Vincotech

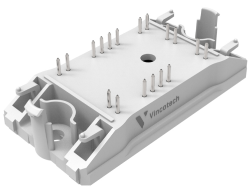
10-FZ06B2A060P7-PB53L78
datasheet

***flow*BOOST 0 dual** — **600 V / 60 mΩ**

Features

- High efficiency dual booster
- Low Inductance Layout
- Ultra fast switching frequency
- Integrated temperature sensor

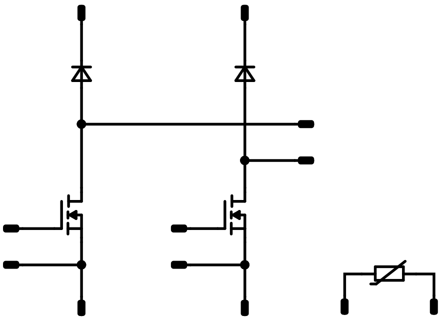
flow 0 12 mm housing



Target applications

- Power Supply
- Solar Inverters

Schematic



Types

- 10-FZ06B2A060P7-PB53L78

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Drain-source voltage	V_{DSS}			600	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$	T_s = 80 °C	23	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		151	A
Avalanche energy, single pulse	E_{AS}	V_{DD} = 50 V	I_D = 0 A	159	mJ
Avalanche energy, repetitive	E_{AR}	V_{DD} = 50 V	I_D = 0 A	0,8	mJ
MOSFET dv/dt ruggedness	dv/dt	V_{DS}= 0..400 V	T_s = 25 °C	80	V/ns
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	67	W
Gate-source voltage	V_{GSS}			±20	V
Reverse diode dv/dt	dv/dt			50	V/ns
Maximum Junction Temperature	T_{jmax}			150	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	28	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		62	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 25 °C	142	A
Surge current capability	I^2t			100	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	60	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
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 s	6000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12,7	mm
Clearance				9,1	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

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	
Boost Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		10		15,9	25 125		63 115	60(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$		0		0,0008	25	3	3,5	4	V
Gate to Source Leakage Current	I_{GSS}		20	0		25			100	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	600		25			1	μA
Internal gate resistance	r_g							2,8		Ω
Gate charge	Q_g		0/10	400	15,9	25		67		nC
Short-circuit input capacitance	C_{iss}	f = 250 kHz	0	400	0	25		2895		pF
Short-circuit output capacitance	C_{oss}							48		
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,05		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	0/10	400	20	25 125		22,08 21,44		ns
Rise time	t_r					25 125		4,8 5,44		ns
Turn-off delay time	$t_{d(off)}$					25 125		73,6 81,6		ns
Fall time	t_f					25 125		5,7 6,59		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,052 μC Q_{rFWD}=0,055 μC				25 125		0,052 0,062		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,022 0,031		mWs

Characteristic Values

Parameter	Symbol	Conditions	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	Unit
Boost Diode										
Static										
Forward voltage	V_F				20	25 125 150		1,47 1,67 1,75	1,8(1)	V
Reverse leakage current	I_R	V_r = 650 V				25		24	120	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,58		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=4821 A/µs d*i*/d*t*=4517 A/µs	0/10	400	20	25 125		14,48 13,96		A
Reverse recovery time	t_{rr}					25 125		8,32 9,31		ns
Recovered charge	Q_r					25 125		0,052 0,055		µC
Reverse recovered energy	E_{rec}					25 125		0,031 0,028		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		4387 3791		A/µs

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		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P							5		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

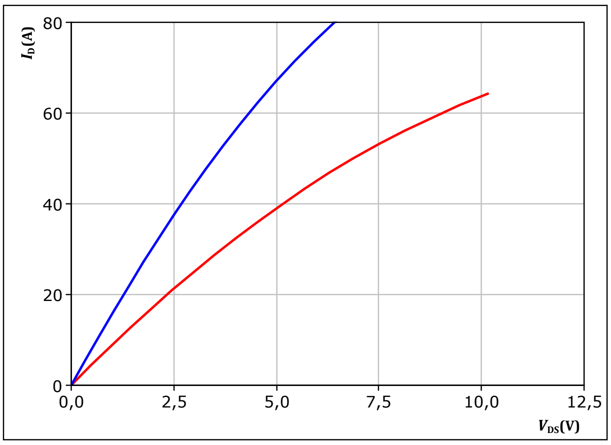
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Boost Switch Characteristics

figure 1.	MOSFET

Typical output characteristics

I_D = f(V_{DS})

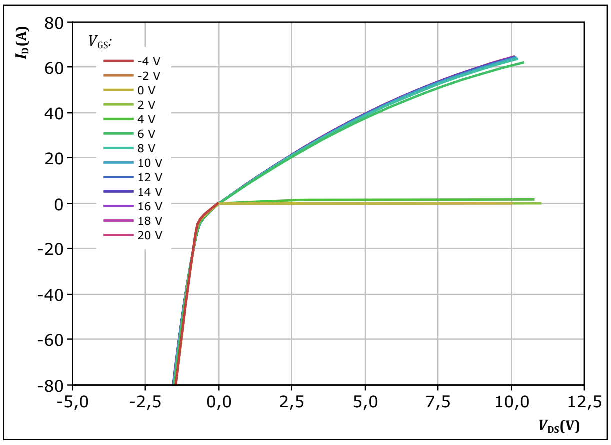


t_p = 250 µs
V_{GS} = 10 V
T_j: 25 °C, 125 °C

figure 2.	MOSFET

Typical output characteristics

I_D = f(V_{DS})

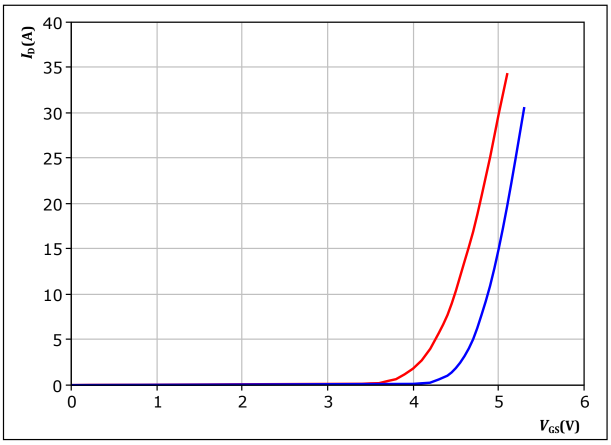


t_p = 250 µs
T_j = 125 °C
V_{GS} from -4 V to 20 V in steps of 2 V

figure 3.	MOSFET

Typical transfer characteristics

I_D = f(V_{GS})

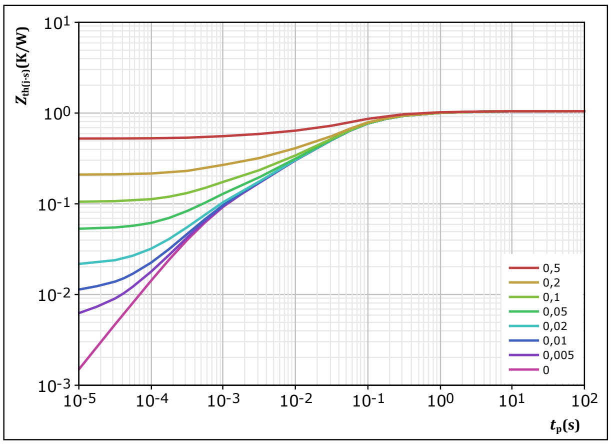


t_p = 250 µs
V_{DS} = 10 V
T_j: 25 °C, 125 °C

figure 4.	MOSFET

Transient thermal impedance as a function of pulse width

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



D = t_p / T
$R_{th(j-s)}$ = 1,047 K/W

MOSFET thermal model values

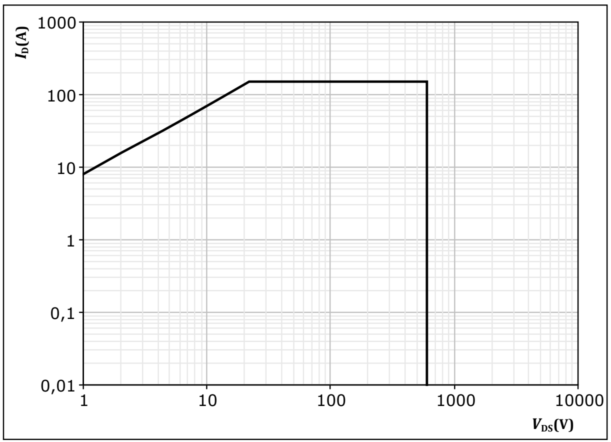
R (K/W)	τ (s)
6,31E-02	1,89E+00
2,11E-01	2,50E-01
5,41E-01	5,16E-02
1,55E-01	6,52E-03
7,68E-02	6,66E-04

Boost Switch Characteristics

figure 5. **MOSFET**

Safe operating area

I_D = f(V_{DS})



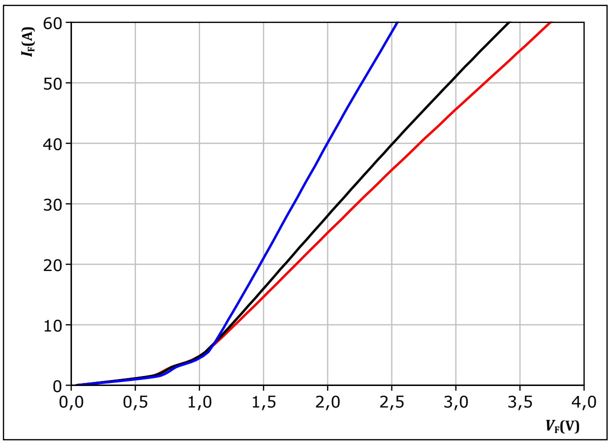
D =	single pulse	
T_s =	80	°C
V_{GS} =	10	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



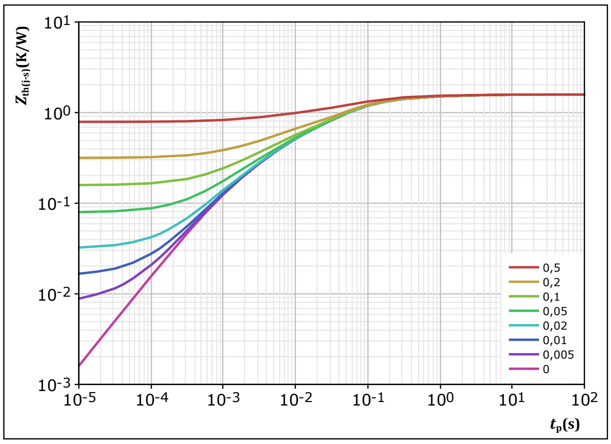
t_p = 250 µs

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

$R_{th(j-s)}$ = 1,58 K/W

FWD thermal model values

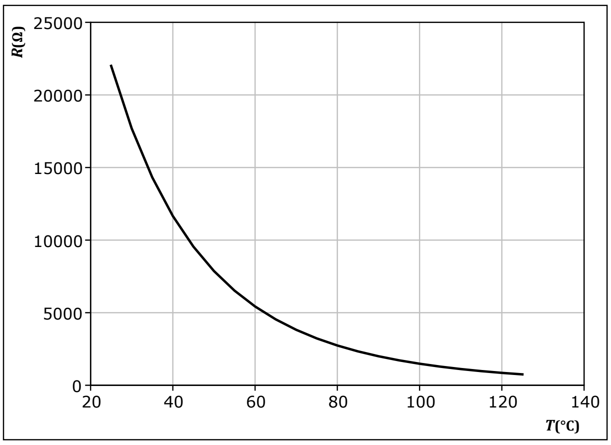
R (K/W)	τ (s)
8,96E-02	2,60E+00
2,36E-01	2,99E-01
8,04E-01	5,52E-02
3,49E-01	6,69E-03
1,01E-01	1,09E-03

Thermistor Characteristics

figure 8.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

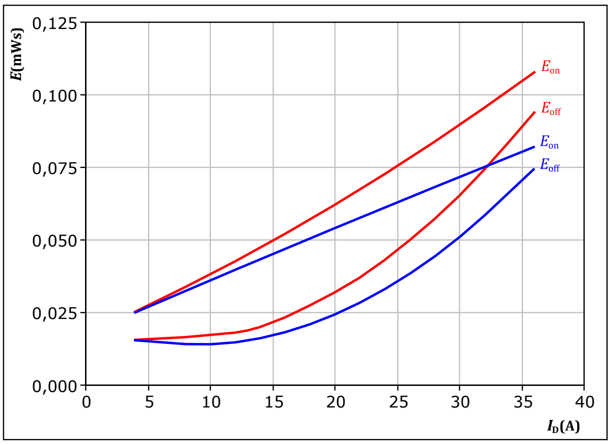


Boost Switching Characteristics

figure 9. **MOSFET**

Typical switching energy losses as a function of drain current

E = f(I_D)



With an inductive load at

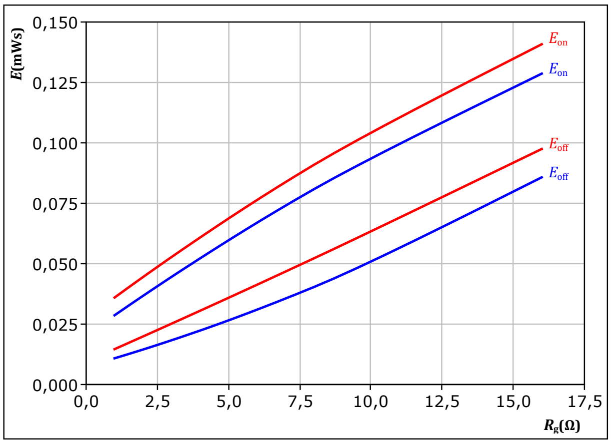
T_j: 25 °C / 125 °C

V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 10. **MOSFET**

Typical switching energy losses as a function of gate resistor

E = f(R_g)



With an inductive load at

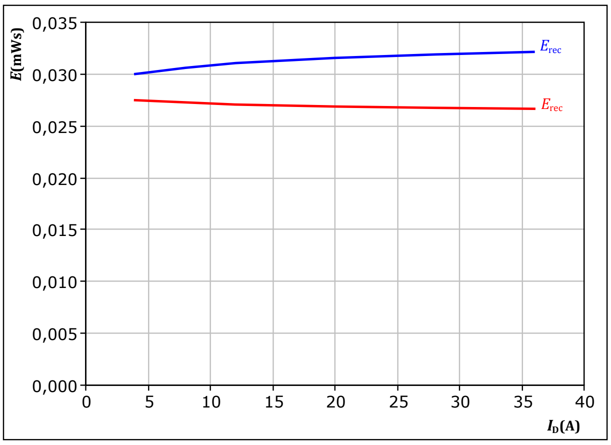
T_j: 25 °C / 125 °C

V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	20	A

figure 11. **FWD**

Typical reverse recovered energy loss as a function of drain current

E_{rec} = f(I_D)



With an inductive load at

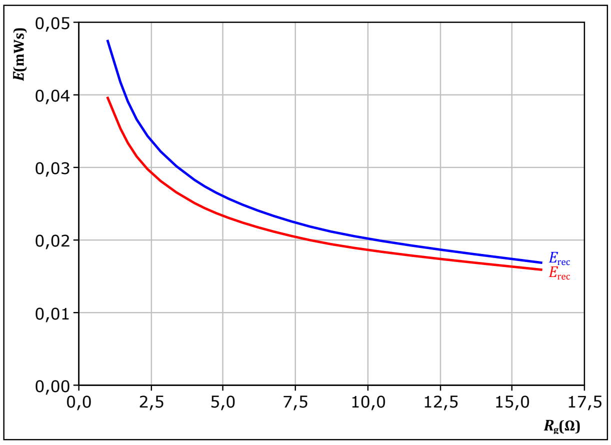
T_j: 25 °C / 125 °C

V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	4	Ω

figure 12. **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 / 125 °C

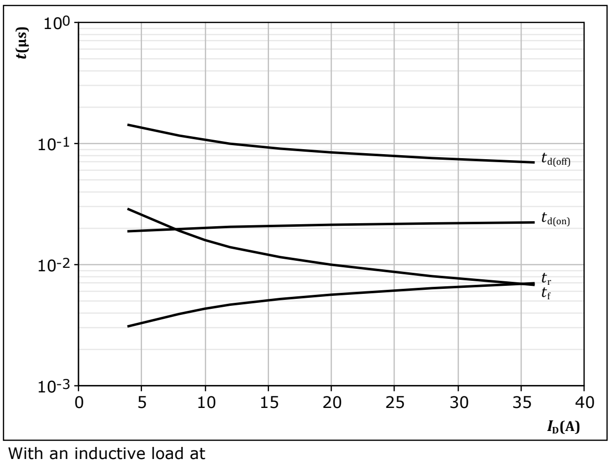
V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	20	A

Boost Switching Characteristics

figure 13. **MOSFET**

Typical switching times as a function of drain current

t = f(I_D)



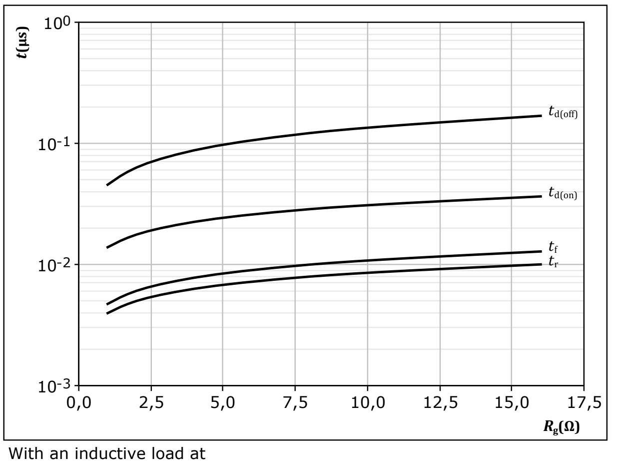
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 14. **MOSFET**

Typical switching times as a function of gate resistor

t = f(R_g)



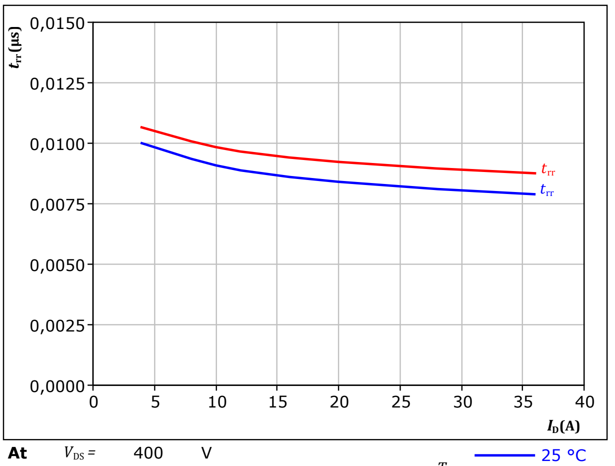
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	0/10	V
I_D =	20	A

figure 15. **FWD**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)



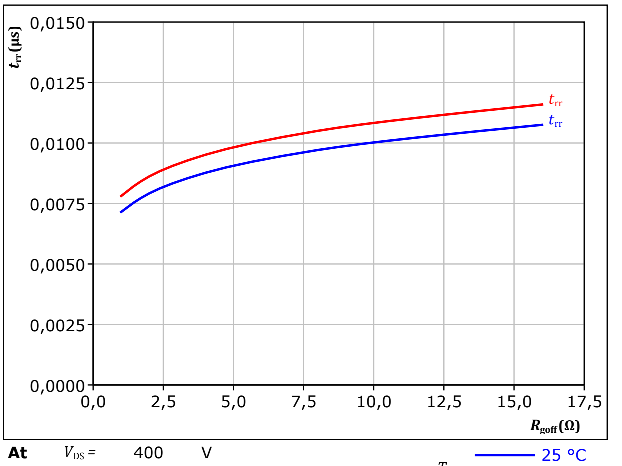
At			
	V_{DS} =	400	V
	V_{GS} =	0/10	V
	R_{gon} =	4	Ω

T_j: 25 °C / 125 °C

figure 16. **FWD**

Typical reverse recovery time as a function of turn off gate resistor

t_{rr} = f(R_{goff})



At			
	V_{DS} =	400	V
	V_{GS} =	0/10	V
	I_D =	20	A

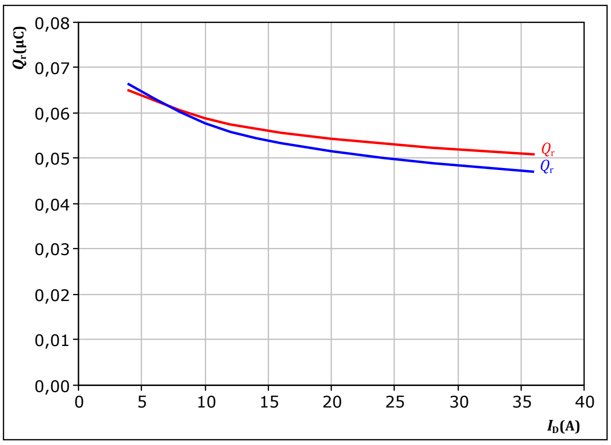
T_j: 25 °C / 125 °C

Boost Switching Characteristics

figure 17. **FWD**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

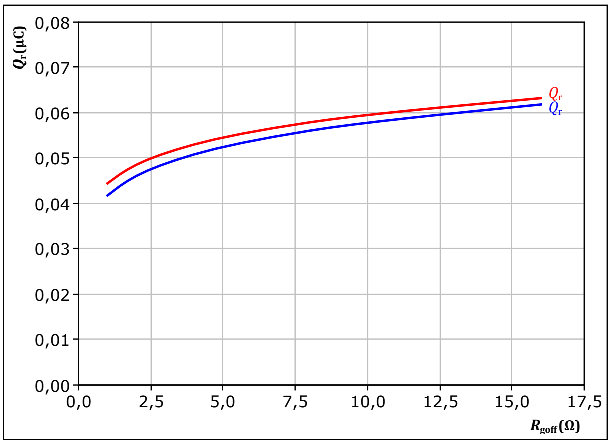


At				
	V_{DS} =	400	V	T_j: 25 °C (blue), 125 °C (red)
	V_{GS} =	0/10	V	
	R_{gon} =	4	Ω	

figure 18. **FWD**

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})

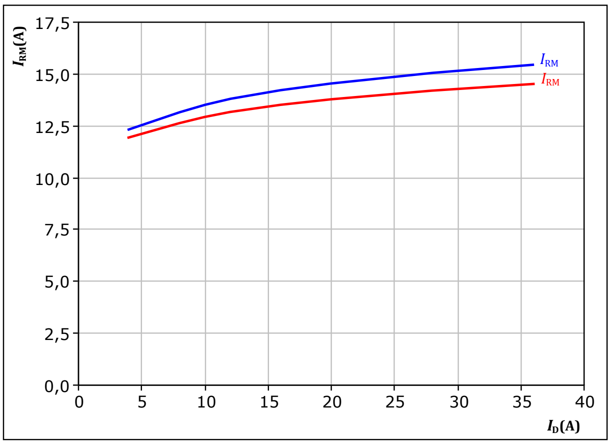


At				
	V_{DS} =	400	V	T_j: 25 °C (blue), 125 °C (red)
	V_{GS} =	0/10	V	
	I_D =	20	A	

figure 19. **FWD**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)

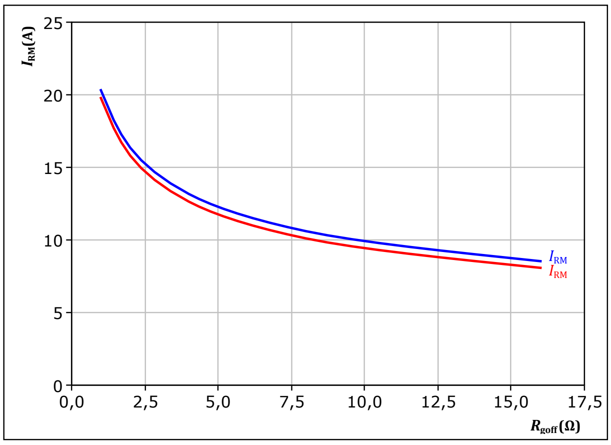


At				
	V_{DS} =	400	V	T_j: 25 °C (blue), 125 °C (red)
	V_{GS} =	0/10	V	
	R_{gon} =	4	Ω	

figure 20. **FWD**

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

I_{RM} = f(R_{goff})



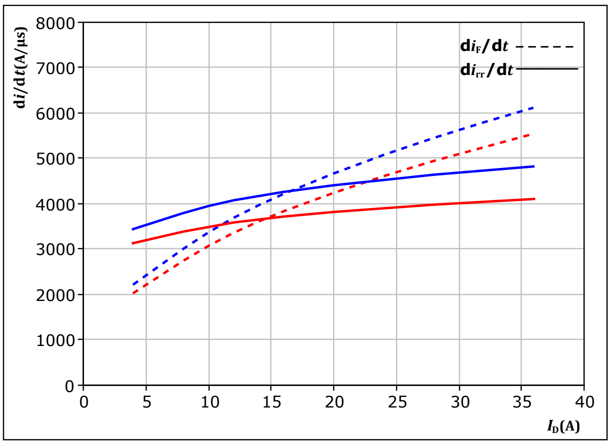
At				
	V_{DS} =	400	V	T_j: 25 °C (blue), 125 °C (red)
	V_{GS} =	0/10	V	
	I_D =	20	A	

Boost Switching Characteristics

figure 21. **FWD**

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

di_F/dt, di_{rr}/dt = f(I_D)

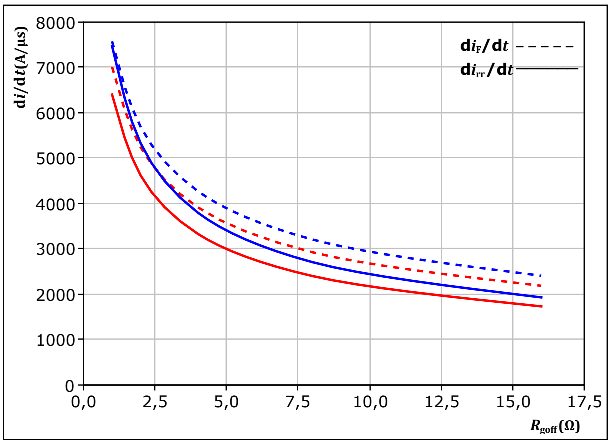


At				
	V_{DS} =	400	V	T_j: 25 °C
	V_{GS} =	0/10	V	125 °C
	R_{gon} =	4	Ω	

figure 22. **FWD**

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

di_F/dt, di_{rr}/dt = f(R_{goff})

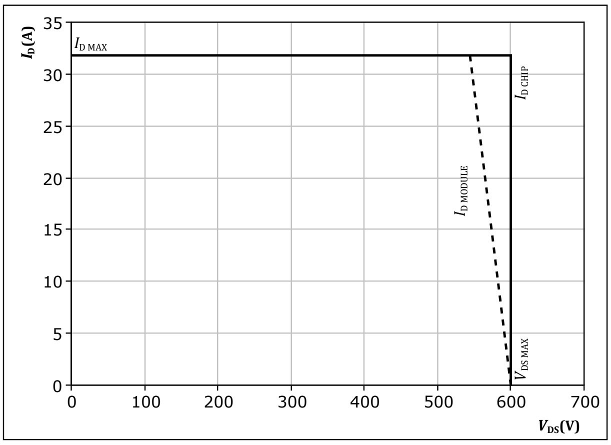


At				
	V_{DS} =	400	V	T_j: 25 °C
	V_{GS} =	0/10	V	125 °C
	I_D =	20	A	

figure 23. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At			
	T_j =	125	°C
	R_{gon} =	4	Ω
	R_{goff} =	4	Ω

Boost Switching Definitions

figure 24. **MOSFET**

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

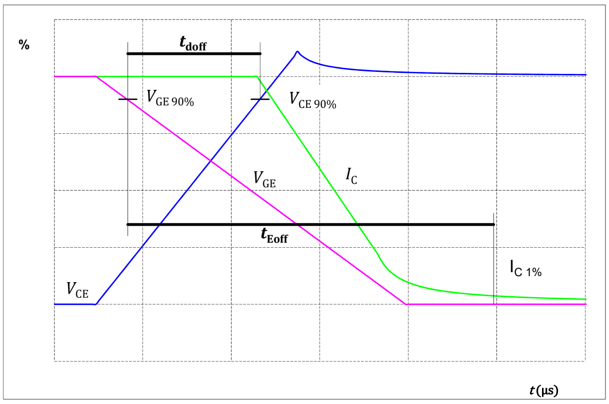


figure 25. **MOSFET**

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

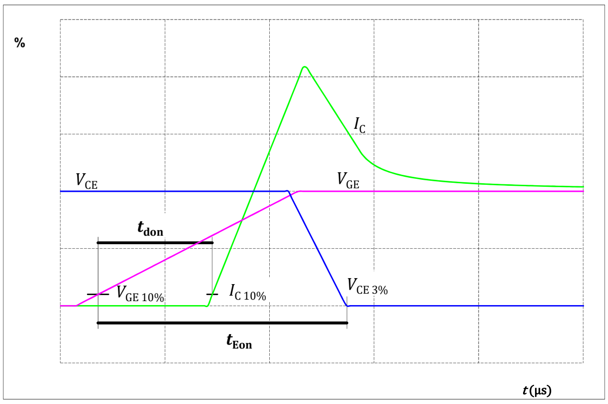


figure 26. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

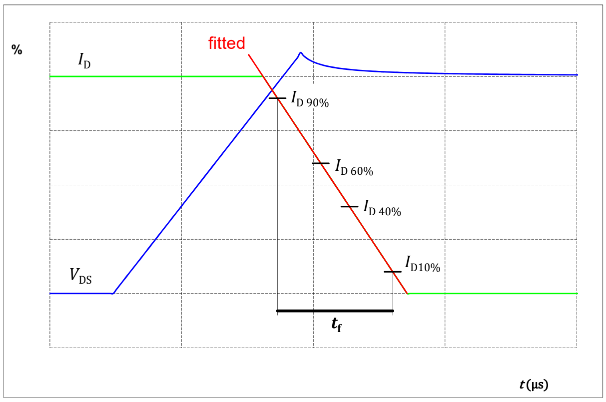
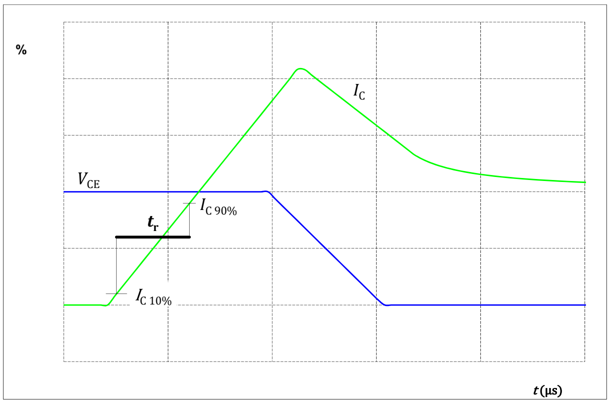


figure 27. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Boost Switching Definitions

figure 28. **FWD**

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

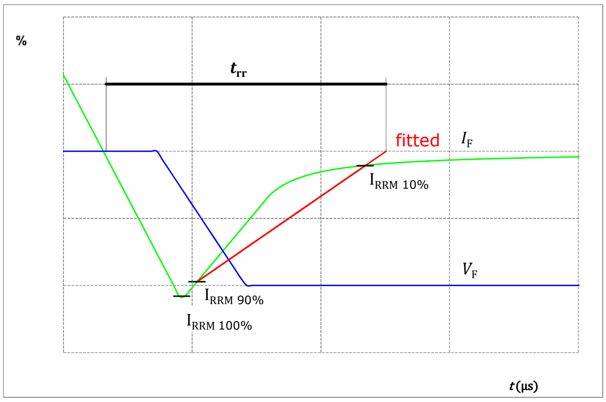


figure 29. **FWD**

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

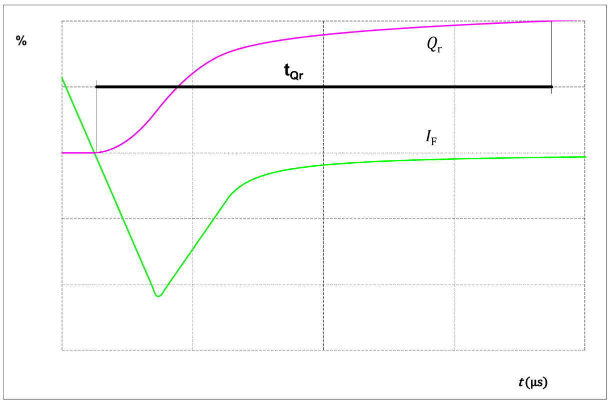
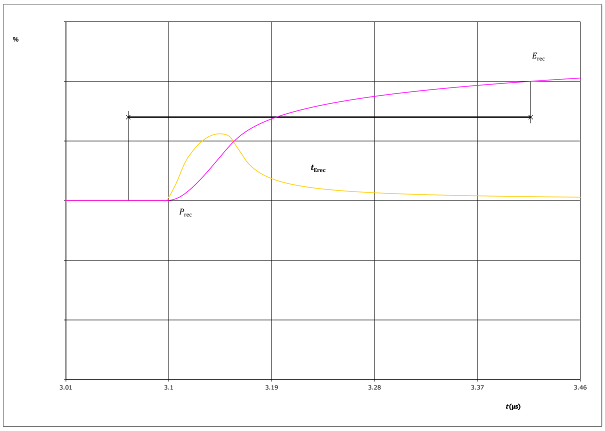


figure 30. **FWD**

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



Ordering Code

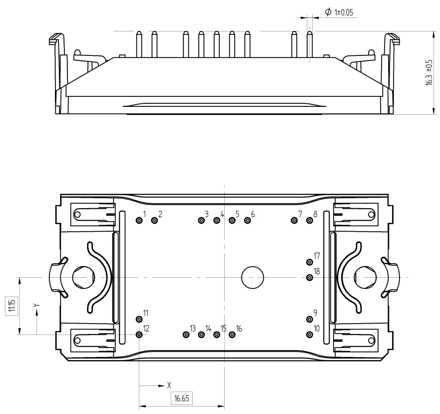
Version	Ordering Code
Without thermal paste	10-FZ06B2A060P7-PB53L78
With thermal paste (5,2 W/mK, PTM6000HV)	10-FZ06B2A060P7-PB53L78-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FZ06B2A060P7-PB53L78-/3/

Marking

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

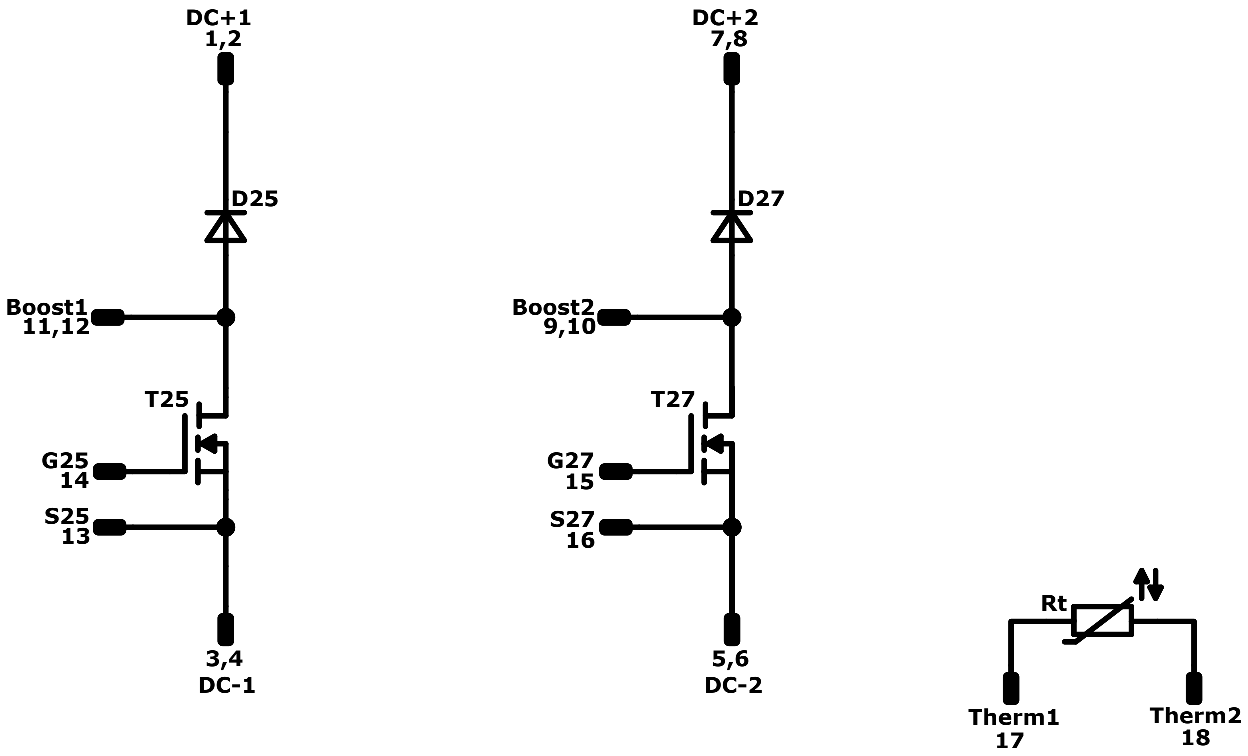
Outline

Pin table [mm]			
Pin	X	Y	Function
1	0	22,3	DC+1
2	3	22,3	DC+1
3	12,15	22,3	DC-1
4	15,15	22,3	DC-1
5	18,15	22,3	DC-2
6	21,15	22,3	DC-2
7	30,3	22,3	DC+2
8	33,3	22,3	DC+2
9	33,3	3	Boost2
10	33,3	0	Boost2
11	0	3	Boost1
12	0	0	Boost1
13	9,15	0	S25
14	12,15	0	G25
15	15,15	0	G27
16	18,15	0	S27
17	33,3	14,15	Therm1
18	33,3	11,15	Therm2



Tolerance of pinpositions ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T25, T27	MOSFET	600 V	49 mΩ	Boost Switch	
D25, D27	FWD	650 V	20 A	Boost Diode	
Rt	Thermistor			Thermistor	

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.

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
10-FZ06B2A060P7-PB53L78-D1-14	7 Jul. 2021		
10-FZ06B2A060P7-PB53L78-D2-14	14 Oct. 2021	Correct Eoff trendline (figure9)	