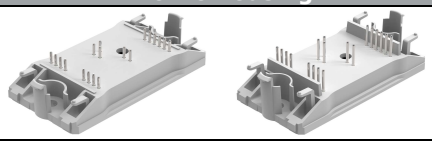
***flow* PHASE0** **600 V / 75 A**

Features

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

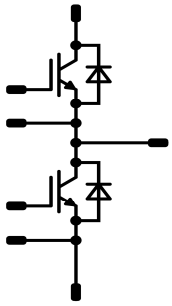
flow 0 housing



Target Applications

- Motor Drive
- UPS

Schematic



Types

- 10-FZ062PA075SA-P993F08
- 10-F0062PA075SA-P993F09

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	60	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	225	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	104	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	51	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	150	A
Power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	69	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 voltage	4000	V
Creepage distance			min 12,7	mm
Clearance		17 mm housing	min 12,7	mm
		12 mm housing	9,88	mm
Comparative Tracking Index	CTI		>200	

Characteristic Values

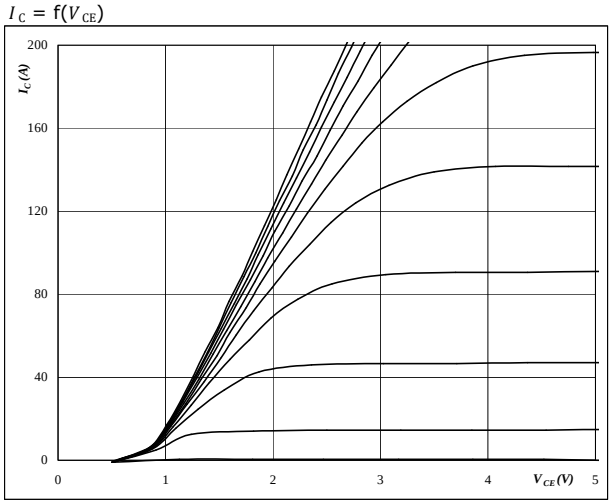
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_r [V] V_{CE} [V] V_{DS} [V]	I_C [A] I_F [A] I_D [A]	T_j [°C]	Min	Typ	Max	
Half-Bridge Switch										
Gate emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0012	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 150	1	1,63 1,87	2,1	V
Collector-emitter cut-off current incl. Diode	I_{CES}		0	600		25			0,03	mA
Gate-emitter leakage current	I_{GES}		20	0		25			700	nA
Integrated Gate resistor	R_{gint}							4		Ω
Turn-on delay time	$t_{d(on)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	±15	300	75	25 150		123 132		ns
Rise time	t_r					25 150		15 21		
Turn-off delay time	$t_{d(off)}$					25 150		169 199		
Fall time	t_f					25 150		87 105		
Turn-on energy loss	E_{on}					25 150		0,52 0,89		mWs
Turn-off energy loss	E_{off}					25 150		1,68 2,26		
Input capacitance	C_{ies}	f = 1 MHz	0	25		25		4700		pF
Output capacitance	C_{oss}							300		
Reverse transfer capacitance	C_{rss}							145		
Gate charge	Q_G		15	480	75	25		465		nC
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						0,83		K/W
Half-Bridge Diode										
Diode forward voltage	V_F				50	25 150	1	1,64 1,59	2,1	V
Peak reverse recovery current	I_{RRM}	R_{gon} = 2 Ω	±15	300	75	25 150		94 111		A
Reverse recovery time	t_{rr}					25 150		101 128		ns
Reverse recovered charge	Q_{rr}					25 150		3,24 6,50		µC
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		6615 4122		A/µs
Reverse recovered energy	E_{rec}					25 150		0,75 1,57		mWs
Thermal resistance junction to sink	$R_{th(j-s)}$	phase-change material λ = 3,4 W/mK						1,18		K/W

Half-Bridge

figure 1. **Half-Bridge Switch**

Typical output characteristics

$I_C = f(V_{CE})$



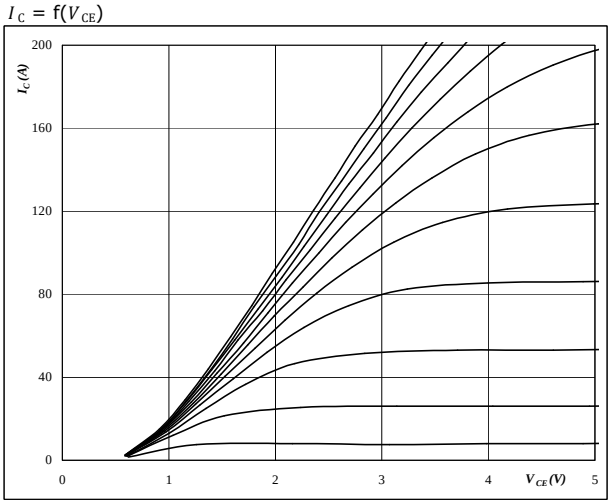
At

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

figure 2. **Half-Bridge Switch**

Typical output characteristics

$I_C = f(V_{CE})$



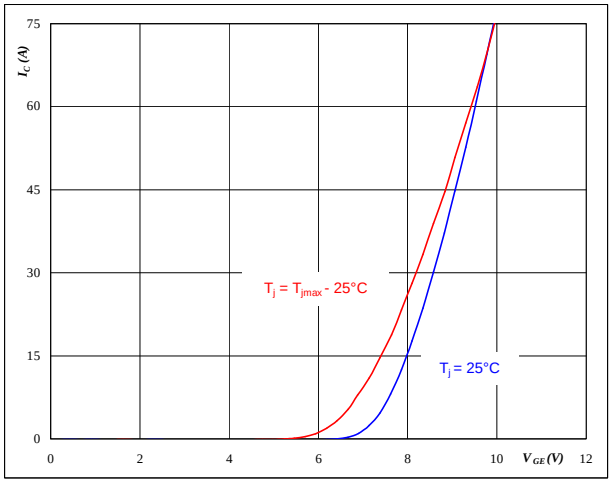
At

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

figure 3. **Half-Bridge Switch**

Typical transfer characteristics

$I_C = f(V_{GE})$



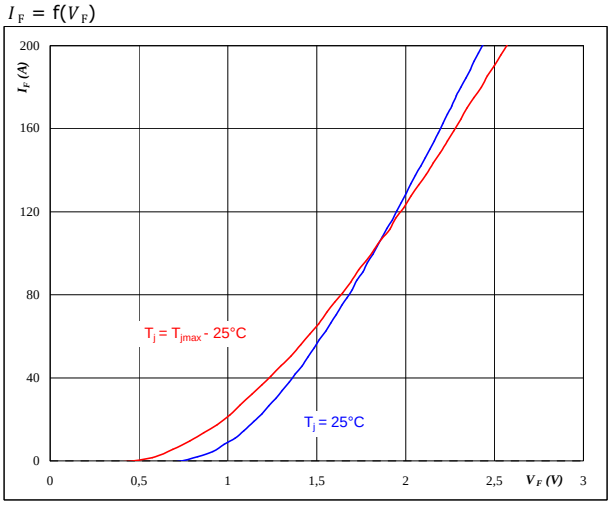
At

t_p =	350	µs
V_{CE} =	10	V

figure 4. **Half-Bridge Diode**

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

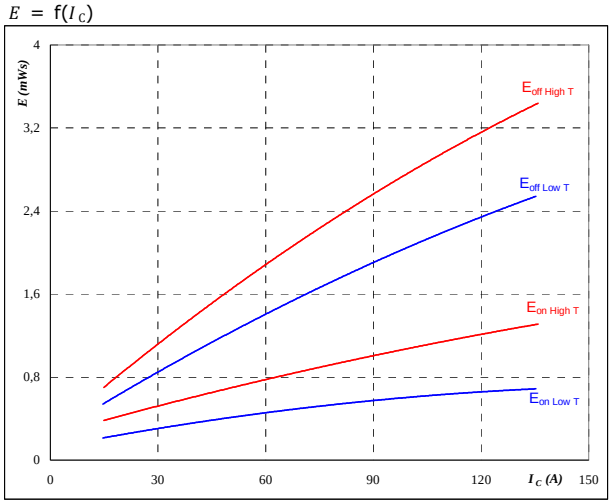
t_p =	350	µs

Half-Bridge

figure 5. **Half-Bridge Switch**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



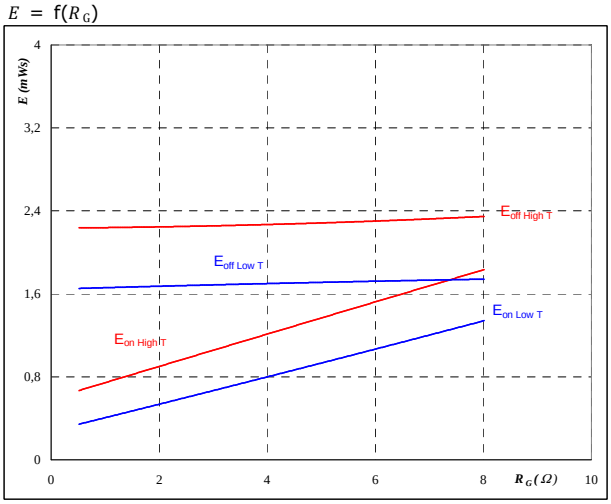
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 6. **Half-Bridge Switch**

Typical switching energy losses as a function of gate resistor

$E = f(R_G)$



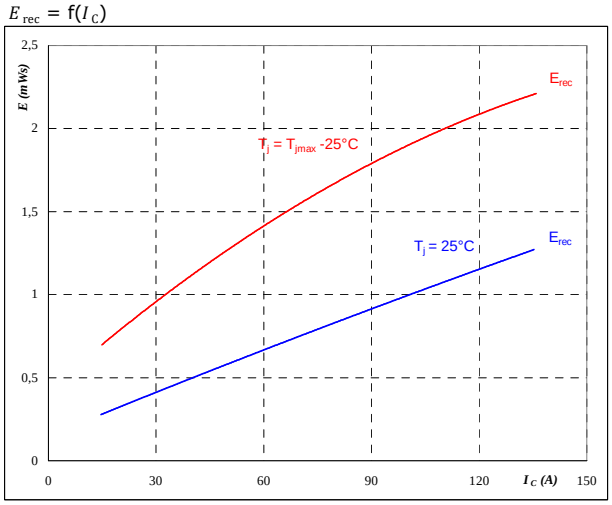
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	75	A

figure 7. **Half-Bridge Switch**

Typical reverse recovery energy loss as a function of collector current

$E_{rec} = f(I_C)$



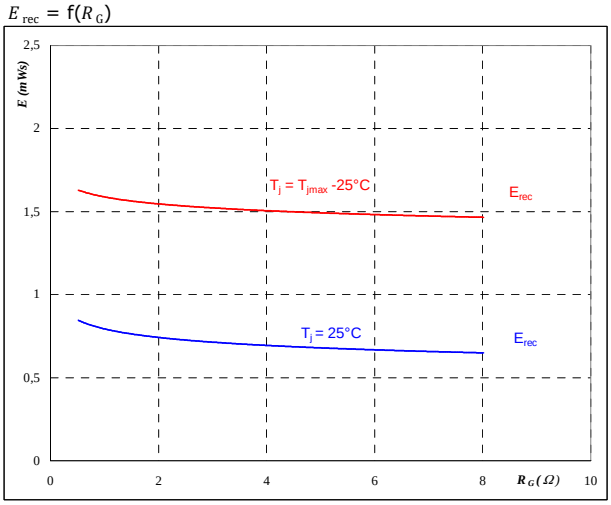
With an inductive load at

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

figure 8. **Half-Bridge Switch**

Typical reverse recovery energy loss as a function of gate resistor

$E_{rec} = f(R_G)$



With an inductive load at

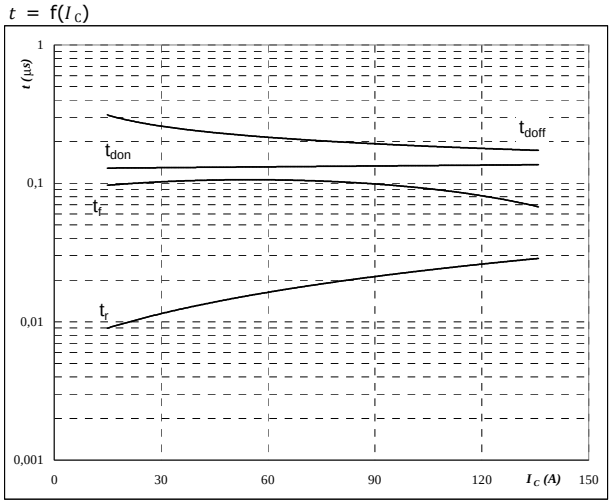
T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	75	A

Half-Bridge

figure 9. **Half-Bridge Switch**

Typical switching times as a function of collector current

$t = f(I_C)$



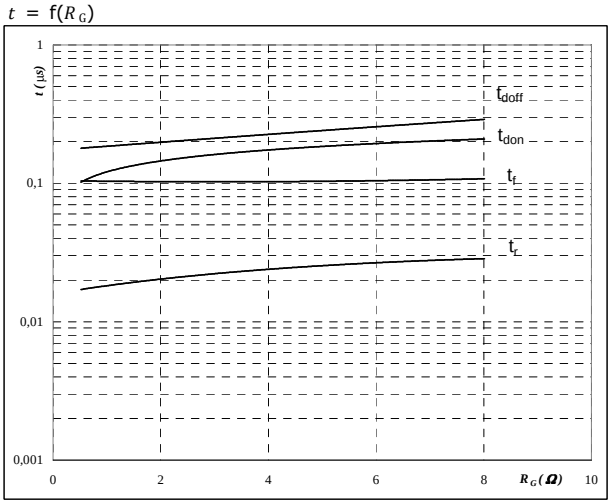
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 10. **Half-Bridge Switch**

Typical switching times as a function of gate resistor

$t = f(R_G)$



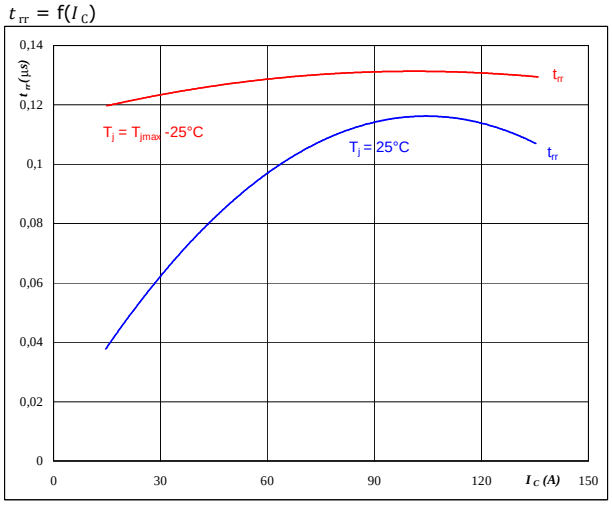
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	75	A

figure 11. **Half-Bridge Diode**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



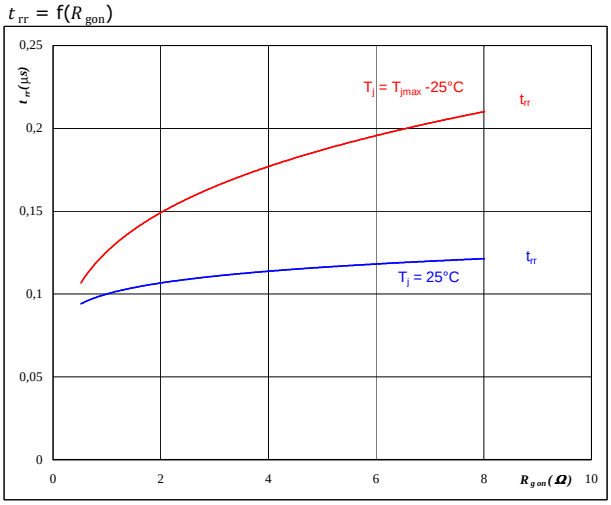
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

figure 12. **Half-Bridge Diode**

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

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



At

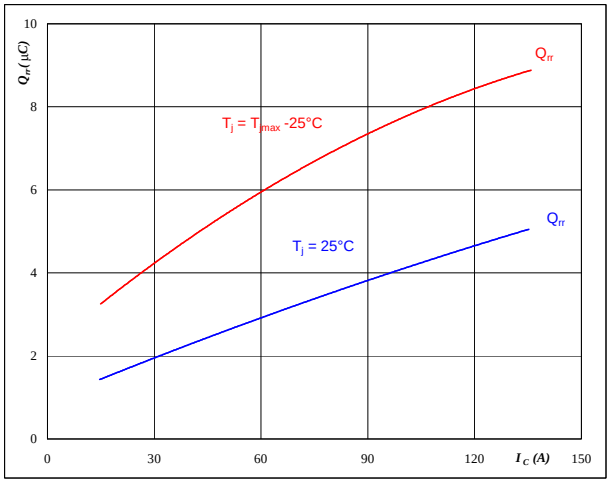
T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GE} =	±15	V

Half-Bridge

figure 13. **Half-Bridge Diode**

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



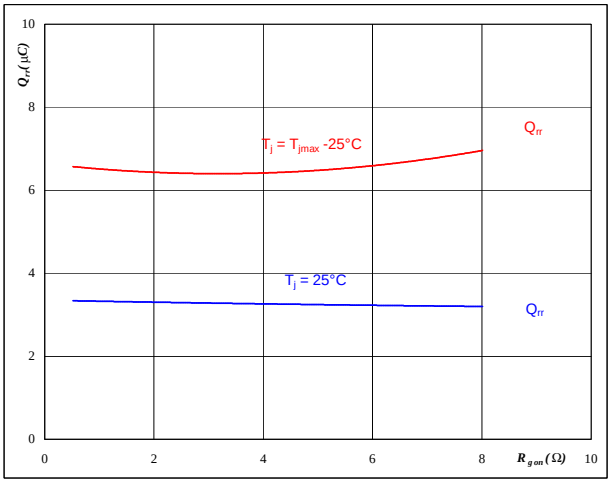
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

figure 14. **Half-Bridge Diode**

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

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



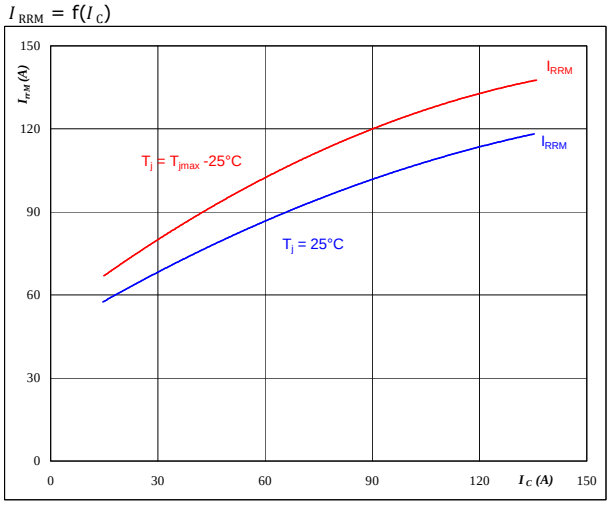
At

T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GE} =	±15	V

figure 15. **Half-Bridge Diode**

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



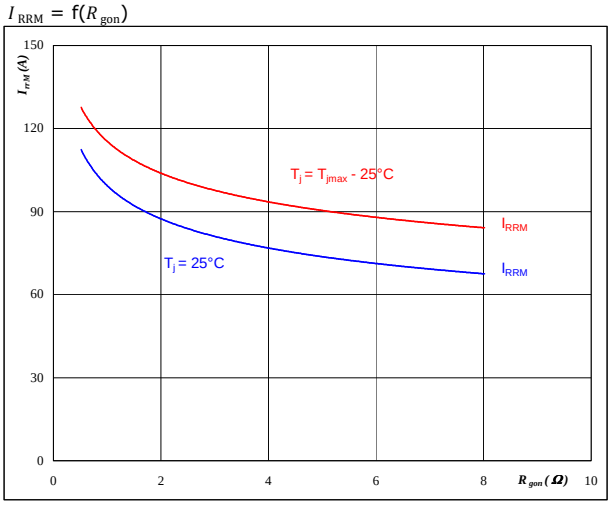
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

figure 16. **Half-Bridge Diode**

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

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



At

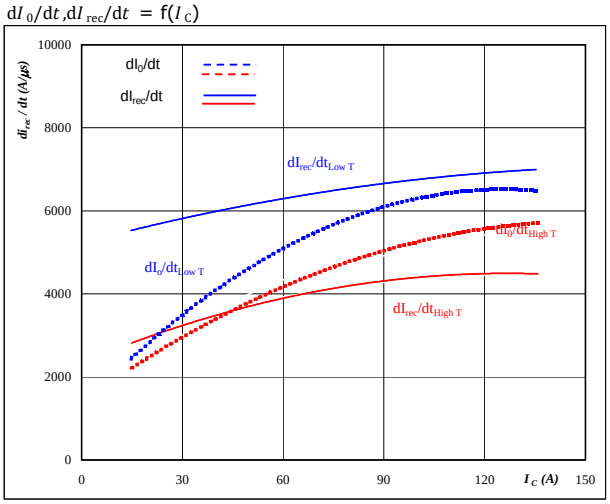
T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GE} =	±15	V

Half-Bridge

figure 17. **Half-Bridge Diode**

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

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



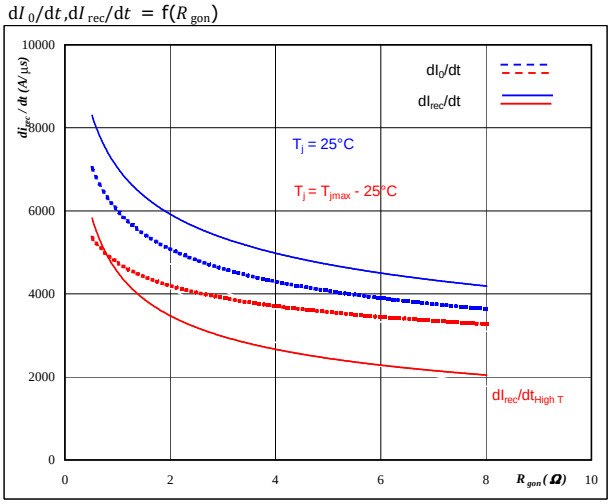
At

T_j =	25/150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

figure 18. **Half-Bridge Diode**

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

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



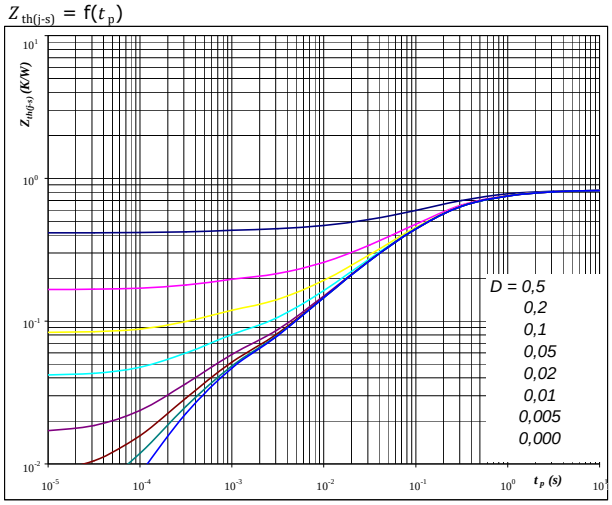
At

T_j =	25/150	°C
V_R =	300	V
I_F =	75	A
V_{GE} =	±15	V

figure 19. **Half-Bridge Switch**

IGBT transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	0,83	K/W

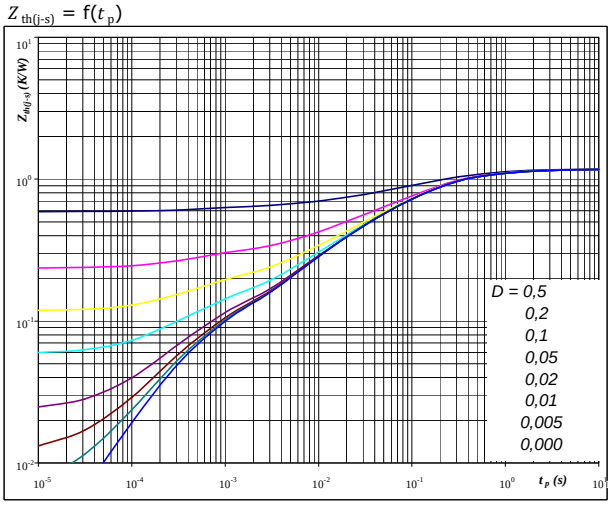
IGBT thermal model values

R (K/W)	Tau (s)
2,50E-02	9,78E+00
1,27E-01	1,12E+00
3,97E-01	1,86E-01
1,75E-01	4,04E-02
6,97E-02	8,14E-03
3,66E-02	4,72E-04

figure 20. **Half-Bridge Diode**

FWD transient thermal impedance as a function of pulse width

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



At

D =	t_p / T	
$R_{th(j-s)}$ =	1,18	K/W

FWD thermal model values

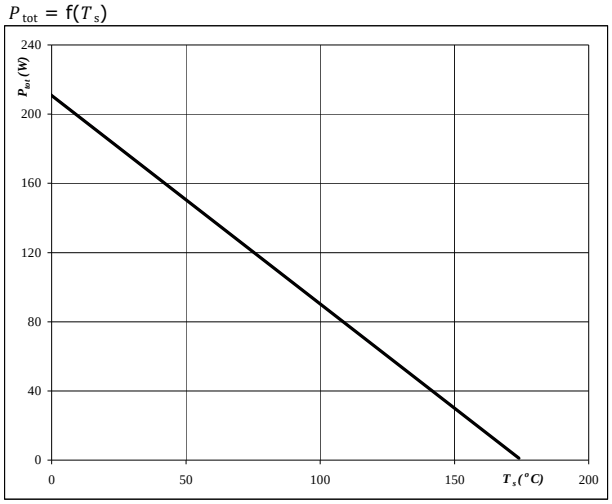
R (K/W)	Tau (s)
3,13E-02	9,08E+00
1,33E-01	1,00E+00
5,21E-01	1,71E-01
2,81E-01	3,39E-02
1,36E-01	6,90E-03
7,81E-02	4,32E-04

Half-Bridge

figure 21. **Half-Bridge Switch**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



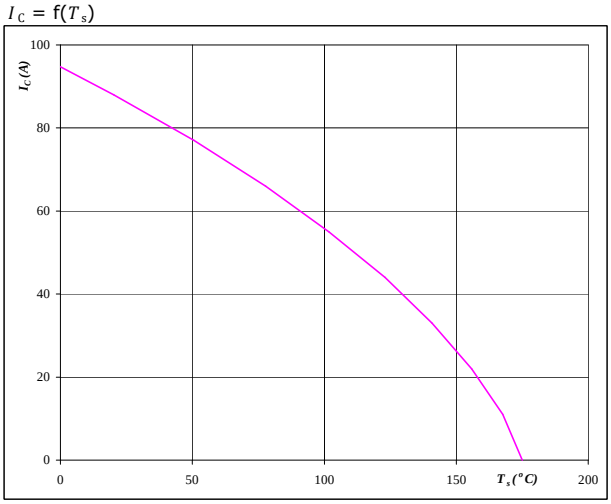
At

T_j = 175 °C

figure 22. **Half-Bridge Switch**

Collector current as a function of heatsink temperature

$I_C = f(T_s)$



At

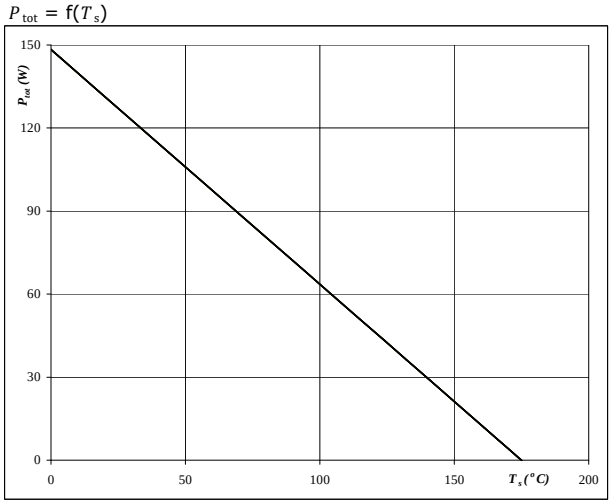
T_j = 175 °C

V_{GE} = 15 V

figure 23. **Half-Bridge Diode**

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_s)$



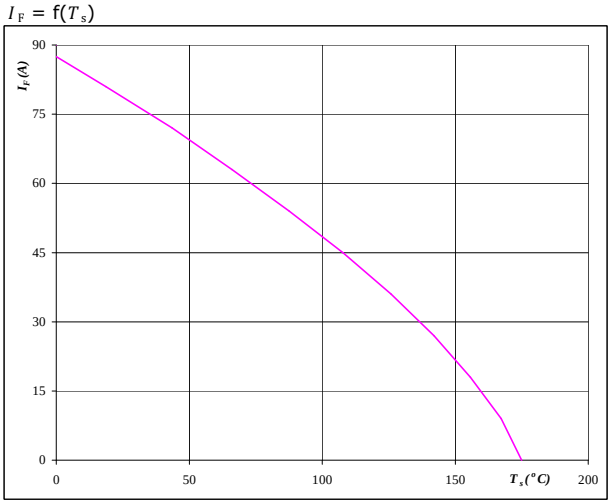
At

T_j = 175 °C

figure 24. **Half-Bridge Diode**

Forward current as a function of heatsink temperature

$I_F = f(T_s)$



At

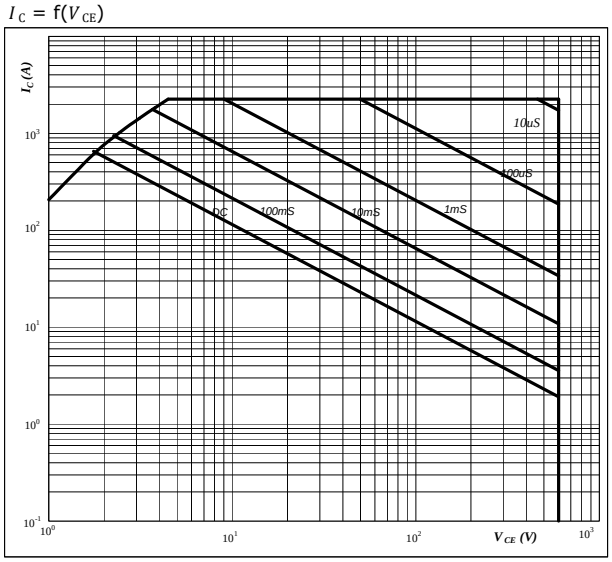
T_j = 175 °C

Half-Bridge

figure 25. **Half-Bridge Switch**

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



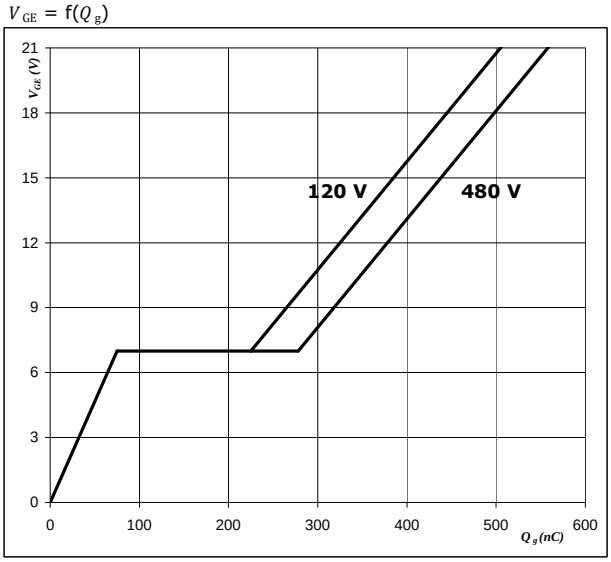
At

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

figure 26. **Half-Bridge Switch**

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

I_C =	75	A

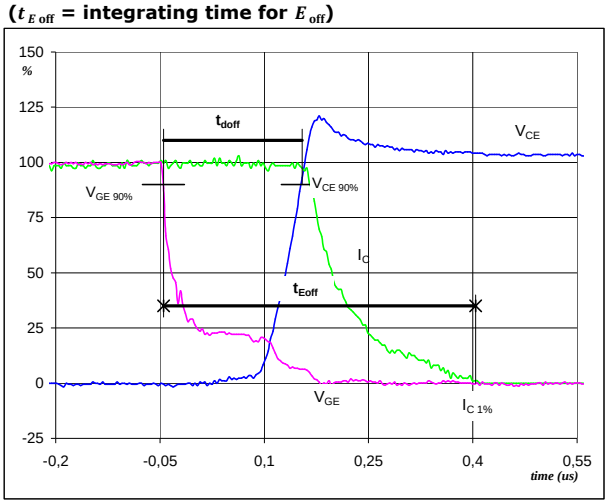
Switching Definitions

General conditions

T_j	=	150 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. **Half-Bridge Switch**

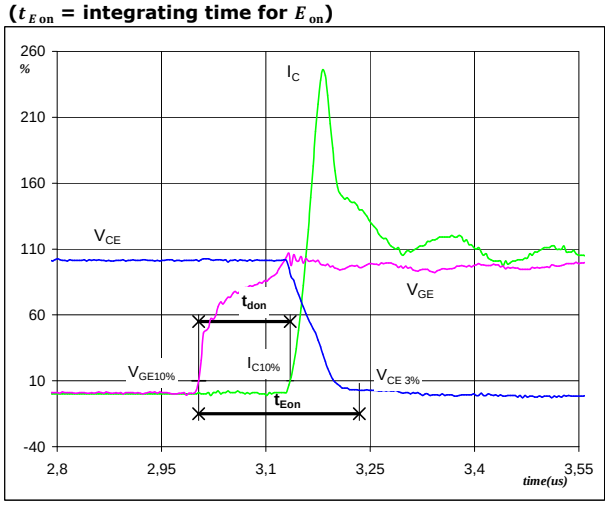
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
($t_{E\,off}$ = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	75	A
t_{doff} =	0,20	µs
$t_{E\,off}$ =	0,45	µs

figure 2. **Half-Bridge Switch**

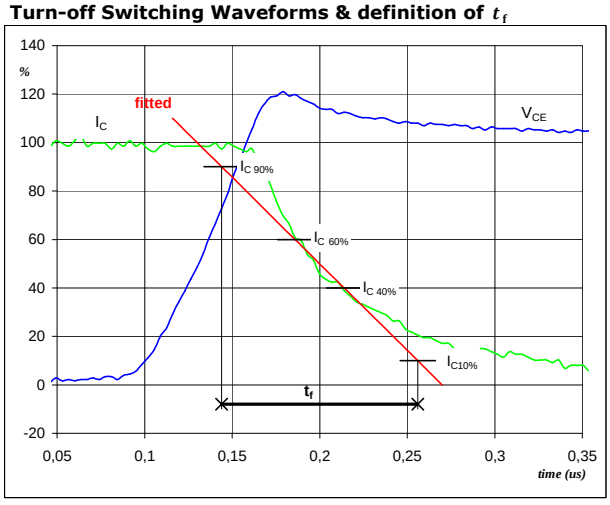
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
($t_{E\,on}$ = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	75	A
t_{don} =	0,13	µs
$t_{E\,on}$ =	0,23	µs

figure 3. **Half-Bridge Switch**

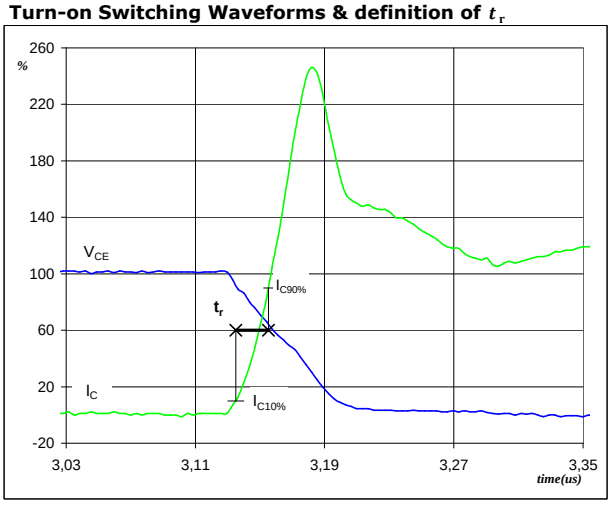
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	300	V
I_C (100%) =	75	A
t_f =	0,105	µs

figure 4. **Half-Bridge Switch**

Turn-on Switching Waveforms & definition of t_r

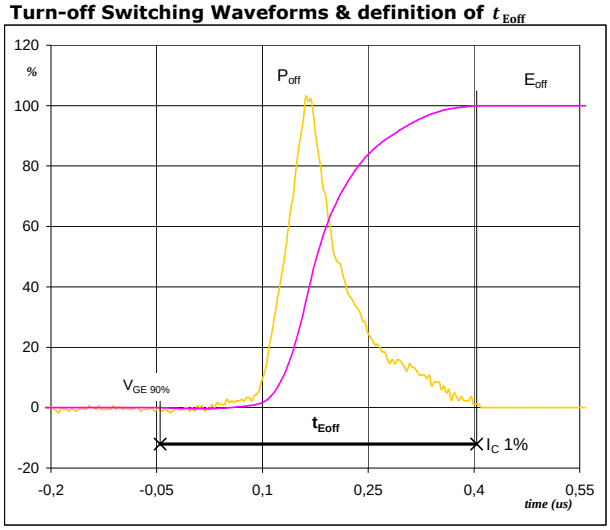


V_C (100%) =	300	V
I_C (100%) =	75	A
t_r =	0,02	µs

Switching Definitions

figure 5. **Half-Bridge Switch**

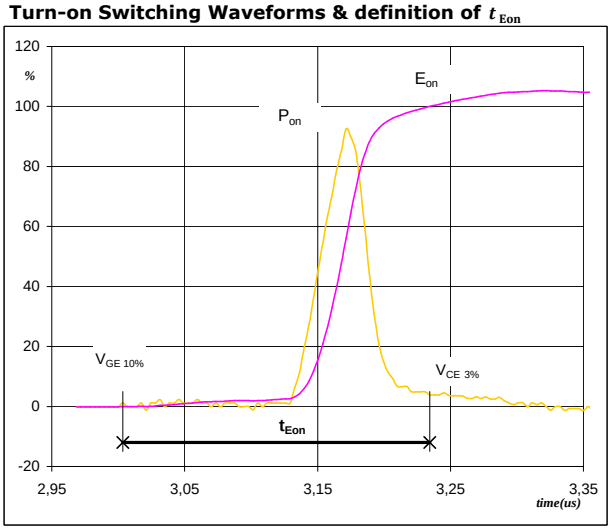
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	22,63	kW
E_{off} (100%) =	2,26	mJ
$t_{E\,off}$ =	0,45	µs

figure 6. **Half-Bridge Switch**

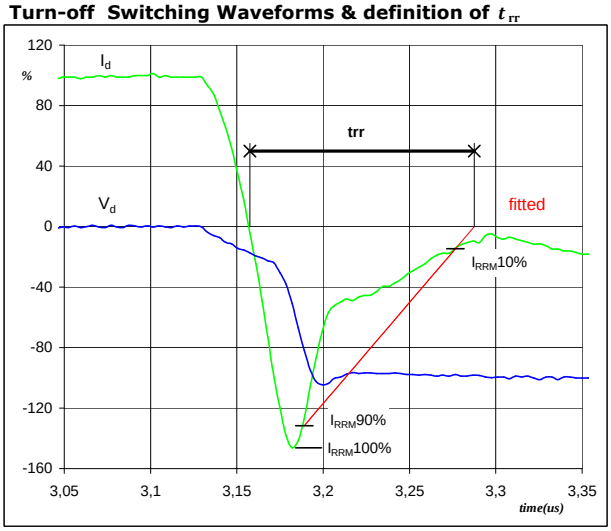
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	22,63	kW
E_{on} (100%) =	0,89	mJ
$t_{E\,on}$ =	0,23	µs

figure 7. **Half-Bridge Switch**

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

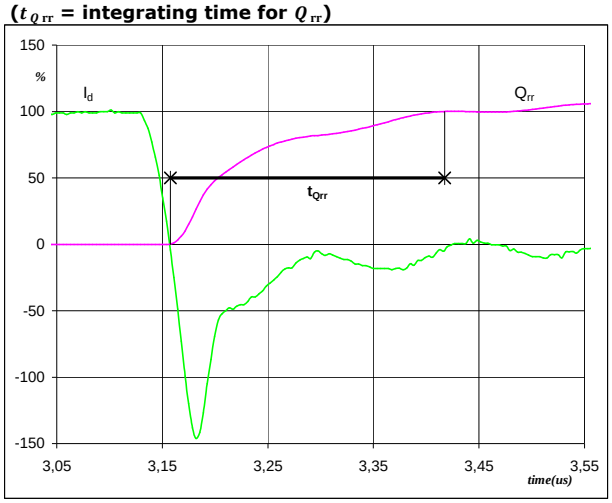


V_d (100%) =	300	V
I_d (100%) =	75	A
I_{RRM} (100%) =	111	A
t_{rr} =	0,13	µs

Switching Definitions

figure 8. **Half-Bridge Diode**

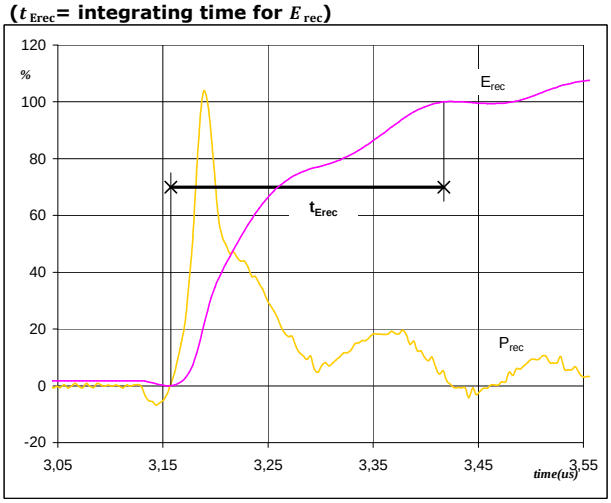
Turn-on Switching Waveforms & definition of t_{Qrr}
($t_{Q\,rr}$ = integrating time for Q_{rr})



I_d (100%) =	75	A
Q_{rr} (100%) =	6,50	µC
$t_{Q\,rr}$ =	0,26	µs

figure 9. **Half-Bridge Diode**

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



P_{rec} (100%) =	22,63	kW
E_{rec} (100%) =	1,57	mJ
$t_{E\,rec}$ =	0,26	µs

Ordering Code and Marking - Outline - Pinout

Ordering Code & Marking

Version	Ordering Code
without thermal paste with solder pins 12mm housing	10-FZ062PA075SA-P993F08
with thermal paste with solder pins 12mm housing	10-FZ062PA075SA-P993F08-/3/
without thermal paste with solder pins 17mm housing	10-F0062PA075SA-P993F09
with thermal paste with solder pins 17mm housing	10-F0062PA075SA-P993F09-/3/

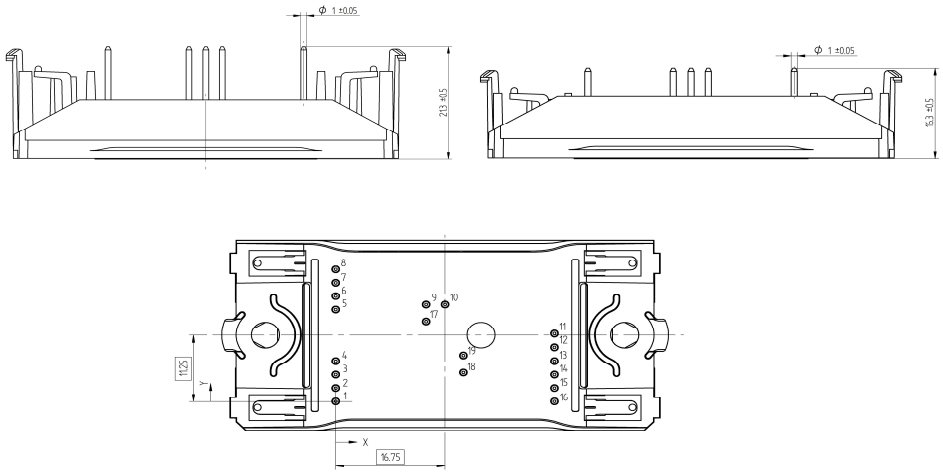
	Name	Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTVV	WWYY	UL VIN	LLLLL	SSSS

Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

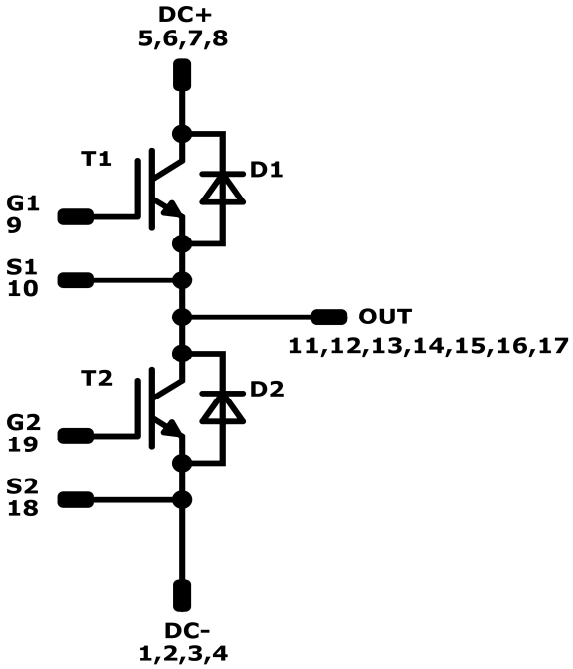
Pin table

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



Ordering Code and Marking - Outline - Pinout

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1, T2	IGBT	600 V	75 A	Half-Bridge Switch	
D1, D2	FWD	600 V	75 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-Fx062PA075SA-P993F0x-D2-14	04. Jun. 2016		