Vincotech

10-EZ126PA035SC-L859F48T
datasheet

*flow*PACK E1	1200 V / 35 A

Features

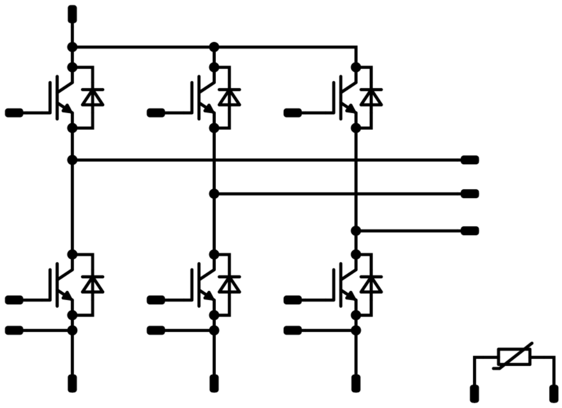
- Trench IGBT4 chip technology
- Compact design
- Integrated NTC

flow E1 12 mm housing

Target applications

- Industrial Drives
- UPS

Schematic



Types

- 10-EZ126PA035SC-L859F48T

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition			Value	Unit
Inverter Switch						
Collector-emitter voltage	V_{CES}				1200	V
Collector current	I_C	$T_j = T_{jmax}$		T_s = 80 °C	41	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}			105	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$		T_s = 80 °C	110	W
Gate-emitter voltage	V_{GES}				±20	V
Short circuit ratings	t_{SC}	$T_j \leq$ 150 °C	V_{GE} = 15 V	V_{CC} = 800 V	10	µs
Maximum junction temperature	T_{jmax}				175	°C

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Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	45	A
Repetitive peak forward current	I_{FRM}			70	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	84	W
Maximum junction temperature	T_{jmax}			175	°C
Module Properties					
General Properties					
Stray inductance	L_P			25	nH
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
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				8,62	mm
Comparative Tracking Index	CTI			≥ 600	

*100 % tested in production

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Characteristic Values

Parameter	Symbol	Conditions					Value			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										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0012	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		35	25 150	1,58	1,87 2,30	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			5	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		2000		pF
Reverse transfer capacitance	C_{res}	f = 1 Mhz	0	25		25		70		pF
Gate charge	Q_g		-15/15			25		270		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,87		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	600	35	25 150		85 89		ns
Rise time	t_r	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	600	35	25 150		22 26		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	600	35	25 150		199 259		ns
Fall time	t_f	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	600	35	25 150		73 115		ns
Turn-on energy (per pulse)*	E_{on}	Q_{rFWD} = 3,8 µC Q_{rFWD} = 7 µC	±15	600	35	25 150		2,48 3,71		mWs
Turn-off energy (per pulse)*	E_{off}		±15	600	35	25 150		1,84 2,91		mWs

*L_S = 14 nH

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Characteristic Values

Parameter	Symbol	Conditions					Value			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 Diode										
Static										
Forward voltage	V_F				35	25 125 150		1,76 1,73 1,70	2,05	V
Reverse leakage current	I_R			1200		25			7,7	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,14		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1463 A/µs di/dt = 1493 A/µs	±15	600	35	25 150		30 34		A
Reverse recovery time	t_{rr}					25 150		298 493		ns
Recovered charge	Q_r					25 150		3,79 7,00		µC
Reverse recovered energy	E_{rec}					25 150		1,48 2,81		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		122 105		A/µs
Thermistor										
Rated resistance	R					25		5		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 493 Ω				100	-5		+5	%
Power dissipation	P					25		245		mW
Power dissipation constant						25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %				25		3375		K
B-value	$B_{(25/100)}$	Tol. ±2 %				25		3437		K
Vincotech NTC Reference									K	

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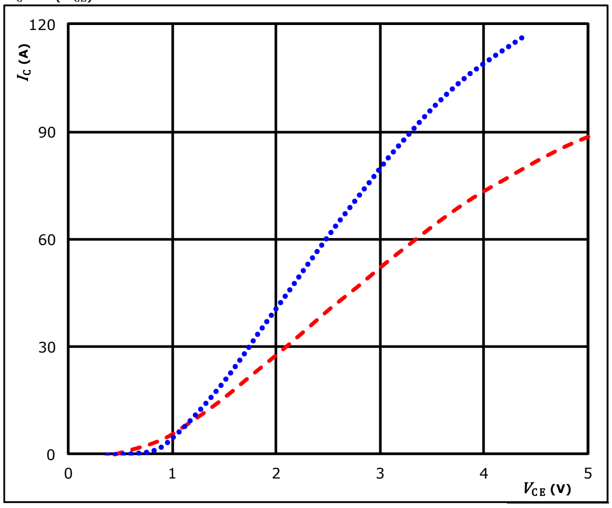
10-EZ126PA035SC-L859F48T
datasheet

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

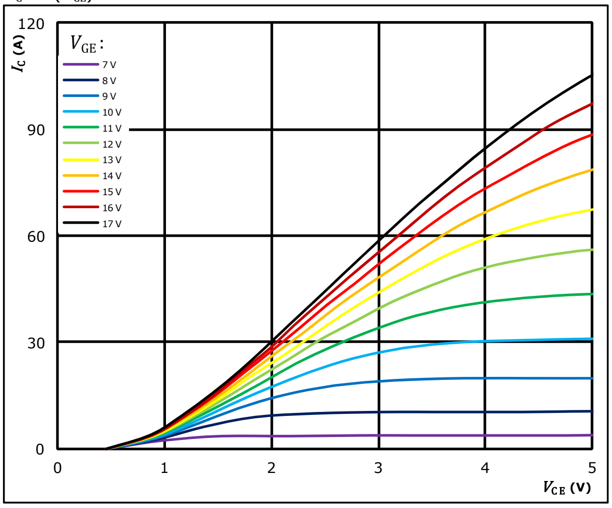


t_p =	250	µs	T_j:	25 °C	··········
V_{GE} =	15	V		150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

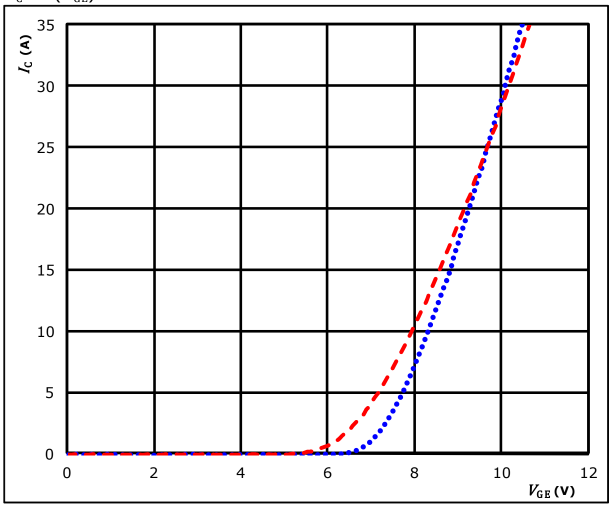
T_j = 150 °C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

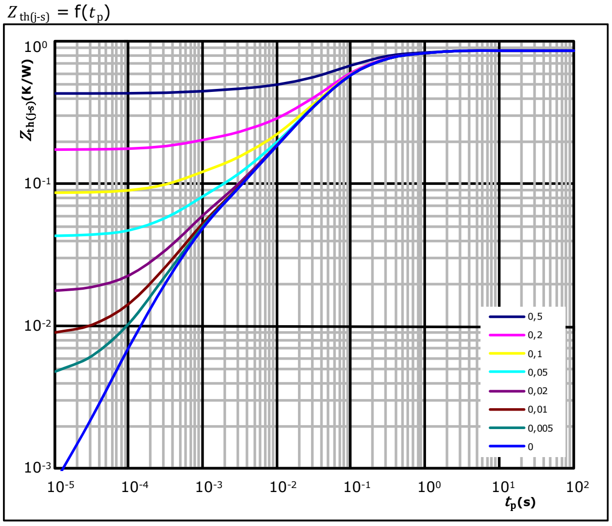


t_p =	100	µs	T_j:	25 °C	··········
V_{CE} =	10	V		150 °C	– – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,87 K/W

IGBT thermal model values

R (K/W)	τ (s)
1,19E-01	7,84E-01
3,72E-01	1,14E-01
2,65E-01	3,81E-02
6,99E-02	6,87E-03
3,98E-02	7,25E-04

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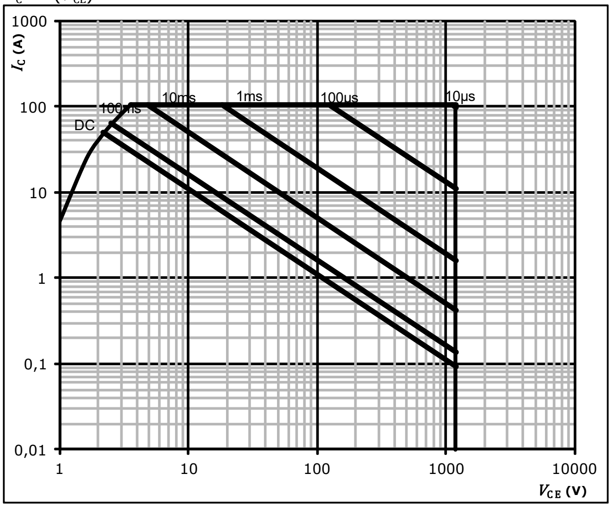
Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



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

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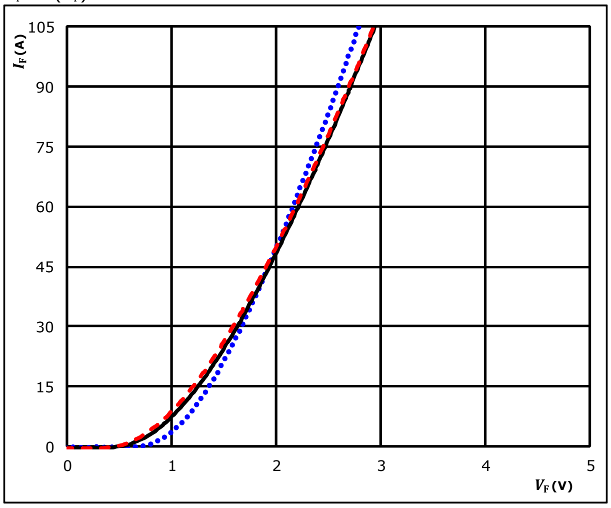
Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



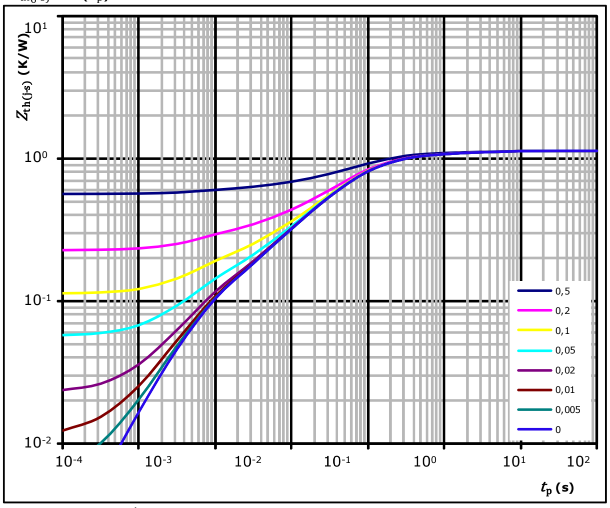
t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,14 K/W

FWD thermal model values

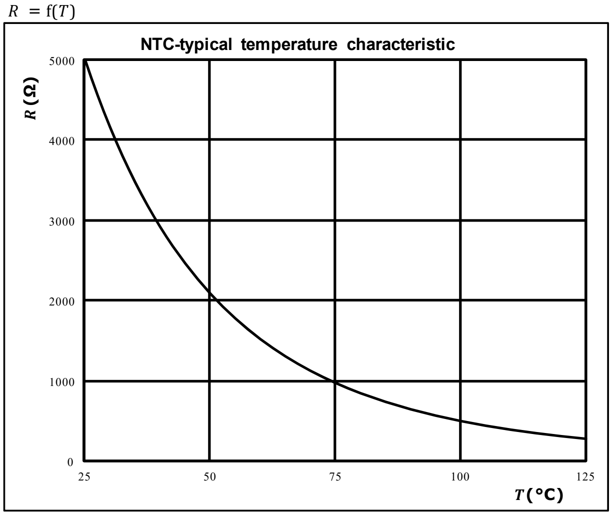
R (K/W)	τ (s)
5,93E-02	3,57E+00
1,54E-01	4,09E-01
5,28E-01	7,51E-02
2,09E-01	2,04E-02
9,97E-02	4,95E-03
8,47E-02	6,04E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$



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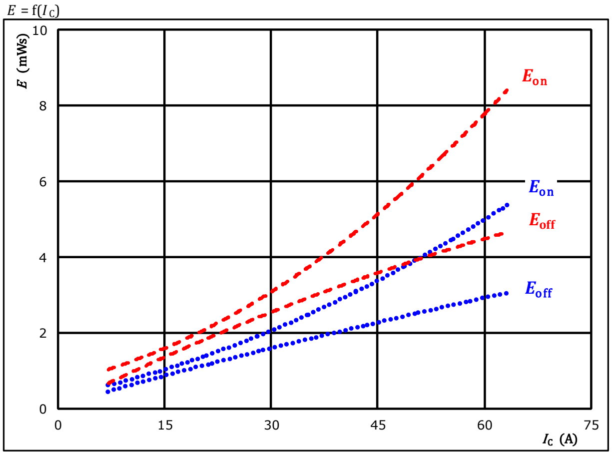
Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



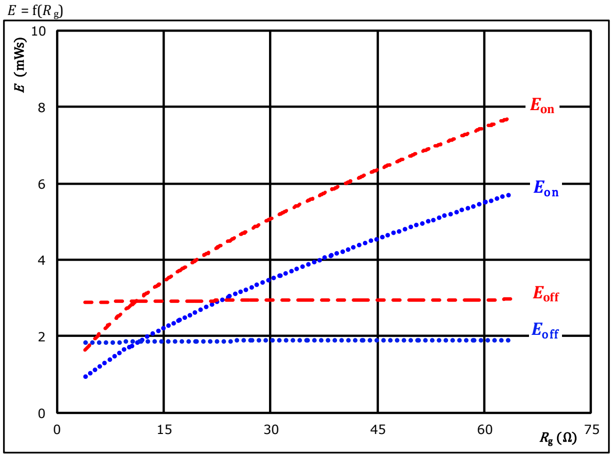
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		150 °C	dashed
R_{gon} =	16	Ω			
R_{goff} =	16	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



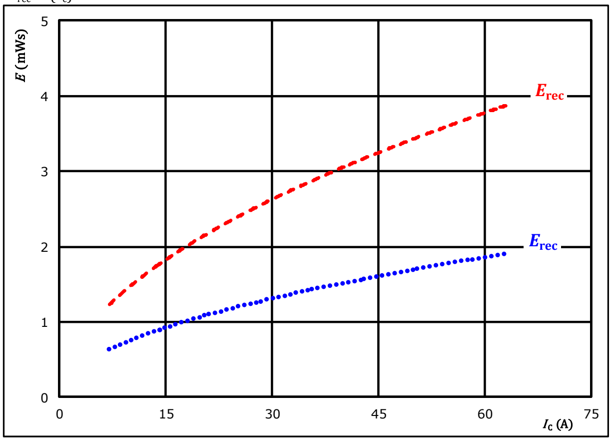
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		150 °C	dashed
I_C =	35	A			

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



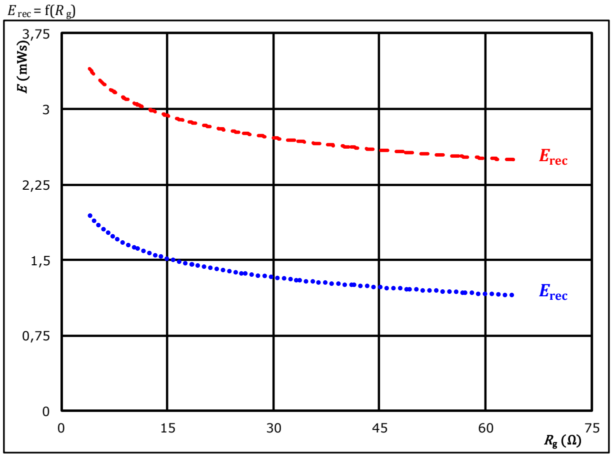
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		150 °C	dashed
R_{gon} =	16	Ω			

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		150 °C	dashed
I_C =	35	A			

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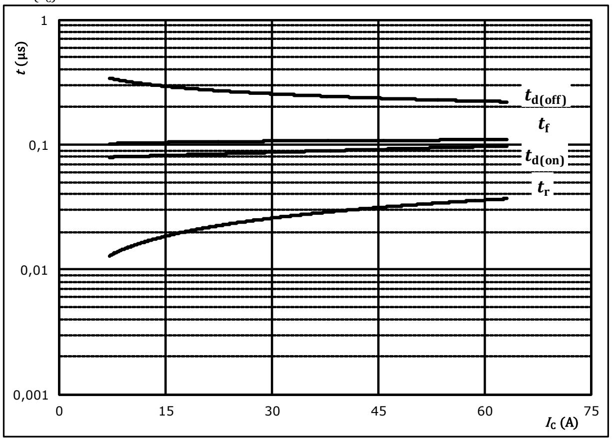
Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



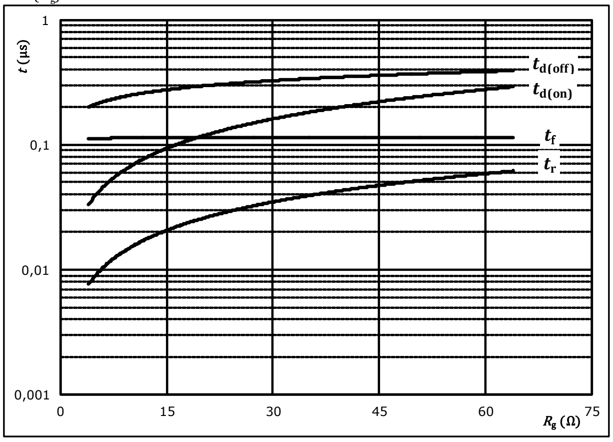
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



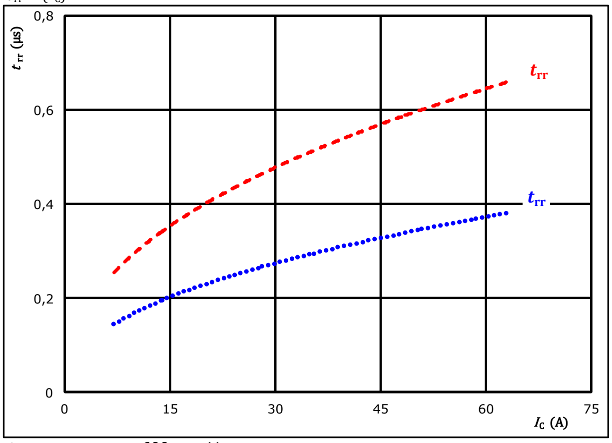
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	35	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

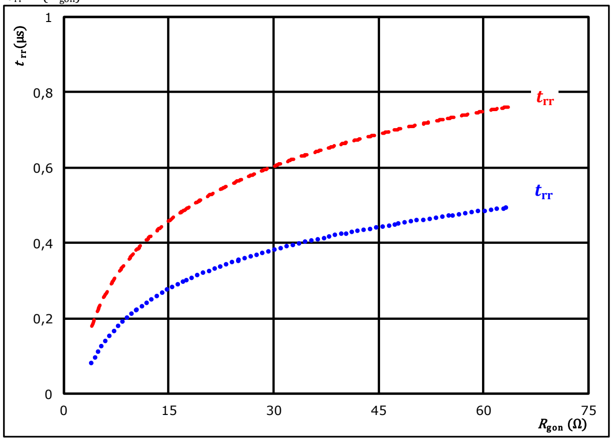


At					
V_{CE} =	600	V	T_j:	25 °C	··············
V_{GE} =	±15	V		150 °C	— — — —
R_{gon} =	16	Ω			

figure 8. FWD

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

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



At					
V_{CE} =	600	V	T_j:	25 °C	··············
V_{GE} =	±15	V		150 °C	— — — —
I_C =	35	A			

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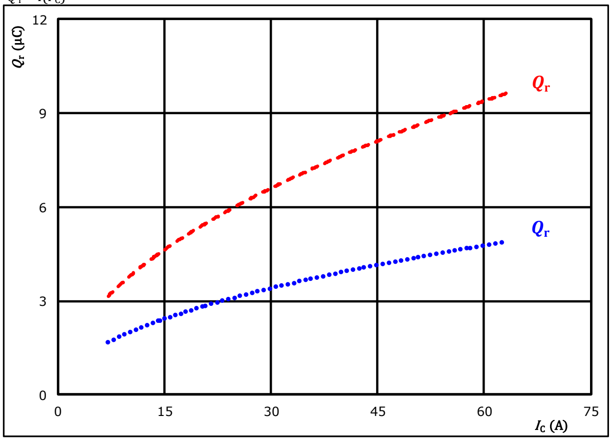
Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

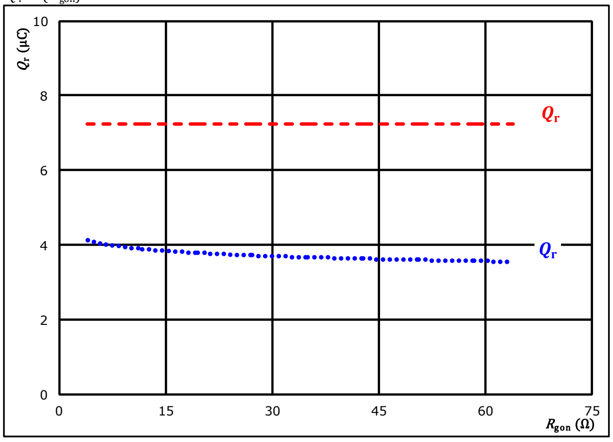


At					
V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		150 °C	– – – –
R_{gon} =	16	Ω			

figure 10. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

$Q_r = f(R_{gon})$

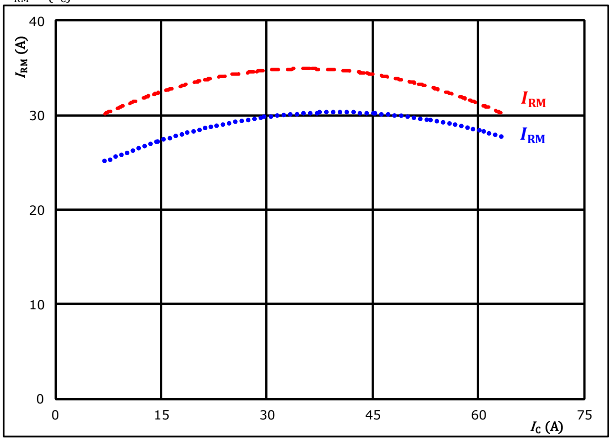


At					
V_{CE}=	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		150 °C	– – – –
I_C=	35	A			

figure 11. FWD

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

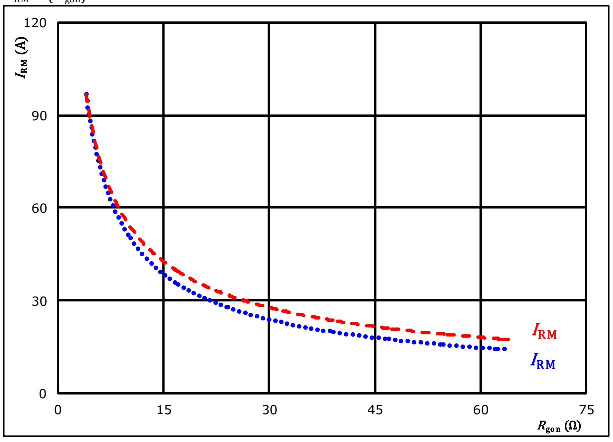


At					
V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		150 °C	– – – –
R_{gon} =	16	Ω			

figure 12. FWD

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

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



At					
V_{CE} =	600	V	T_j:	25 °C	···········
V_{GE} =	±15	V		150 °C	– – – –
I_C =	35	A			

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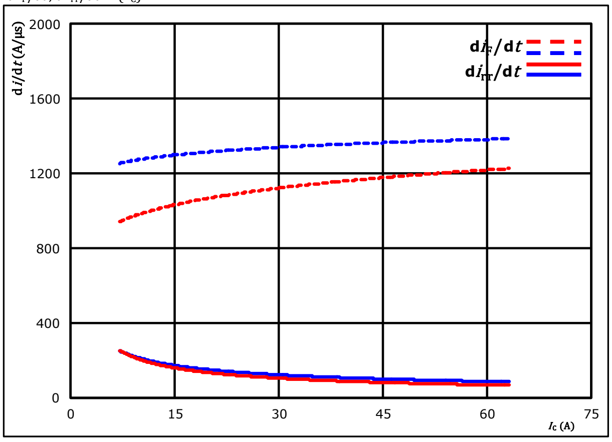
Inverter Switching Characteristics

figure 13. **FWD**

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

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

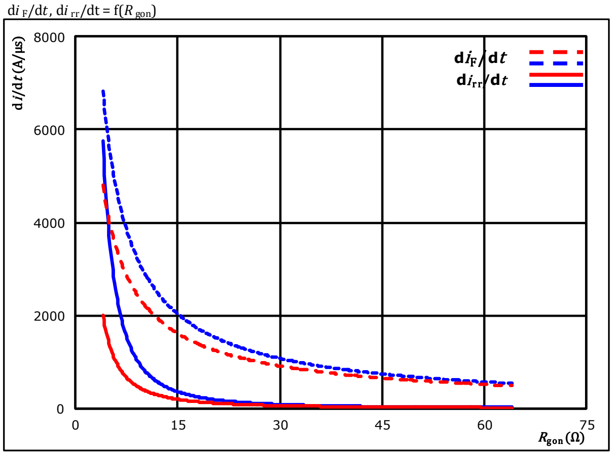


At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	150	°C
R_{gon} =	16	Ω			

figure 14. **FWD**

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

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

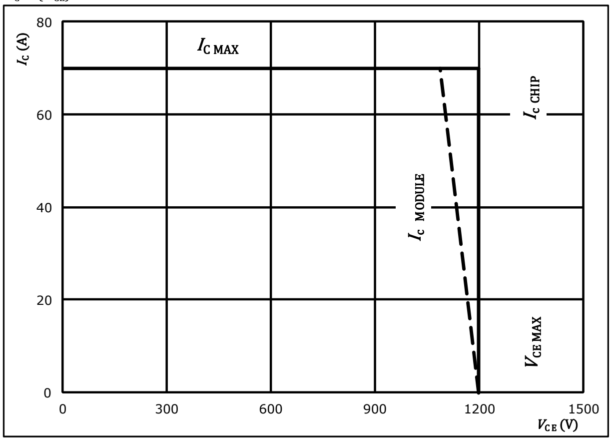


At					
V_{CE} =	600	V		25	°C
V_{GE} =	±15	V	T_j:	150	°C
I_C =	35	A			

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

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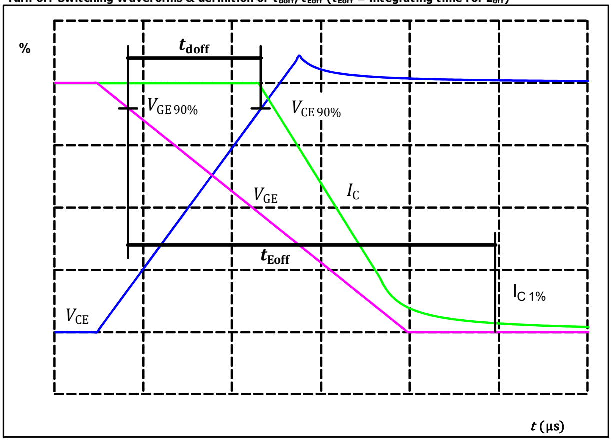
Inverter Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. **IGBT**

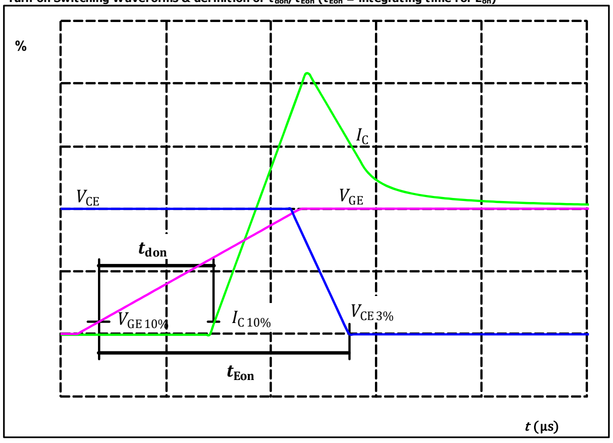
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{doff} =	259	ns

figure 2. **IGBT**

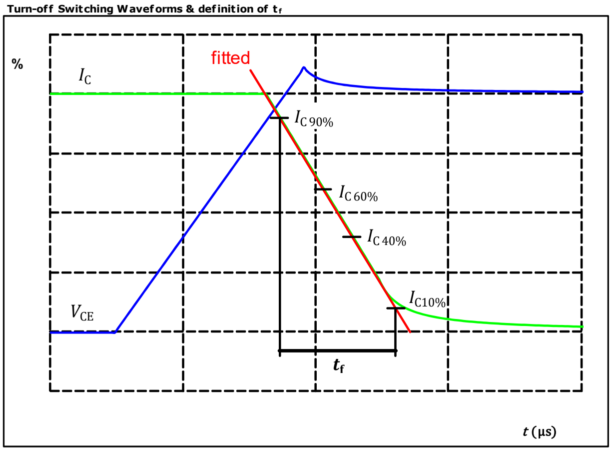
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{don} =	89	ns

figure 3. **IGBT**

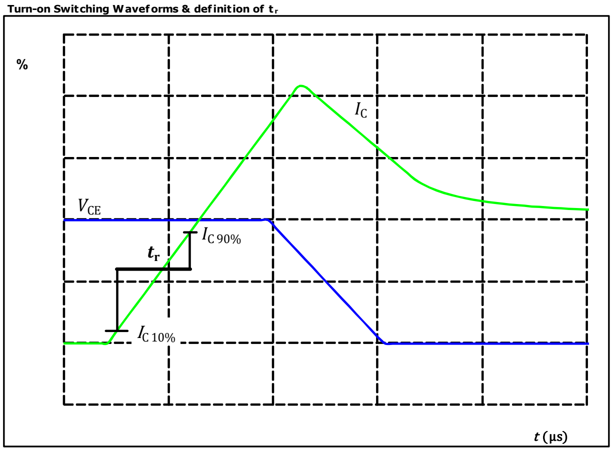
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	600	V
I_C (100%) =	35	A
t_f =	115	ns

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r



V_C (100%) =	600	V
I_C (100%) =	35	A
t_r =	26	ns

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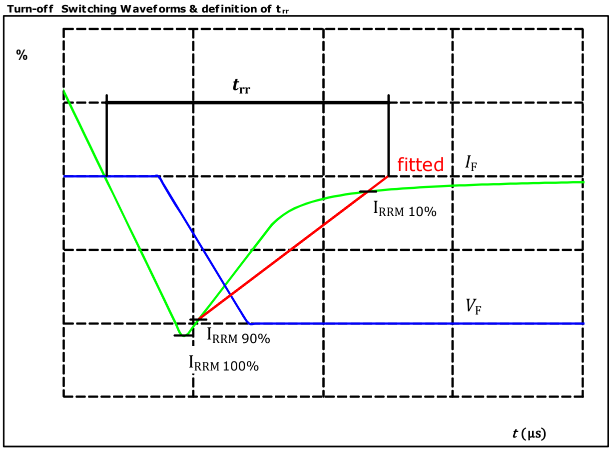
Inverter Switching Characteristics

figure 5. **FWD**

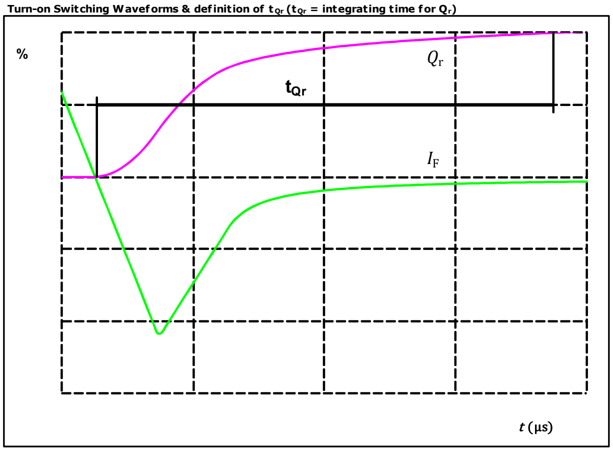
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	600	V
I_F (100%) =	35	A
I_{RRM} (100%) =	34	A
t_{rr} =	493	ns

figure 6. **FWD**

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



I_F (100%) =	35	A
Q_r (100%) =	7,00	µC

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Ordering Code & Marking

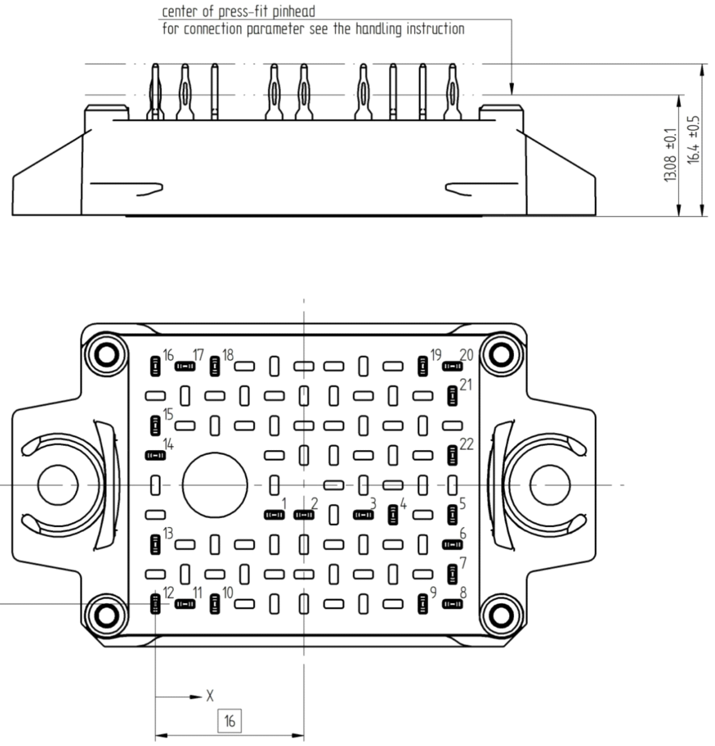
Version	Ordering Code
without thermal paste 12 mm housing with press-fit pins	10-EZ126PA035SC-L859F48T
with thermal paste 12 mm housing with press-fit pins	10-EZ126PA035SC-L859F48T-/3/

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

Pin	X	Y	Function
1	12,8	9,6	DC+
2	16	9,6	DC+
3	22,4	9,6	Therm1
4	25,6	9,6	Therm2
5	32	9,6	DC-2
6	32	6,4	S13
7	32	3,2	DC-1
8	32	0	S11
9	28,8	0	G11
10	6,4	0	Ph1
11	3,2	0	Ph1
12	0	0	G12
13	0	6,4	G14
14	0	16	Ph2
15	0	19,2	Ph2
16	0	25,6	G16
17	3,2	25,6	Ph3
18	6,4	25,6	Ph3
19	28,8	25,6	G15
20	32	25,6	S15
21	32	22,4	DC-3
22	32	16	G13



Tolerance of pinpositions ±0.4mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

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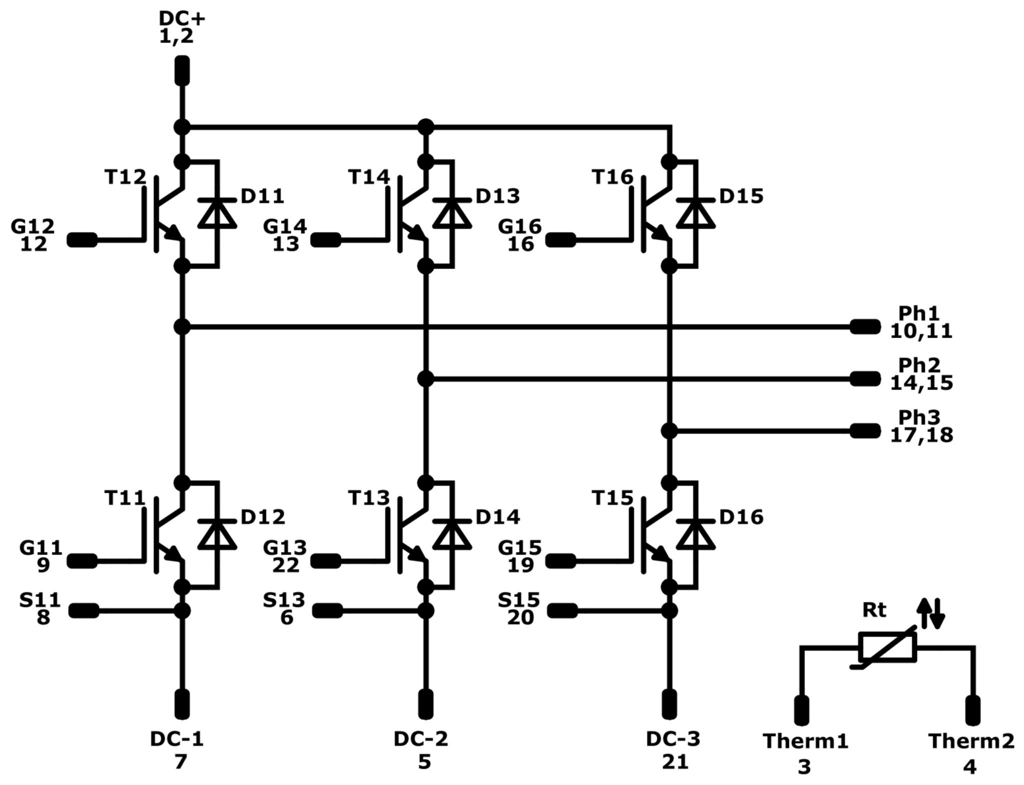
Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	35 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	35 A	Inverter Diode	
Rt	NTC			Thermistor	

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Vincotech

10-EZ126PA035SC-L859F48T
datasheet

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

Handling instruction
Handling instructions for *flow* E1 packages see vincotech.com website.

Package data
Package data for *flow* E1 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-EZ126PA035SC-L859F48T-D3-14	05 Mar. 2019	Correction of I_c/I_f values	1

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