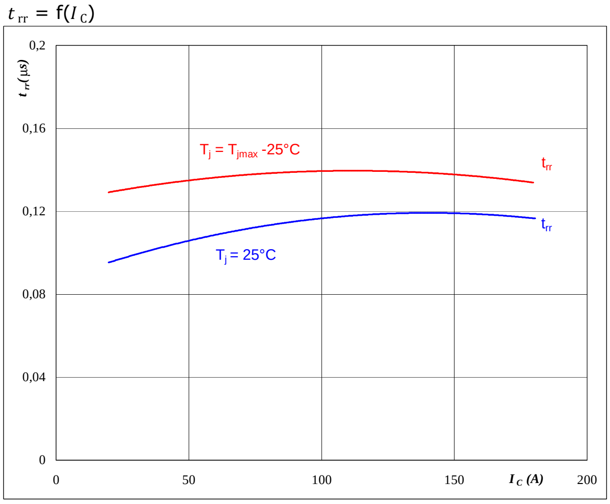
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	100	A

Figure 11 FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



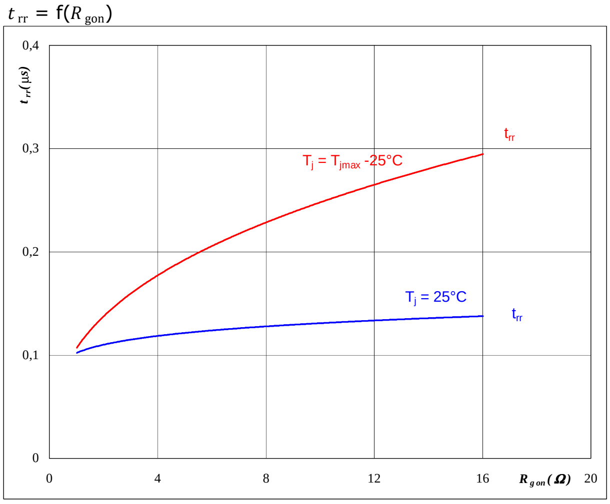
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 12 FWD

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

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



At

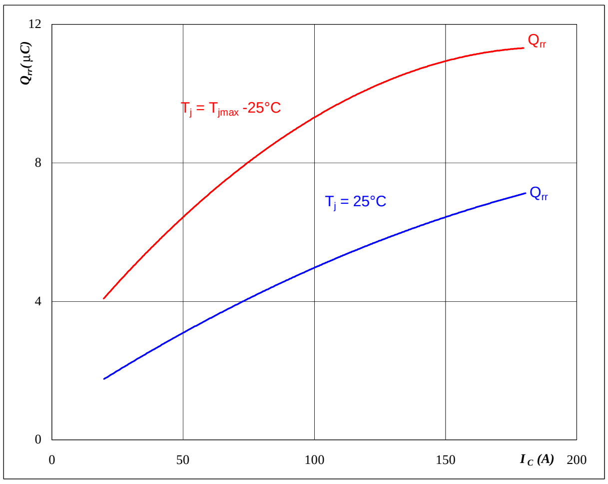
T_j =	25/150	°C
V_R =	300	V
I_F =	100	A
V_{GE} =	±15	V

Half-Bridge Characteristics

Figure 13 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



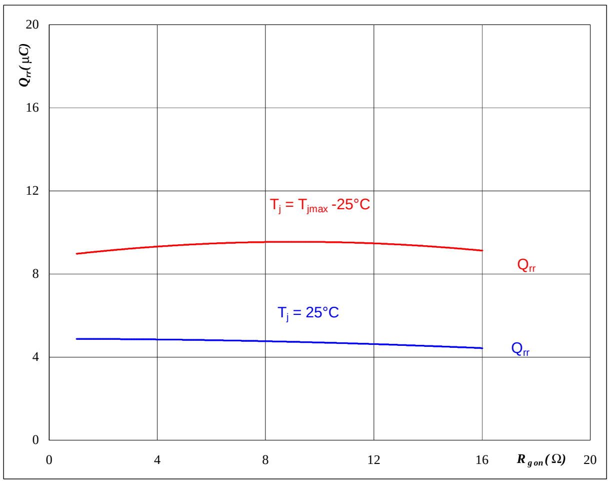
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 14 FWD

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

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



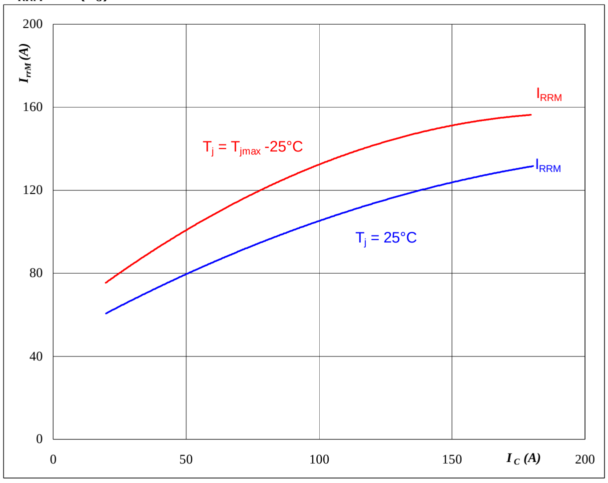
At

T_j =	25/150	°C
V_R =	300	V
I_F =	100	A
V_{GE} =	±15	V

Figure 15 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



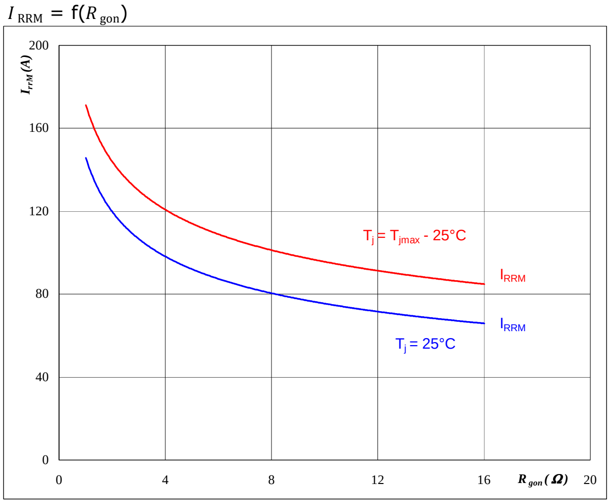
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 16 FWD

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

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



At

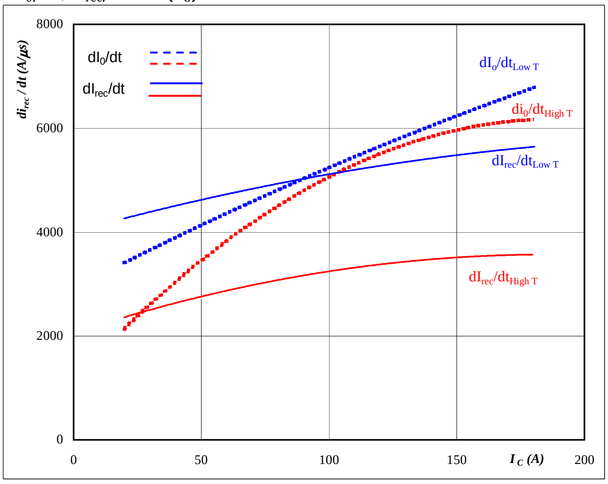
T_j =	25/150	°C
V_R =	300	V
I_F =	100	A
V_{GE} =	±15	V

Half-Bridge Characteristics

Figure 17 FWD

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

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



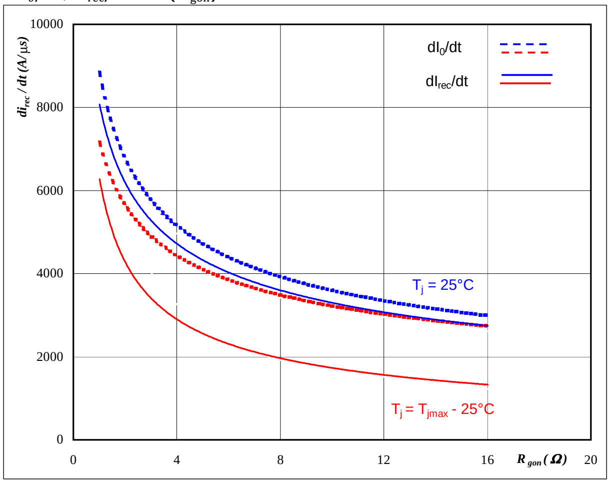
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

Figure 18 FWD

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

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



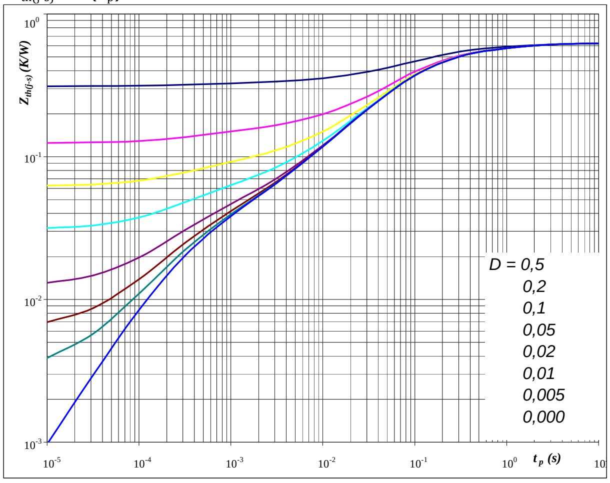
At

T_j =	25/150	°C
V_R =	300	V
I_F =	100	A
V_{GE} =	±15	V

Figure 19 IGBT

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	0,62	K/W

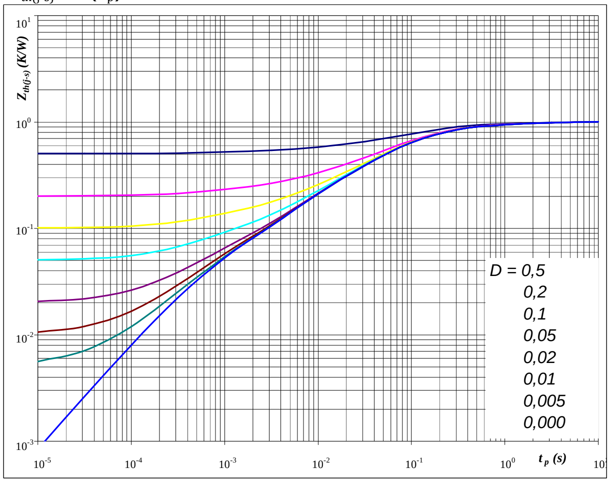
IGBT thermal model values

R (K/W)	Tau (s)
8,89E-02	1,58E+00
1,73E-01	2,29E-01
2,72E-01	6,41E-02
5,53E-02	9,53E-03
2,07E-02	9,12E-04
1,41E-02	2,17E-04

Figure 20 FWD

FWD transient thermal impedance as a function of pulse width

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



At

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

FWD thermal model values

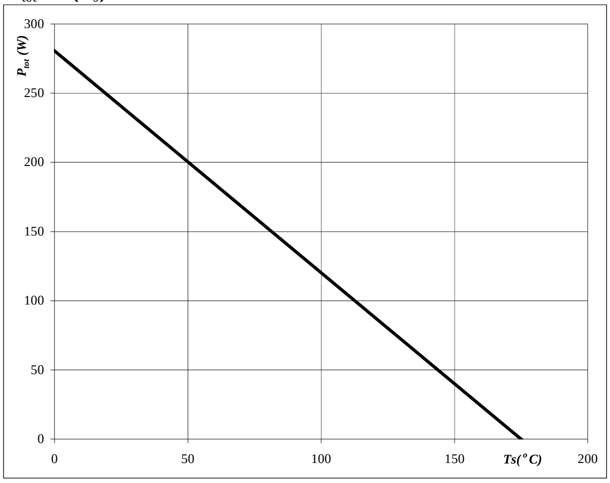
R (K/W)	Tau (s)
6,88E-02	2,96E+00
1,71E-01	4,07E-01
5,09E-01	9,03E-02
1,60E-01	2,01E-02
6,67E-02	4,84E-03
3,19E-02	5,60E-04

Half-Bridge Characteristics

Figure 21 IGBT

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



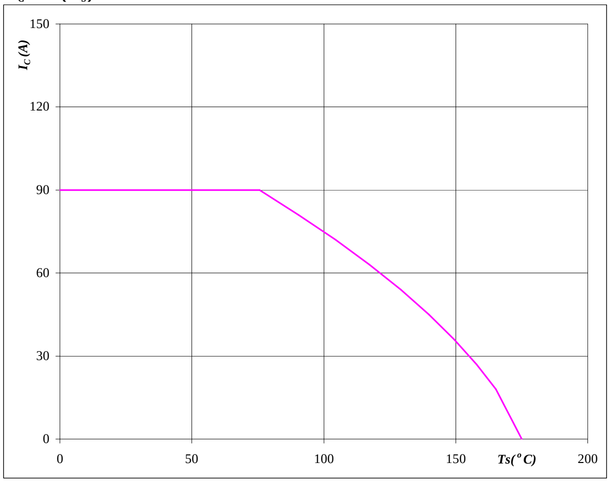
At

T_j = 175 °C

Figure 22 IGBT

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

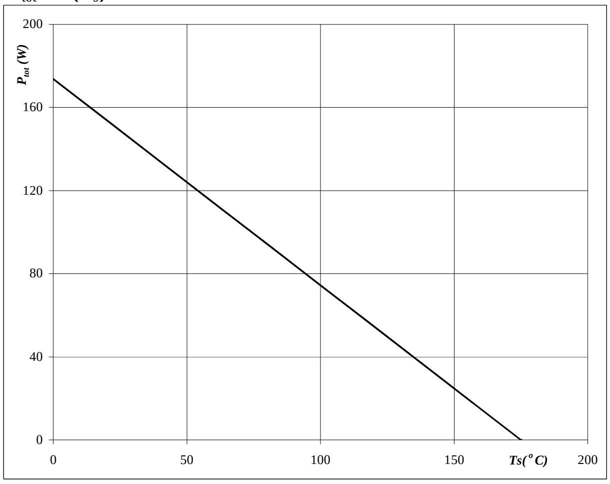
T_j = 175 °C

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



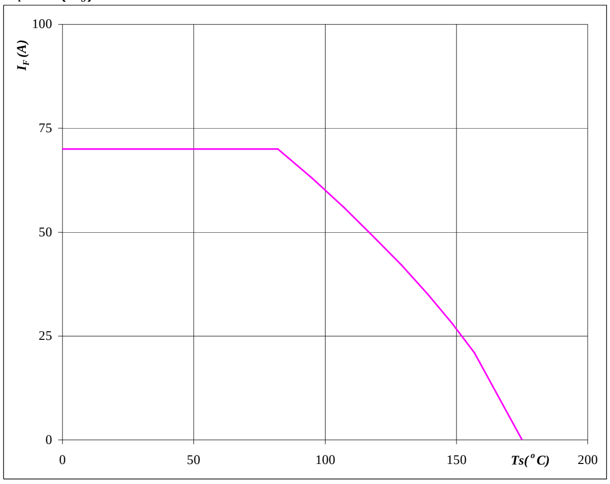
At

T_j = 175 °C

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



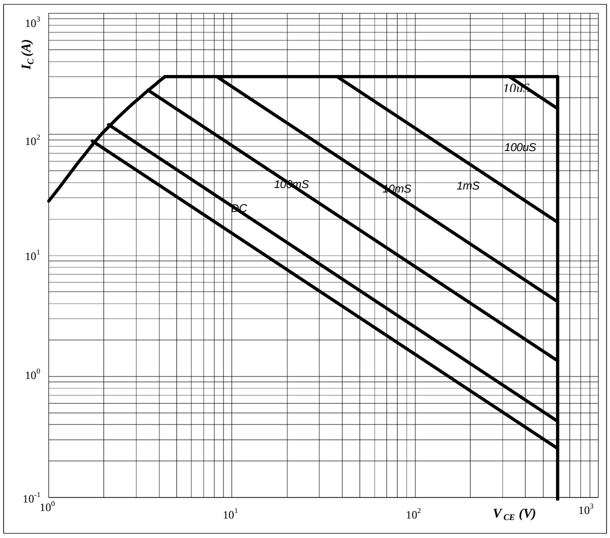
At

T_j = 175 °C

Half-Bridge Characteristics

Figure 25 IGBT
Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$

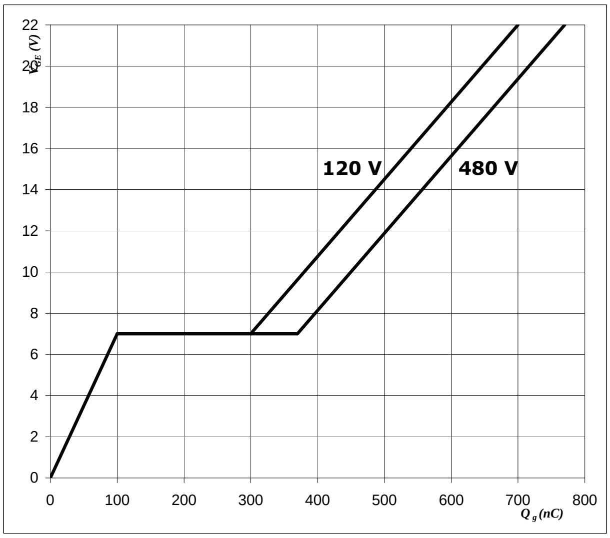


At

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

Figure 26 IGBT
Gate voltage vs Gate charge

$V_{GE} = f(Q_G)$



At

I_C =	100	A

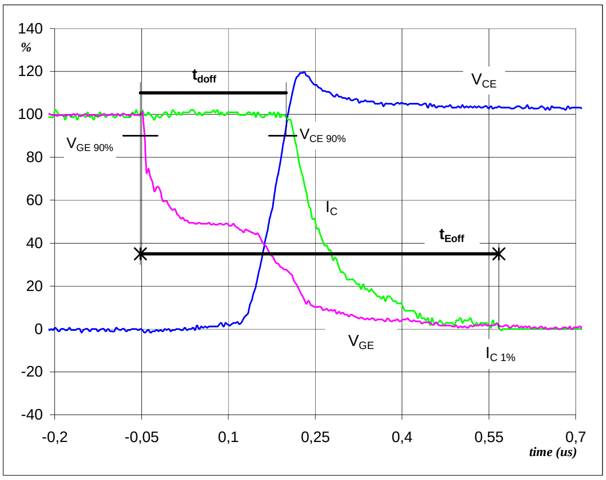
Switching Definitions Half-Bridge

General conditions

T_j	=	150 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

Figure 1 IGBT

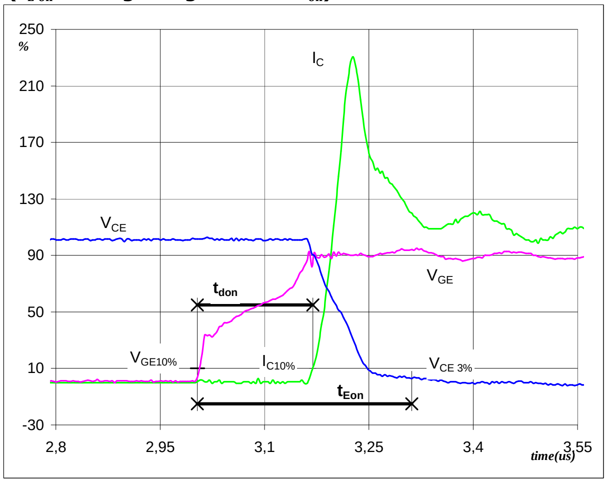
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	99	A
t_{doff} =	0,24	µs
$t_{E\,off}$ =	0,62	µs

Figure 2 IGBT

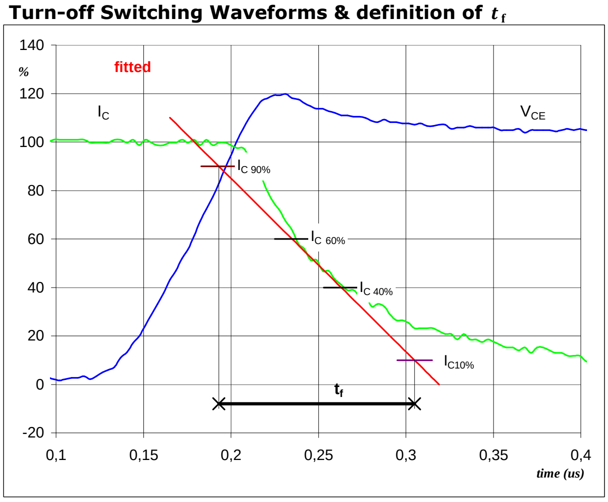
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	99	A
t_{don} =	0,16	µs
$t_{E\,on}$ =	0,31	µs

Figure 3 IGBT

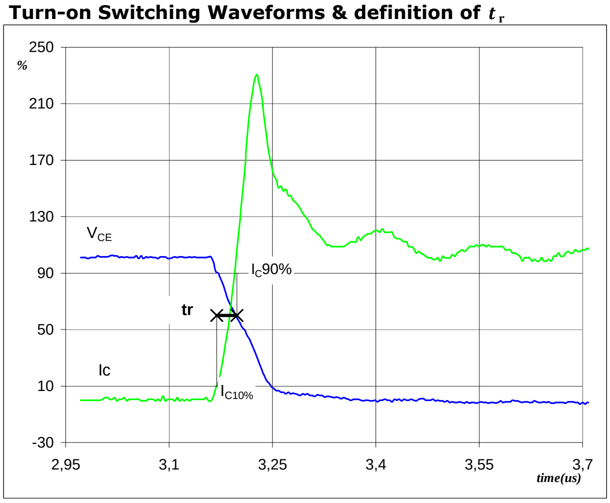
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	300	V
I_C (100%) =	99	A
t_f =	0,11	µs

Figure 4 IGBT

Turn-on Switching Waveforms & definition of t_r

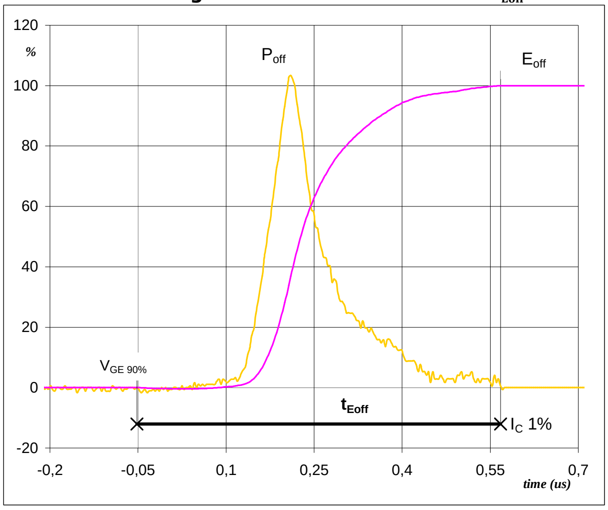


V_C (100%) =	300	V
I_C (100%) =	99	A
t_r =	0,03	µs

Switching Definitions Half-Bridge

Figure 5 IGBT

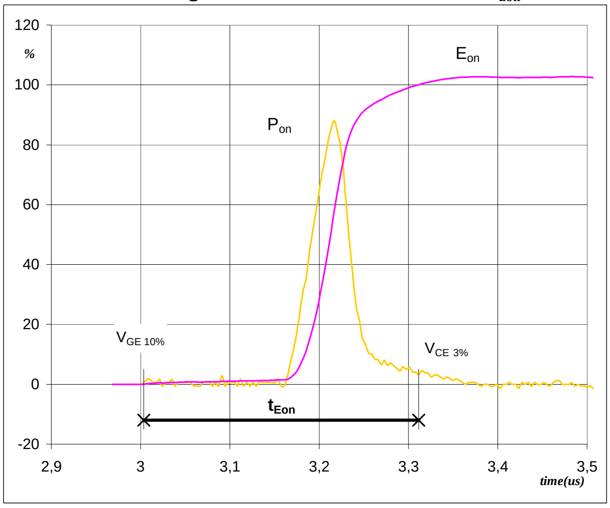
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	29,81	kW
E_{off} (100%) =	3,59	mJ
$t_{E\,off}$ =	0,62	μs

Figure 6 IGBT

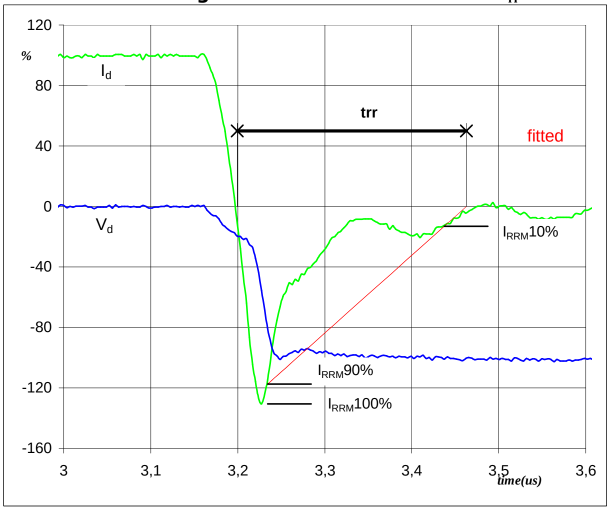
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	29,81	kW
E_{on} (100%) =	1,40	mJ
$t_{E\,on}$ =	0,31	μs

Figure 7 IGBT

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

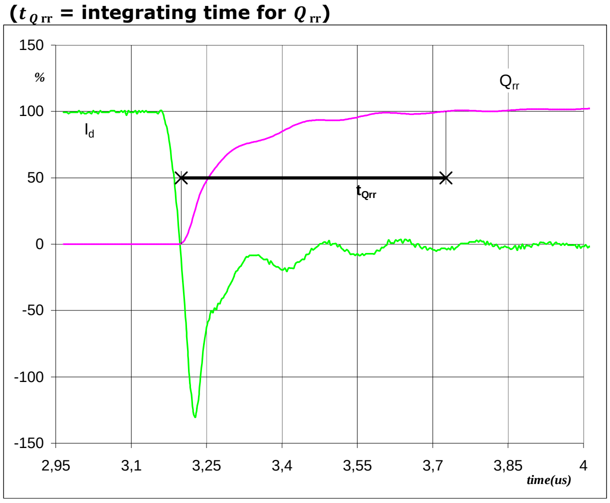


V_d (100%) =	300	V
I_d (100%) =	99	A
I_{RRM} (100%) =	-130	A
t_{rr} =	0,14	μs

Switching Definitions Half-Bridge

Figure 8 FWD

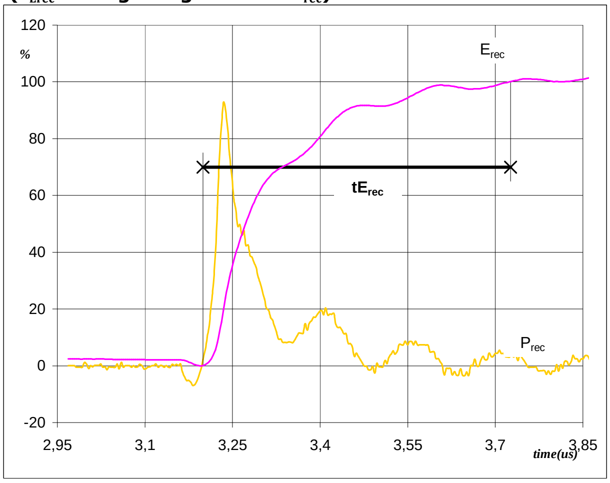
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	99	A
Q_{rr} (100%) =	8,86	μC
$t_{Q\,rr}$ =	0,53	μs

Figure 9 FWD

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



P_{rec} (100%) =	29,81	kW
E_{rec} (100%) =	2,07	mJ
$t_{E\,rec}$ =	0,53	μs

Ordering Code and Marking - Outline - Pinout

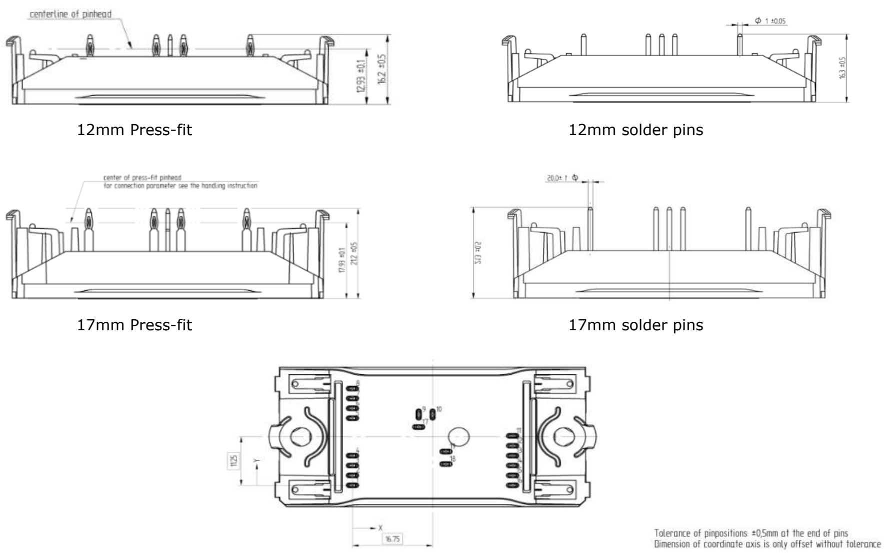
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12mm housing solder pins	10-FZ062PA100SA-P994F08
with thermal paste 12mm housing solder pins	10-FZ062PA100SA-P994F08-/3/
with thermal paste 12mm housing Press-fit pins	10-PZ062PA100SA-P994F08Y-/3/
without thermal paste 17mm housing solder pins	10-F0062PA100SA-P994F09
with thermal paste 17mm housing solder pins	10-F0062PA100SA-P994F09-/3/
without thermal paste 17mm housing Press-fit pins	10-P0062PA100SA-P994F09Y
with thermal paste 17mm housing Press-fit pins	10-P0062PA100SA-P994F09Y-/3/

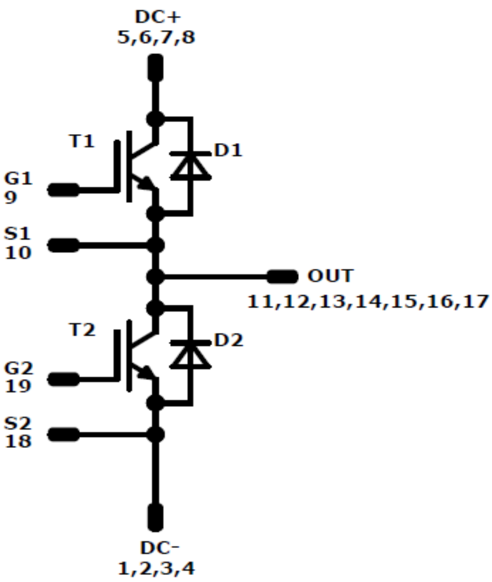
Text	Name	Date code	UL & Vinco	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTTVV	WWYY	UL Vinco	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table			
Pin	X	Y	Function
1	0	0	DC-
2	0	2,3	DC-
3	0	4,6	DC-
4	0	6,9	DC-
5	0	15,6	DC+
6	0	17,9	DC+
7	0	20,2	DC+
8	0	22,5	DC+
9	13,85	16,45	G1
10	16,75	16,45	S1
11	33,5	11,5	OUT
12	33,5	9,2	OUT
13	33,5	6,9	OUT
14	33,5	4,6	OUT
15	33,5	2,3	OUT
16	33,5	0	OUT
17	13,85	13,55	OUT
18	19,55	4,95	S2
19	19,55	7,85	G2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2	IGBT	600 V	100 A	Half-bridge Switch	
D1,D2	FWD	600 V	100 A	Half-bridge Diode	

Packaging instruction					
Standard packaging quantity (SPQ)	**135**	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 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
10-xx062PA100SA-P994F0xx-D3-14	31 Aug. 2016	New subtypes added	1, 14

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.