



Vincotech

10-FZ06B2A060P7-PB53L78

datasheet

flowBOOST 0 dual

600 V / 60 mΩ

Features

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

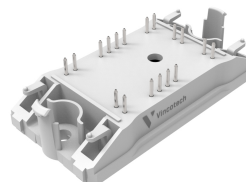
Target applications

- Power Supply
- Solar Inverters

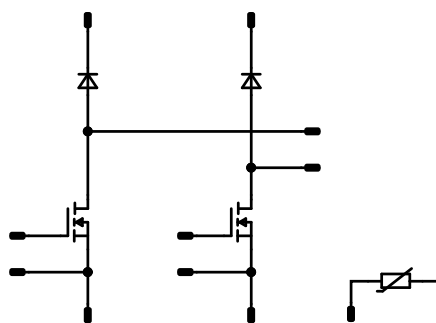
Types

- 10-FZ06B2A060P7-PB53L78

flow 0 12 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Boost Switch				
Drain-source voltage	V_{DS}		600	V
Drain current (DC current)	I_D	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	23	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	151	A
Avalanche energy, single pulse	E_{AS}	$V_{DD} = 50\text{ V}$ $I_D = 0\text{ A}$	159	mJ
Avalanche energy, repetitive	E_{AR}	$V_{DD} = 50\text{ V}$ $I_D = 0\text{ A}$	0,8	mJ
MOSFET dv/dt ruggedness	dv/dt	$V_{DS} = 0..400\text{ V}$ $T_s = 25\text{ °C}$	80	V/ns
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	67	W
Gate-source voltage	V_{GS}		±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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	28	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	92	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$	180	A
Surge current capability	I^2t		162	A²s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	60	W
Maximum junction temperature	T_{jmax}		175	°C



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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
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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* $t_p = 2\text{ s}$	6000	V
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			9,1	mm
Comparative Tracking Index	CTI		≥ 200	

*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	

Boost Switch

Static

Drain-source on-state resistance	$r_{DS(on)}$		10		15,9	25 125		63 115		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}	$f = 250 \text{ kHz}$	0	400	0	25		2895		pF
Short-circuit output capacitance	C_{oss}							48		

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,05		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4 \Omega$ $R_{goff} = 4 \Omega$	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}					25 125		0,052 0,062		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,022 0,031		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	

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	$V_i = 650$ V				25		24	120	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,58		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=4821$ A/μs $di/dt=4517$ 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	$(di_{rr}/dt)_{max}$					25 125		4387 3791		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		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P							5		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$						3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$						4000		K
Vincotech Thermistor Reference									I	

⁽¹⁾ Value at chip level

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



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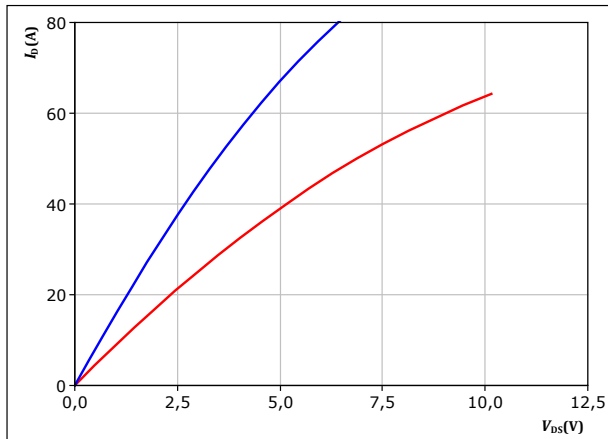
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Boost Switch Characteristics

figure 1. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

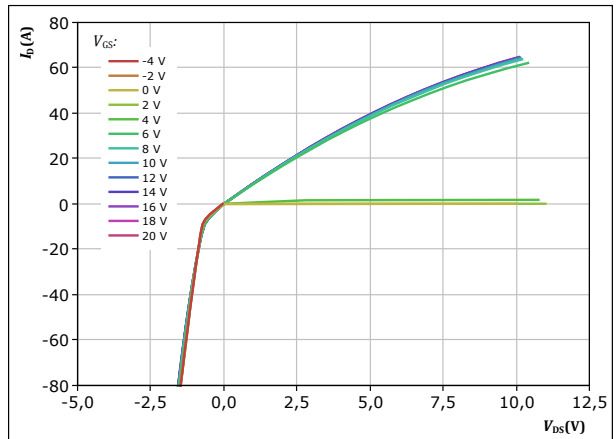


$t_p = 250 \mu s$
 $V_{GS} = 10 V$
 $T_j: \text{blue } 25^\circ C, \text{ red } 125^\circ C$

figure 2. MOSFET

Typical output characteristics

$$I_D = f(V_{DS})$$

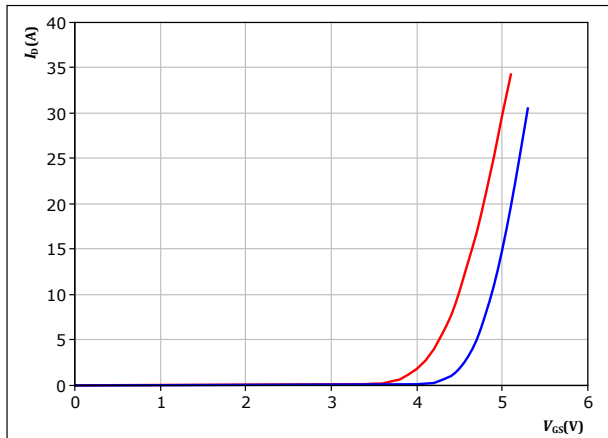


$t_p = 250 \mu s$
 $T_j = 125^\circ C$
 V_{GS} from -4 V to 20 V in steps of 2 V

figure 3. MOSFET

Typical transfer characteristics

$$I_D = f(V_{GS})$$

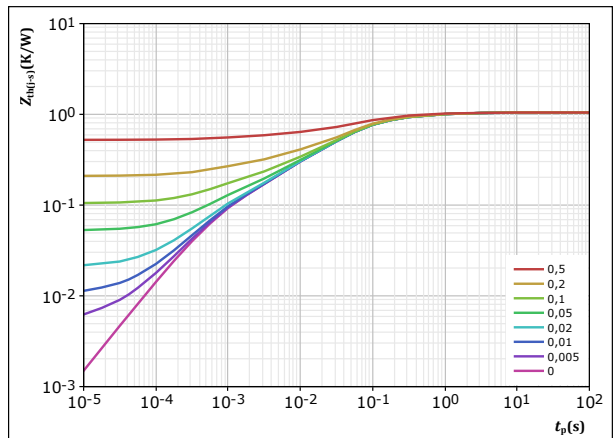


$t_p = 250 \mu s$
 $V_{DS} = 10 V$
 $T_j: \text{blue } 25^\circ C, \text{ red } 125^\circ C$

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

$R (K/W)$	$\tau (s)$
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



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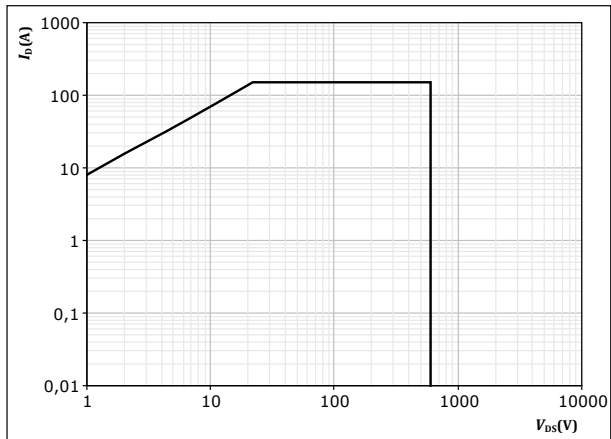
Boost Switch Characteristics

figure 5.

MOSFET

Safe operating area

$I_D = f(V_{DS})$



$D = \text{single pulse}$

$T_s = 80 \text{ } ^\circ\text{C}$

$V_{GS} = 10 \text{ V}$

$T_j = T_{jmax}$



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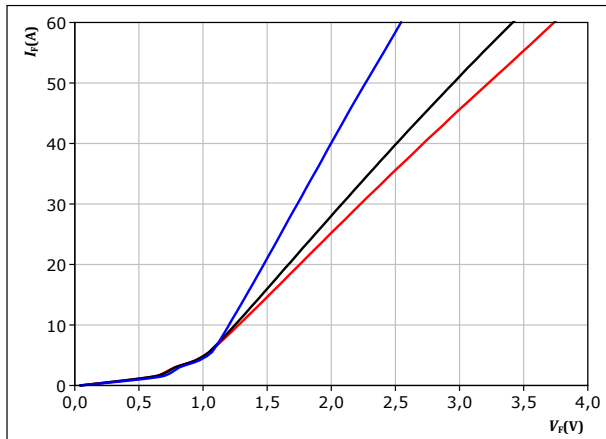
datasheet

Boost Diode Characteristics

figure 6. FWD

Typical forward characteristics

$$I_F = f(V_F)$$



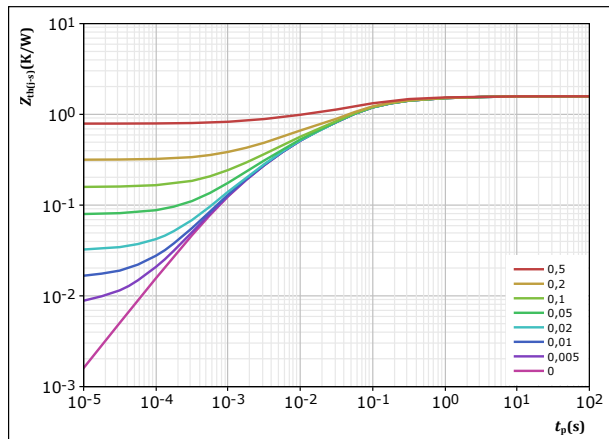
$t_p = 250 \mu s$

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 7. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,58 \text{ K/W}$
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



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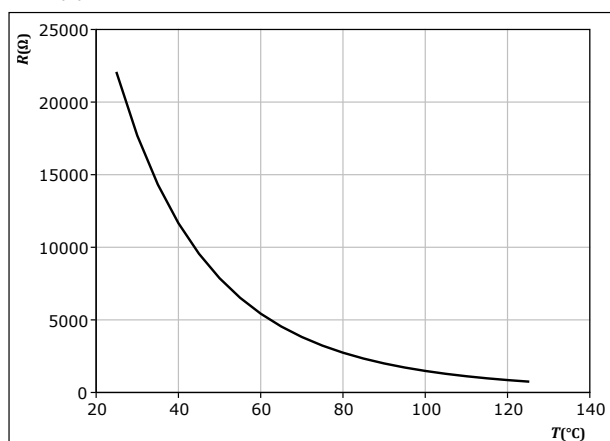
Thermistor Characteristics

figure 8.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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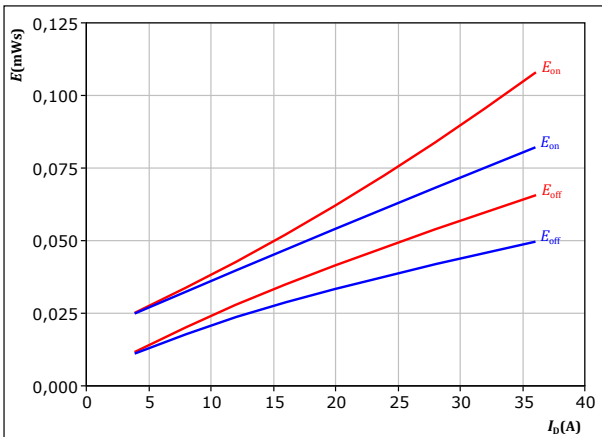
Boost Switching Characteristics

figure 9.

MOSFET

Typical switching energy losses as a function of drain current

$$E = f(I_D)$$



With an inductive load at

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

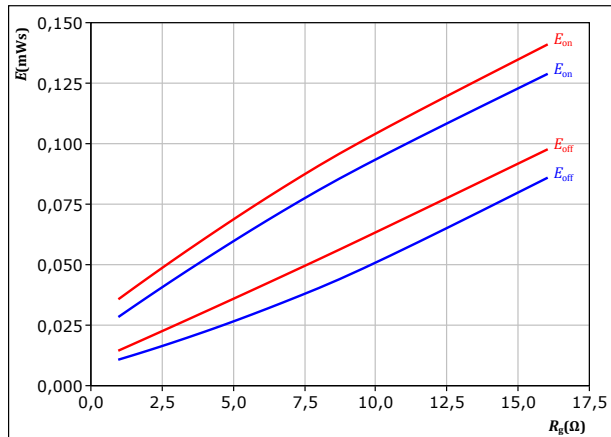
T_j : — 25 °C
— 125 °C

figure 10.

MOSFET

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

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

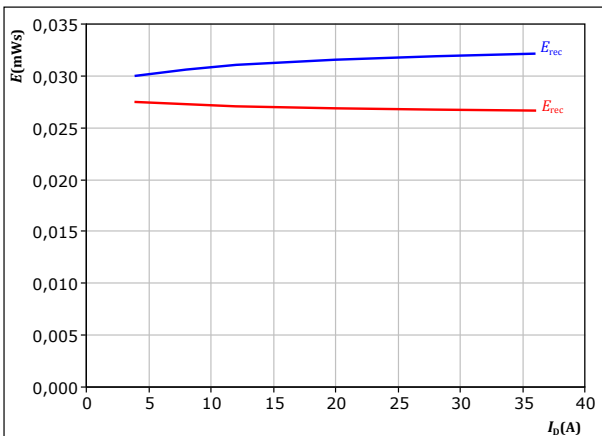
T_j : — 25 °C
— 125 °C

figure 11.

FWD

Typical reverse recovered energy loss as a function of drain current

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



With an inductive load at

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

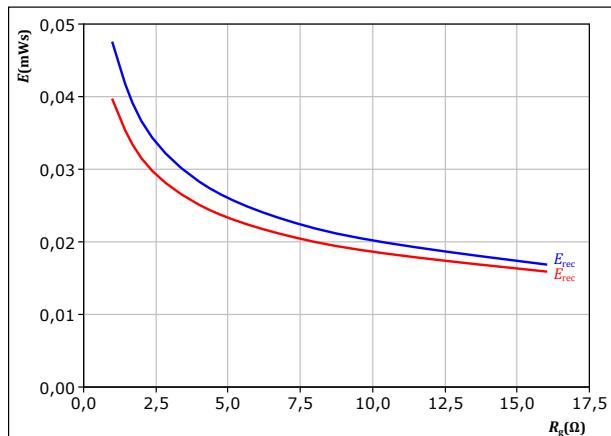
T_j : — 25 °C
— 125 °C

figure 12.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

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

T_j : — 25 °C
— 125 °C



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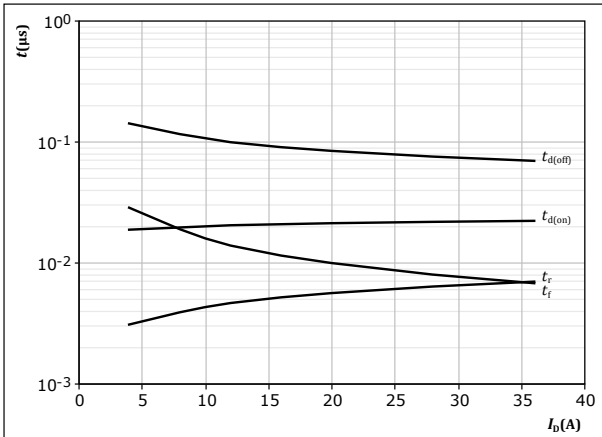
datasheet

Boost Switching Characteristics

figure 13.

MOSFET

Typical switching times as a function of drain current
 $t = f(I_D)$



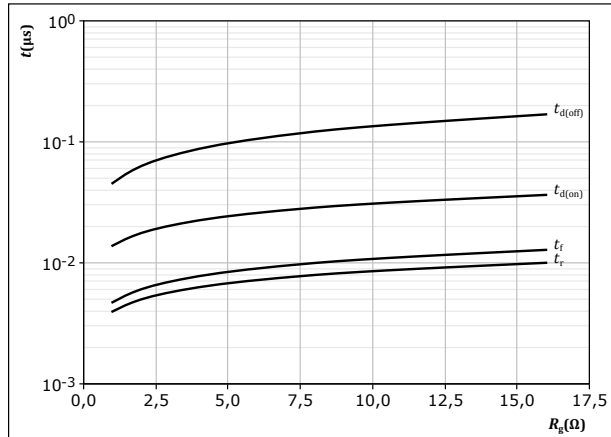
With an inductive load at

$T_j = 125$ °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
 $t = f(R_g)$



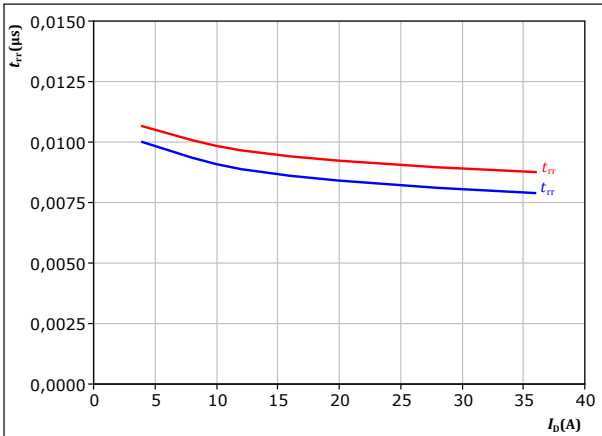
With an inductive load at

$T_j = 125$ °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
 $t_{rr} = f(I_D)$

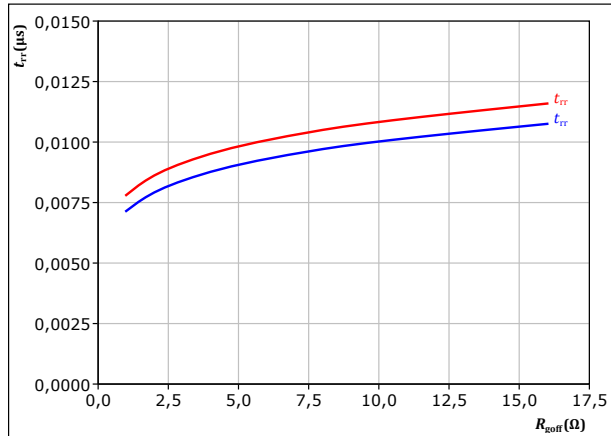


At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $R_{gon} = 4$ Ω
 T_j : — 25 °C
— 125 °C

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



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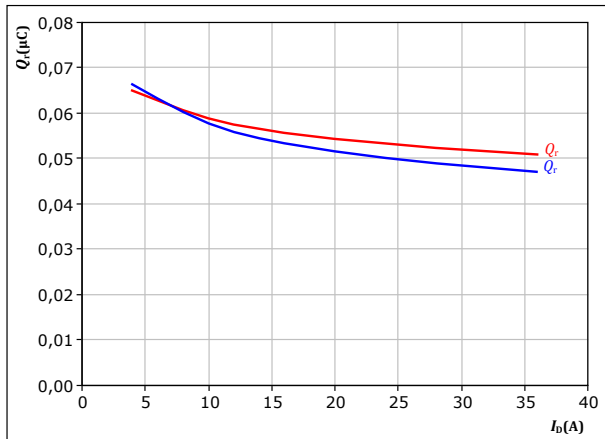
Boost Switching Characteristics

figure 17.

FWD

Typical recovered charge as a function of drain current

$$Q_r = f(I_D)$$



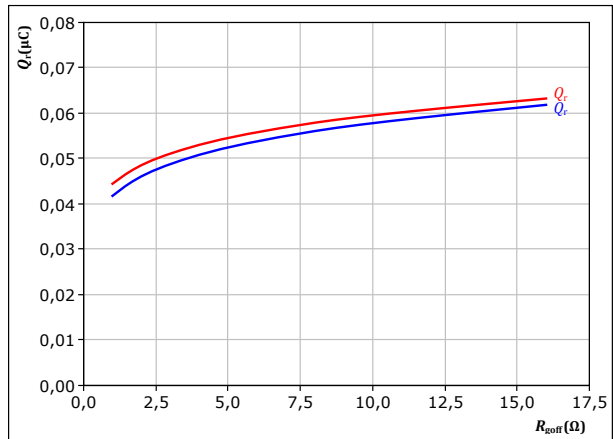
At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $R_{gon} = 4$ Ω
 T_j : — 25 °C
— 125 °C

figure 18.

FWD

Typical recovered charge as a function of turn off gate resistor

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



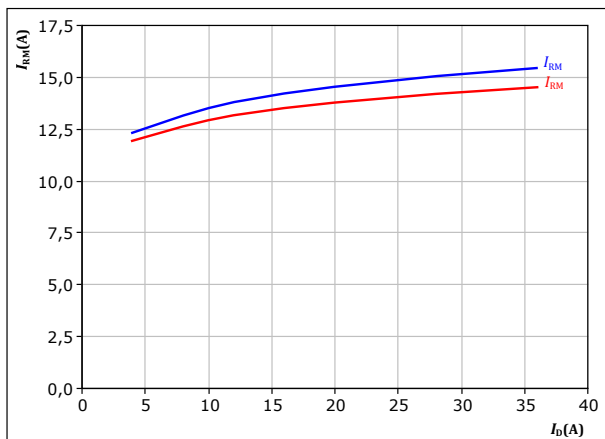
At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $I_D = 20$ A
 T_j : — 25 °C
— 125 °C

figure 19.

FWD

Typical peak reverse recovery current as a function of drain current

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



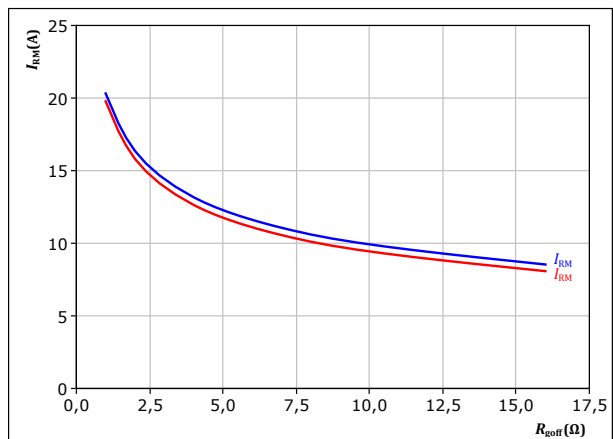
At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $R_{gon} = 4$ Ω
 T_j : — 25 °C
— 125 °C

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
 $V_{GS} = 0/10$ V
 $I_D = 20$ A
 T_j : — 25 °C
— 125 °C



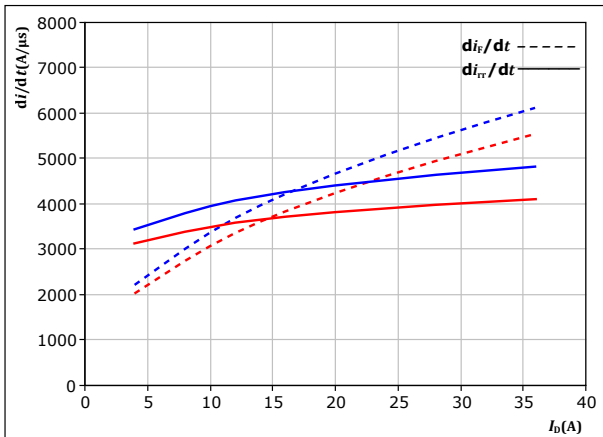
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Boost Switching Characteristics

figure 21. FWD

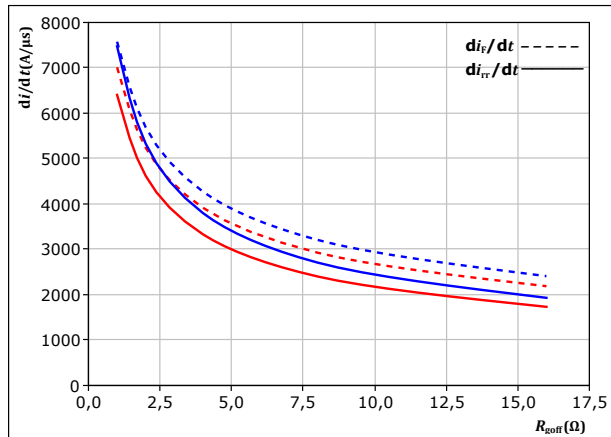
Typical rate of fall of forward and reverse recovery current as a function of drain current
 $di_f/dt, di_r/dt = f(I_D)$



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

figure 22. FWD

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

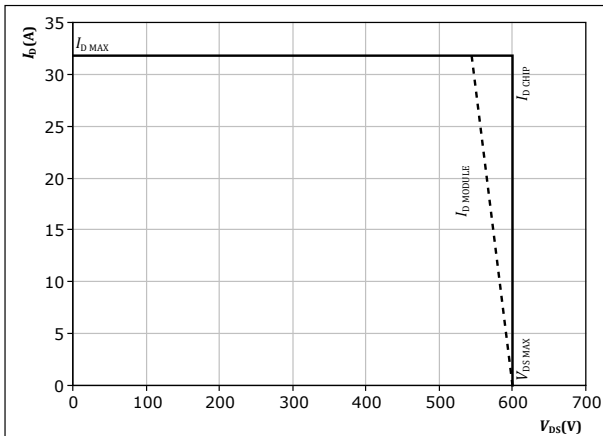


At $V_{DS} = 400$ V
 $V_{GS} = 0/10$ V
 $I_D = 20$ A
 $T_j = 25$ °C
 $T_j = 125$ °C

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



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Boost Switching Definitions

figure 24. MOSFET

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

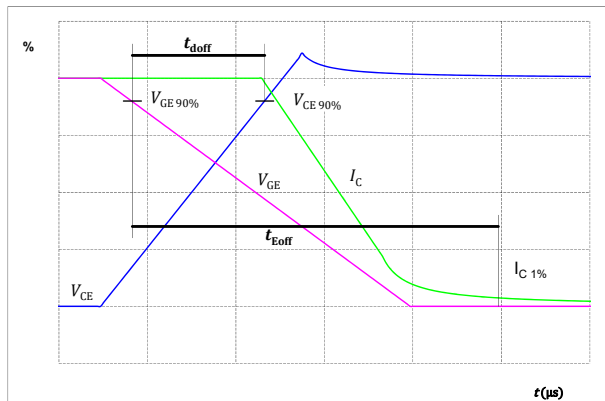


figure 25. MOSFET

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

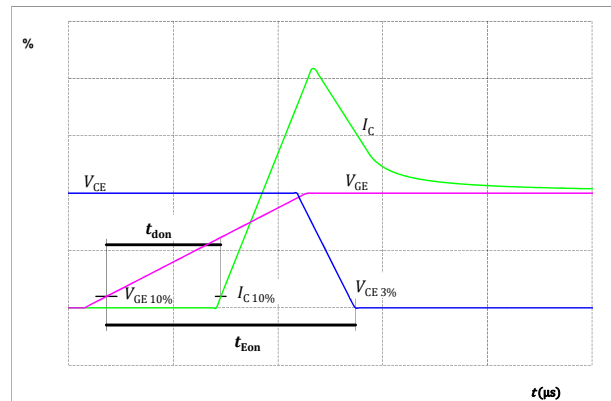


figure 26. MOSFET

Turn-off Switching Waveforms & definition of t_f

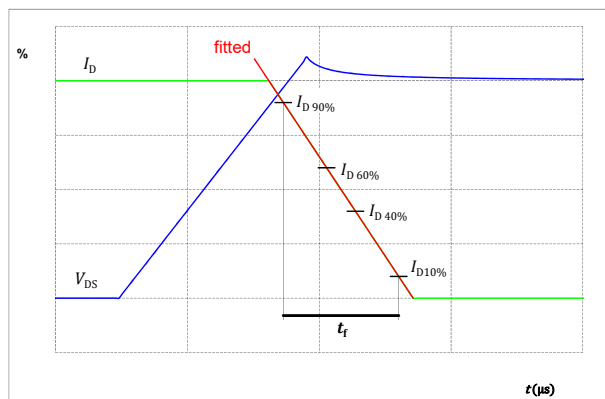
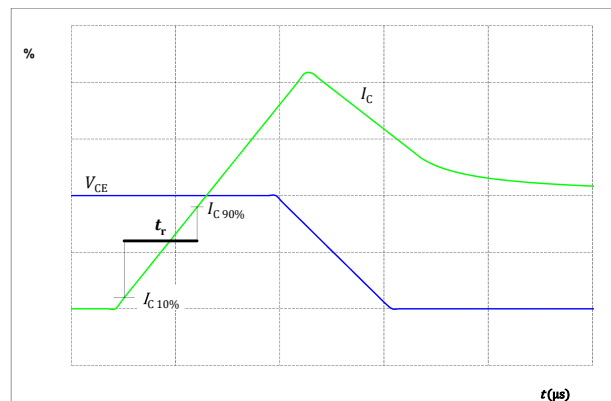


figure 27. MOSFET

Turn-on Switching Waveforms & definition of t_r





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Boost Switching Definitions

figure 28. FWD

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

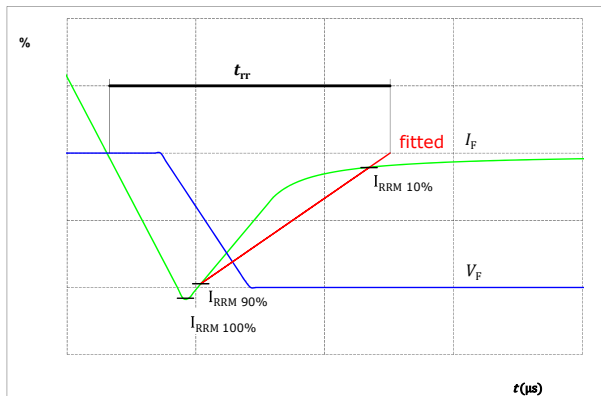


figure 29. FWD

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

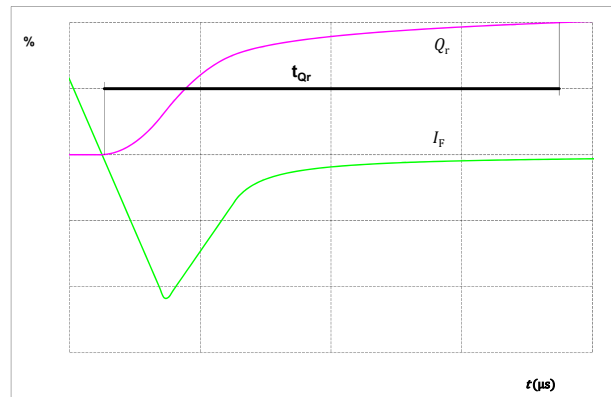
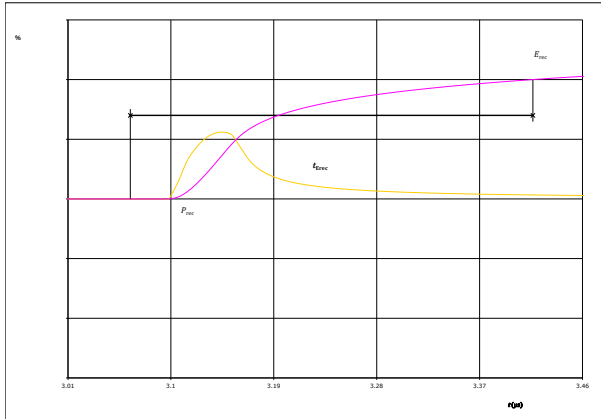


figure 30. FWD

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





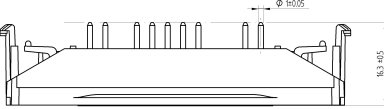
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	10-FZ06B2A060P7-PB53L78
With thermal paste (4,4 W/mK, PTM6000)	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- TTTTTIVV		WWYY	UL VIN	LLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTIVV	LLLL	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



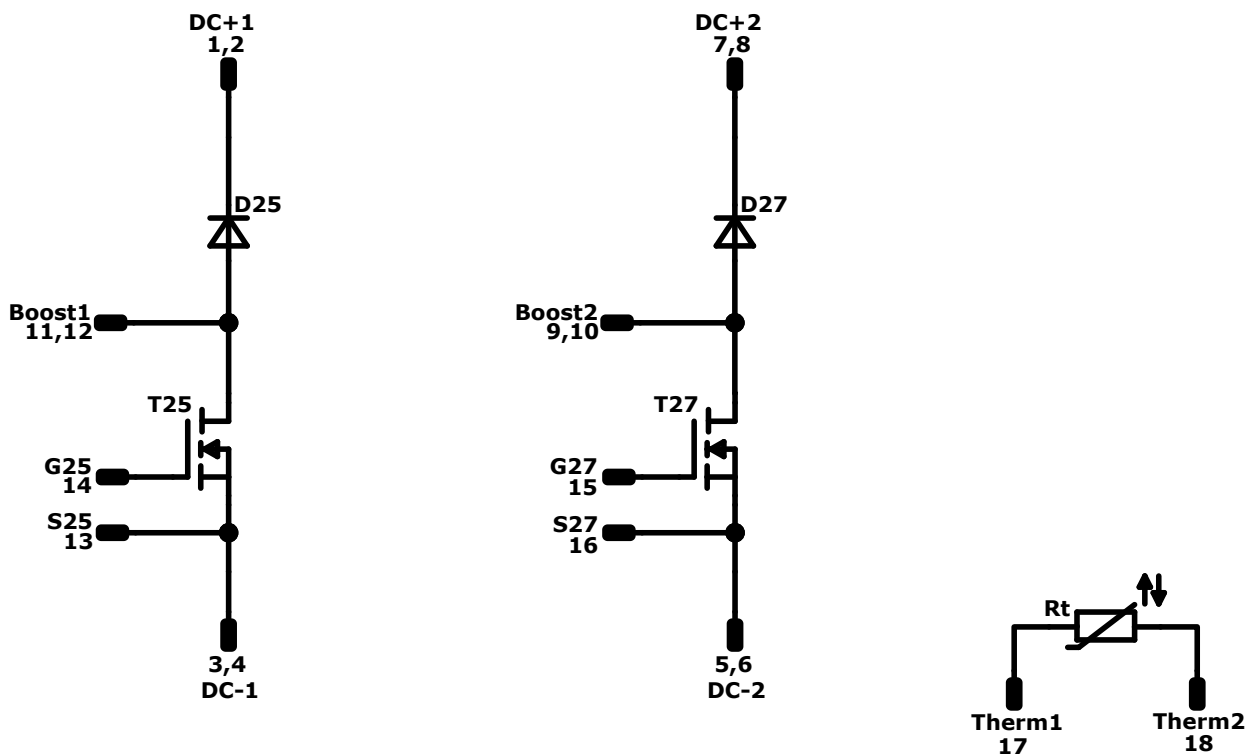

Tolerance of pinpositions: ±0,5mm at the end of pins
 Dimension of coordinate axis is only offset without tolerance



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Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T25, T27	MOSFET	600 V	60 mΩ	Boost Switch	
D25, D27	FWD	650 V	20 A	Boost Diode	
Rt	Thermistor			Thermistor	



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

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> 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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