Vincotech

10-PY064PA040F7-L581L88Y
datasheet

fastPACK 1 **650 V / 31 mΩ**

Topology features

- Kelvin Emitter for improved switching performance
- Integrated DC capacitor
- Open Emitter configuration
- Temperature sensor

Component features

- Extremly low losses
- Improved reverse diode commutation ruggedness
- Ultra-fast body diode

Housing features

- Base isolation: Al_2O_3
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

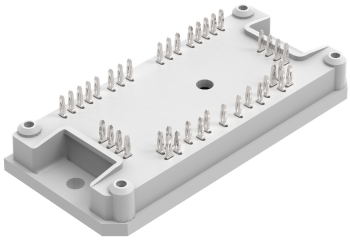
Target applications

- Charging Stations

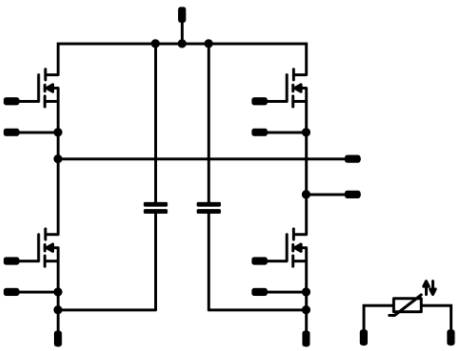
Types

- 10-PY064PA040F7-L581L88Y

flow 1 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Inverter Switch					
Drain-source voltage	V_{DSS}			600	V
Drain current (DC current)	I_D	T_j = T_{jmax}	T_s = 80 °C	22	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}		212	A
Avalanche energy, single pulse	E_{AS}	V_{DD} = 50 V	I_D = 7,4 A	249	mJ
Avalanche energy, repetitive	E_{AR}	V_{DD} = 50 V	I_D = 7,4 A	1,25	mJ
MOSFET dv/dt ruggedness	dv/dt	V_{DS}= 0..400 V	T_s = 25 °C	120	V/ns
Total power dissipation	P_{tot}	T_j = T_{jmax}	T_s = 80 °C	73	W
Gate-source voltage	V_{GSS}			±20	V
Reverse diode dv/dt	dv/dt			70	V/ns
Maximum Junction Temperature	T_{jmax}			150	°C
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			630	V
Operation Temperature	T_{op}			-55 ... 125	°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 s	6000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12,7	mm
Clearance				7,92	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	
Inverter Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		10		24,9	25 125		77,8 143	40(1)	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$	0		0,00125	25	3,5	4	4,5	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							3,8		Ω
Gate charge	Q_g	V_{DD} = 400 V	0/10		14,6	25		109		nC
Short-circuit input capacitance	C_{iss}	f = 250 kHz	0	400	0	25		4354		pF
Short-circuit output capacitance	C_{oss}							85		
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,95		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 120 Ω R_{goff} = 8 Ω	-5/10	350	25	25 125		592,83 563,94		ns
Rise time	t_r					25 125		89,33 97,68		ns
Turn-off delay time	$t_{d(off)}$					25 125		98,8 107,46		ns
Fall time	t_f					25 125		2 2,47		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,4 µC Q_{rFWD}=2,86 µC				25 125		1,78 2,59		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,042 0,049		mWs
Peak recovery current	I_{RRM}	di/dt=318 A/µs di/dt=302 A/µs				25 125		27,67 38,51		A
Reverse recovery time	t_{rr}					25 125		92,4 139,13		ns
Recovered charge	Q_r					25 125		1,4 2,86		µC
Reverse recovered energy	E_{rec}					25 125		0,035 0,074		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		7987,88 6067,26		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	
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		100		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%
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					25		130		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

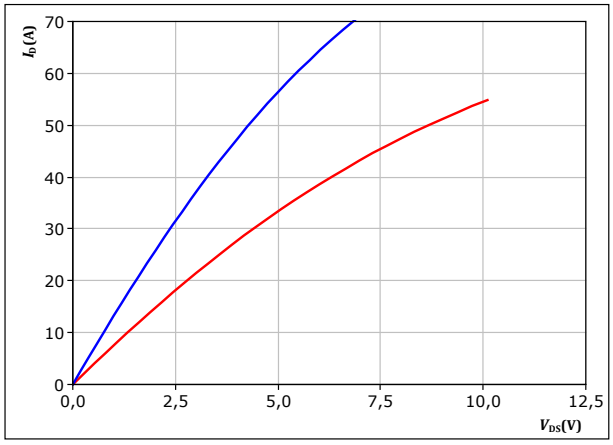
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

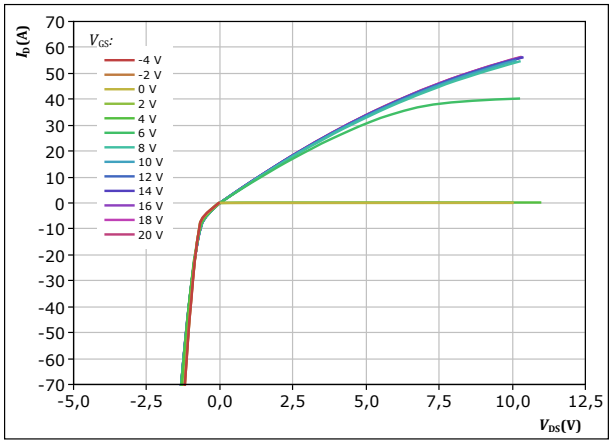


t_p =	250	µs	T_j:	25 °C
V_{GS} =	10	V		125 °C

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$



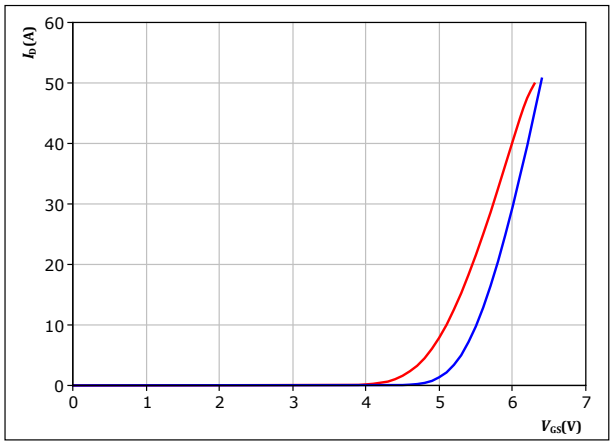
t_p =	250	µs
T_j =	125	°C

V_{GS} from -4 V to 20 V in steps of 2 V

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

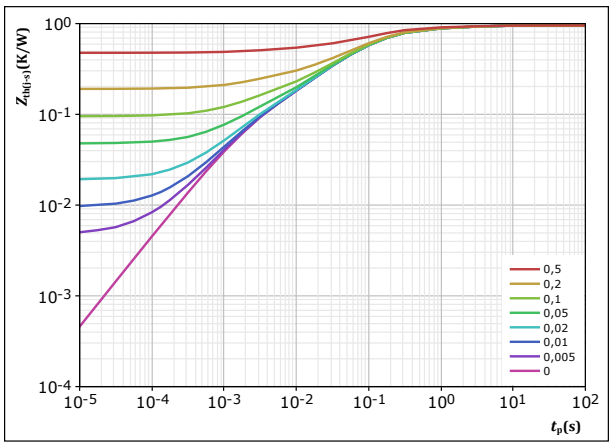


t_p =	250	µs	T_j:	25 °C
V_{DS} =	10	V		125 °C

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,953	K/W

MOSFET thermal model values

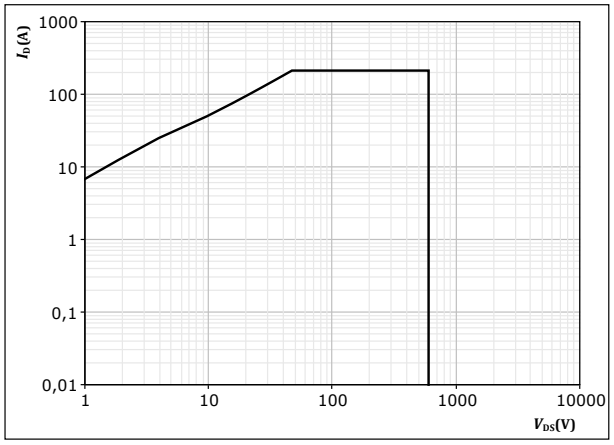
R (K/W)	τ (s)
6,96E-02	3,02E+00
1,75E-01	4,19E-01
4,94E-01	9,37E-02
1,49E-01	1,82E-02
6,56E-02	2,05E-03

Inverter Switch Characteristics

figure 5. **MOSFET**

Safe operating area

$I_D = f(V_{DS})$



D = single pulse

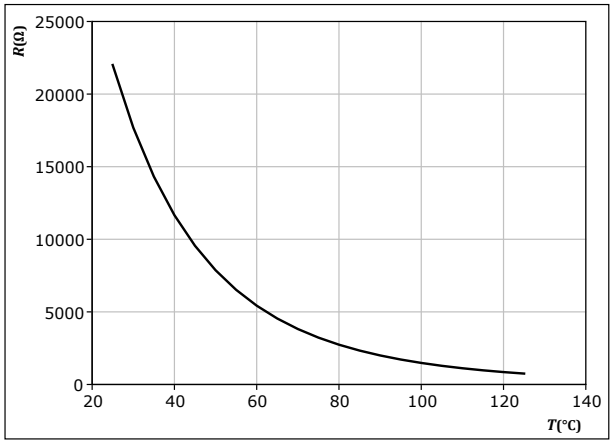
T_s =	80	°C
V_{GS} =	10	V
T_j =	T_{jmax}	

Thermistor Characteristics

figure 6. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

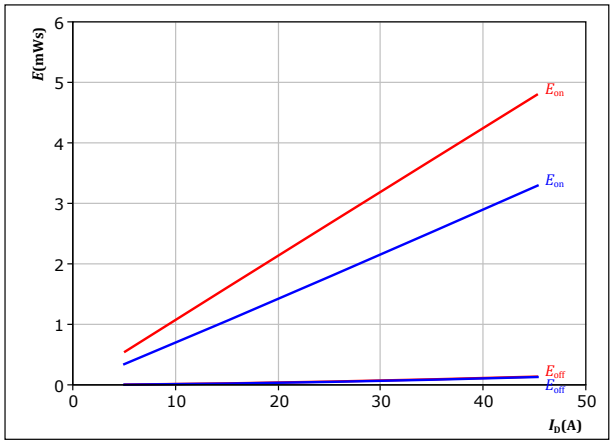


Inverter Switching Characteristics

figure 7. **MOSFET**

Typical switching energy losses as a function of drain current

$E = f(I_D)$



With an inductive load at

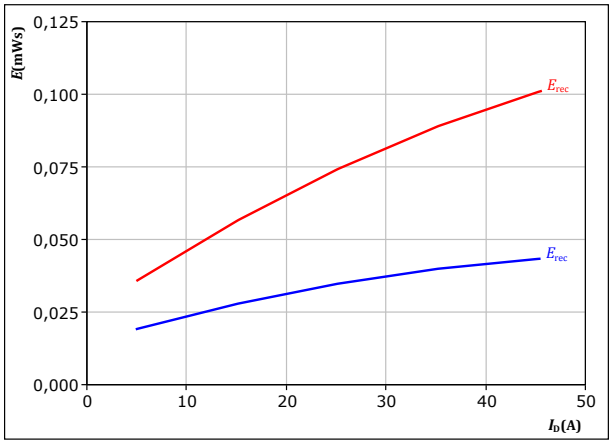
V_{DS} =	350	V
V_{GS} =	-5/10	V
R_{gon} =	120	Ω
R_{goff} =	8	Ω

T_j: 25 °C, 125 °C

figure 8. **MOSFET**

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



With an inductive load at

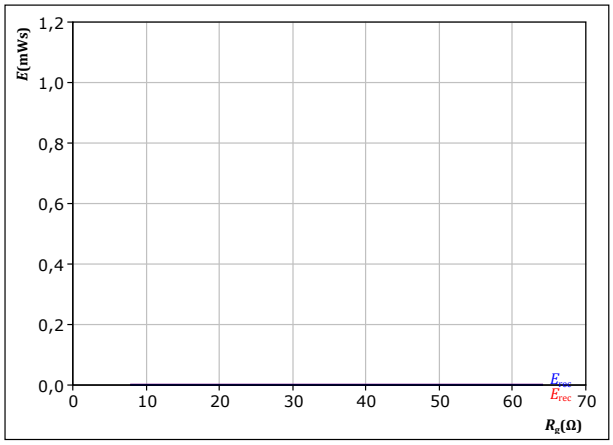
V_{DS} =	350	V
V_{GS} =	-5/10	V
R_{gon} =	120	Ω

T_j: 25 °C, 125 °C

figure 9. **MOSFET**

Typical reverse recovered energy loss as a function of MOSFET turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

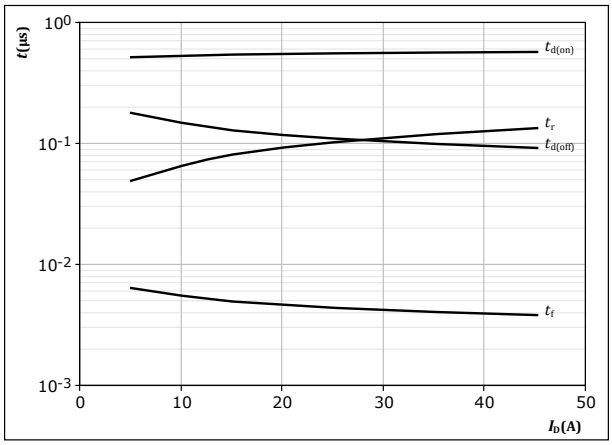
V_{DS} =	350	V
V_{GS} =	-5/10	V
I_D =	25	A

T_j: 25 °C, 125 °C

figure 10. **MOSFET**

Typical switching times as a function of drain current

$t = f(I_D)$



With an inductive load at

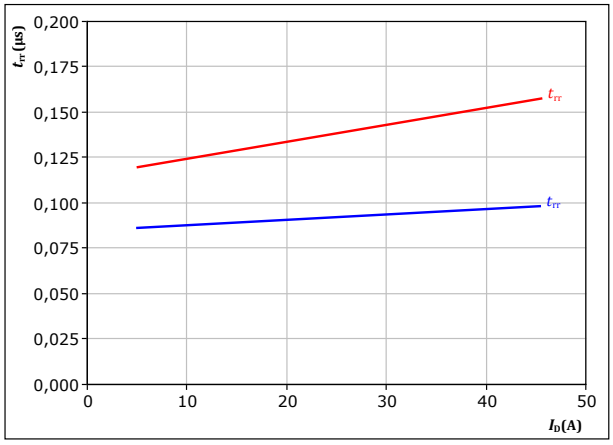
T_j =	125	°C
V_{DS} =	350	V
V_{GS} =	-5/10	V
R_{gon} =	120	Ω
R_{goff} =	8	Ω

Inverter Switching Characteristics

figure 11. **MOSFET**

Typical reverse recovery time as a function of drain current

t_{rr} = f(I_D)

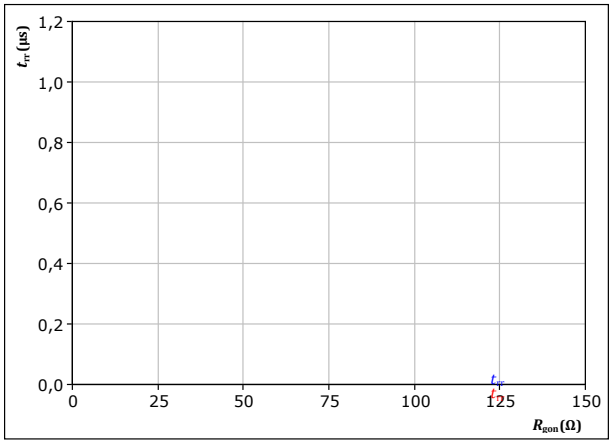


At				T_j:	
	V_{DS} =	350	V		25 °C
	V_{GS} =	-5/10	V		125 °C
	R_{gon} =	120	Ω		

figure 12. **MOSFET**

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

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

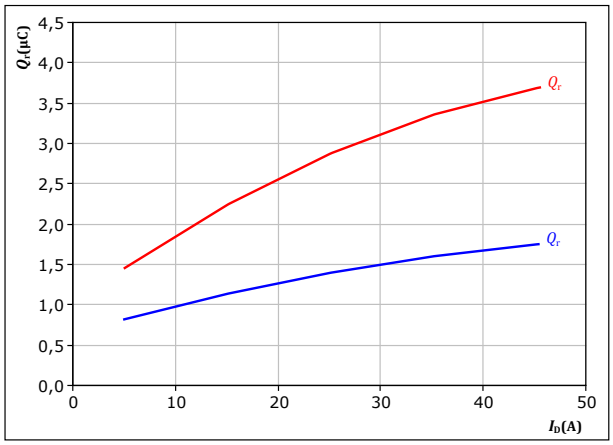


At				T_j:	
	V_{DS} =	350	V		25 °C
	V_{GS} =	-5/10	V		125 °C
	I_D =	25	A		

figure 13. **MOSFET**

Typical recovered charge as a function of drain current

Q_r = f(I_D)

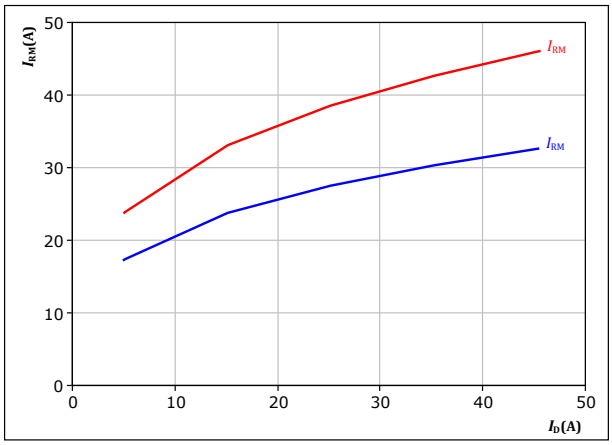


At				T_j:	
	V_{DS} =	350	V		25 °C
	V_{GS} =	-5/10	V		125 °C
	R_{gon} =	120	Ω		

figure 14. **MOSFET**

Typical peak reverse recovery current as a function of drain current

I_{RM} = f(I_D)



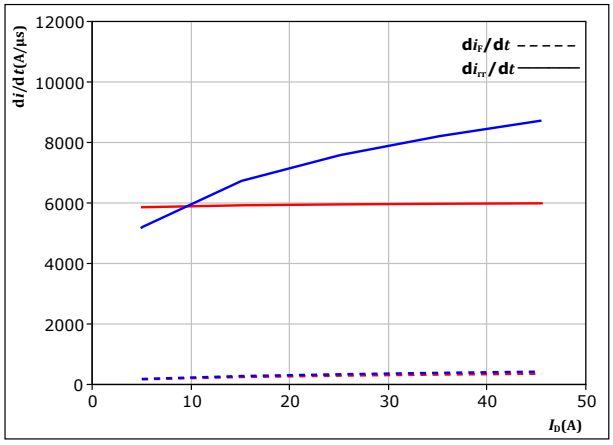
At				T_j:	
	V_{DS} =	350	V		25 °C
	V_{GS} =	-5/10	V		125 °C
	R_{gon} =	120	Ω		

Inverter Switching Characteristics

figure 15. **MOSFET**

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)

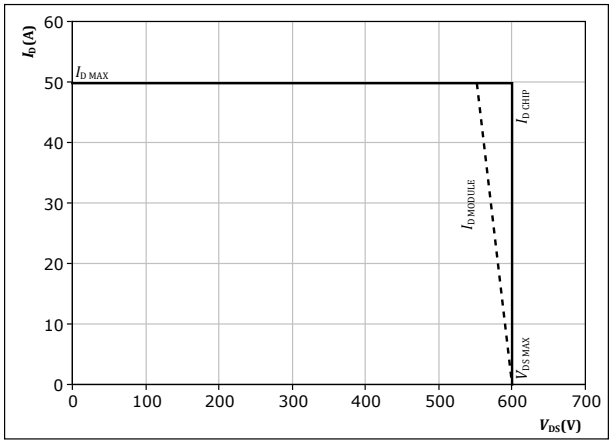


At				
	V_{DS} =	350	V	
	V_{GS} =	-5/10	V	
	R_{gon} =	120	Ω	
	T_j:			25 °C
				125 °C

figure 16. **MOSFET**

Reverse bias safe operating area

I_D = f(V_{DS})



At			
	T_j =	125	°C
	R_{gon} =	120	Ω
	R_{goff} =	8	Ω

Inverter Switching Definitions

figure 17. **MOSFET**

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

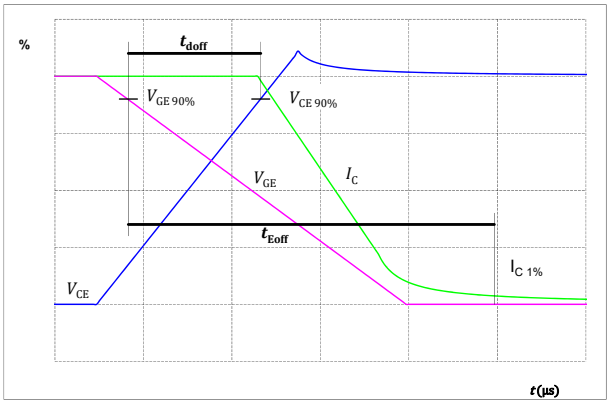


figure 18. **MOSFET**

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

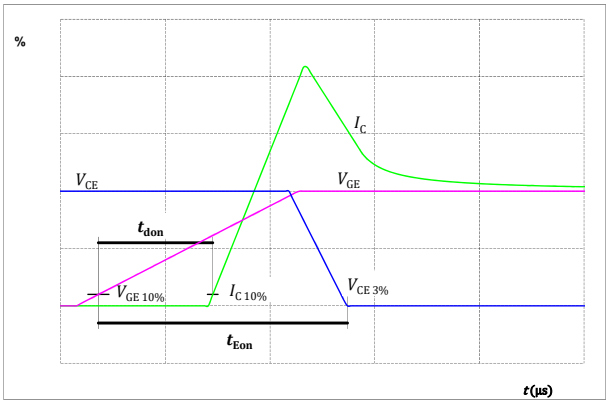


figure 19. **MOSFET**

Turn-off Switching Waveforms & definition of t_f

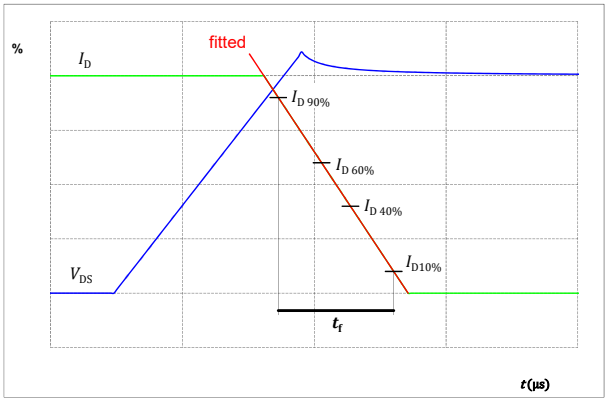
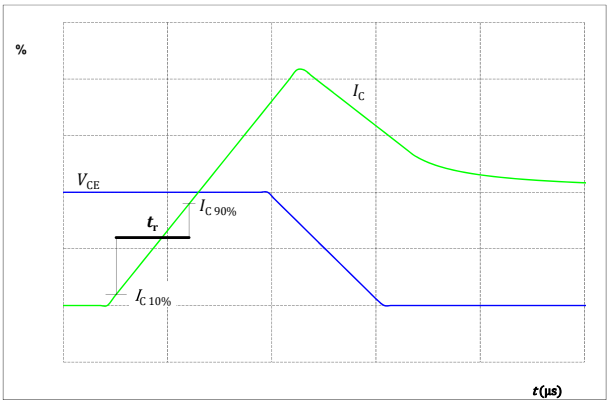


figure 20. **MOSFET**

Turn-on Switching Waveforms & definition of t_r



Inverter Switching Definitions

figure 21. **FWD**

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

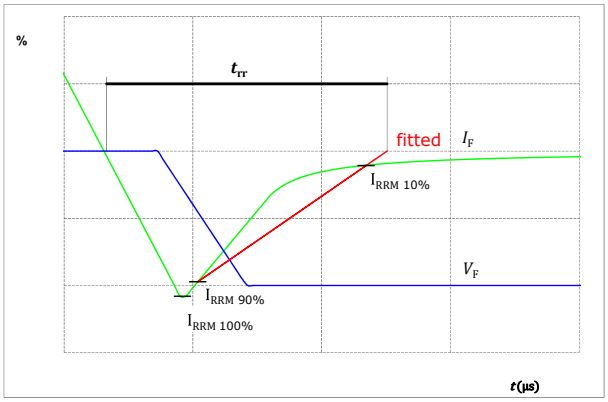


figure 22. **FWD**

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

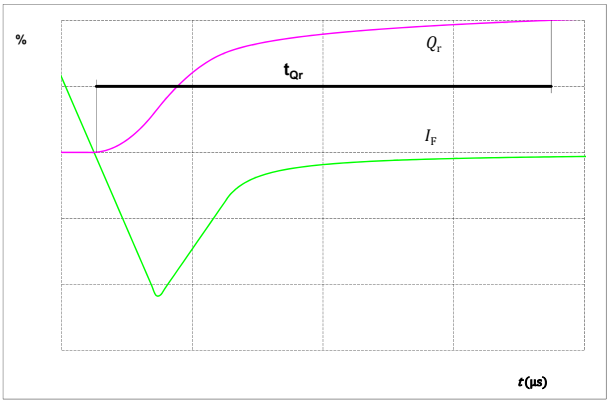
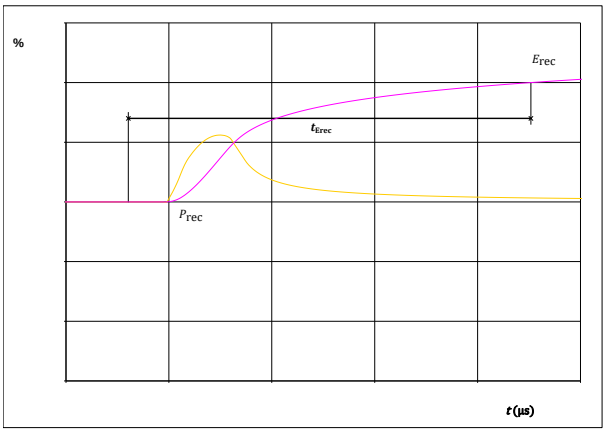


figure 23. **FWD**

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



Ordering Code

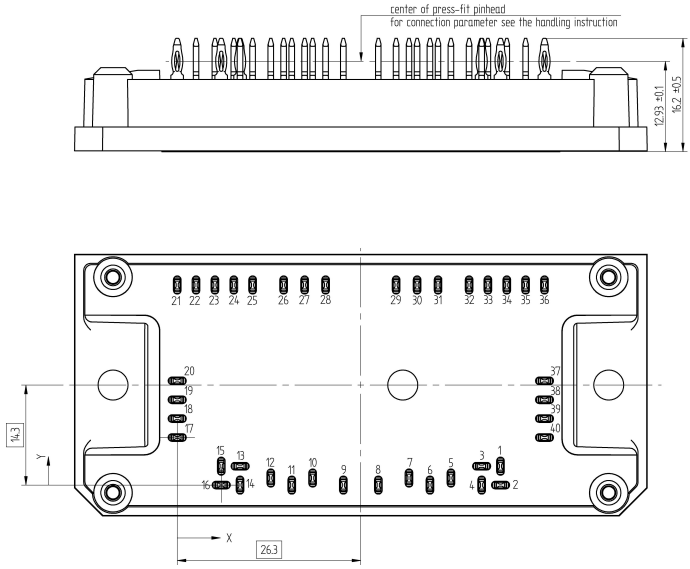
Version	Ordering Code
Without thermal paste	10-PY064PA040F7-L581L88Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PY064PA040F7-L581L88Y-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-PY064PA040F7-L581L88Y-/3/

Marking

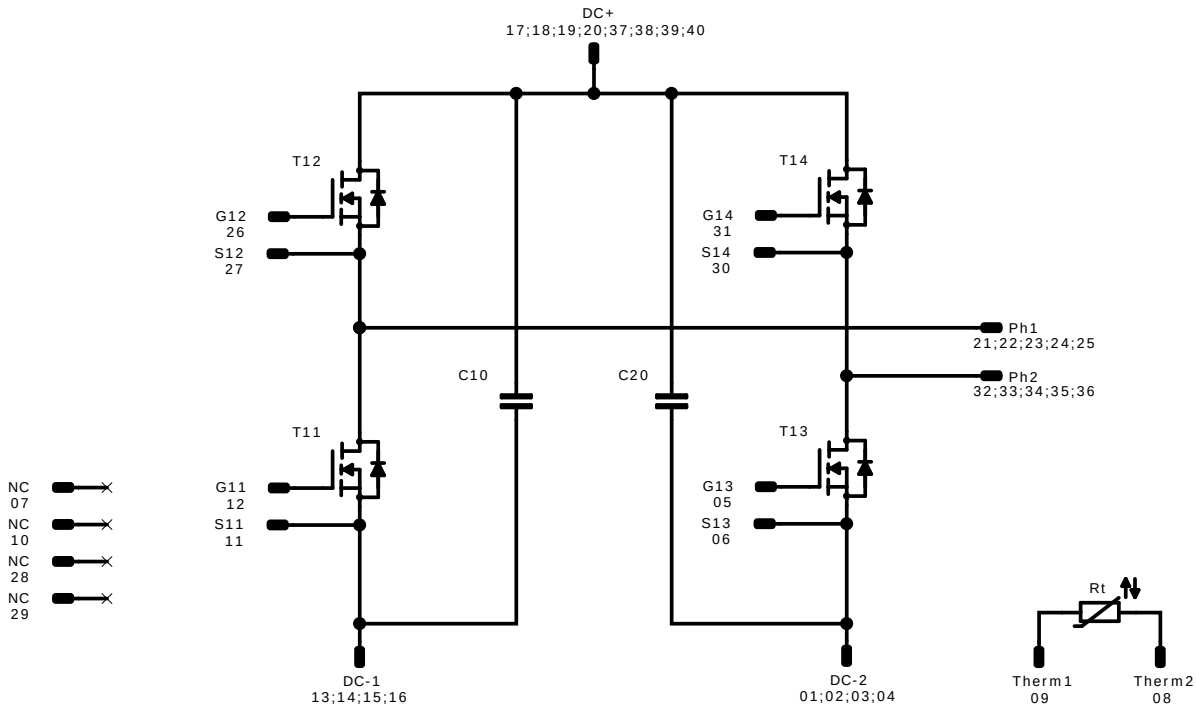
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	46,3	2,7	DC-2
2	46,3	0	DC-2
3	43,6	2,7	DC-2
4	43,6	0	DC-2
5	39,2	1	G13
6	36,2	0	S13
7	33,2	1	NC
8	28,8	0	Therm2
9	23,8	0	Therm1
10	19,4	1	NC
11	16,4	0	S11
12	13,4	1	G11
13	9	2,7	DC-1
14	9	0	DC-1
15	6,3	2,7	DC-1
16	6,3	0	DC-1
17	0	6,8	DC+
18	0	9,5	DC+
19	0	12,2	DC+
20	0	14,9	DC+
21	0	28,6	Ph1
22	2,7	28,6	Ph1
23	5,4	28,6	Ph1
24	8,1	28,6	Ph1
25	10,8	28,6	Ph1
26	15,25	28,6	G12
27	18,25	28,6	S12
28	21,25	28,6	NC
29	31,35	28,6	NC
30	34,35	28,6	S14
31	37,35	28,6	G14
32	41,8	28,6	Ph2
33	44,5	28,6	Ph2
34	47,2	28,6	Ph2
35	49,9	28,6	Ph2
36	52,6	28,6	Ph2
37	52,6	14,9	DC+
38	52,6	12,2	DC+
39	52,6	9,5	DC+
40	52,6	6,8	DC+



Pinout



Identification					
ID	**Component**	**Voltage**	**Current**	**Function**	**Comment**
T11, T12, T13, T14	MOSFET	600 V	31 mΩ	Inverter Switch	
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 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-PY064PA040F7-L581L88Y-D1-14	15 Sep. 2022		