



flowPACK 0

1200 V / 25 A

### Topology features

- Open Emitter configuration
- Temperature sensor
- Inverter
- Low side Kelvin Emitter for improved switching performance

### Component features

- Easy paralleling
- High speed switching
- Low switching losses

### Housing features

- Base isolation: Al<sub>2</sub>O<sub>3</sub>
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

### Target applications

- Industrial Drives

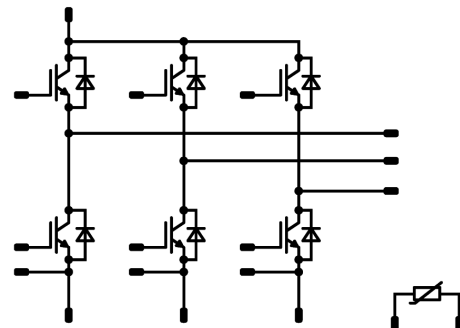
### Types

- 10-PC126PA025SH-LA09F58Y

### flow 0 12 mm housing



### Schematic





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**10-PC126PA025SH-LA09F58Y**  
datasheet

## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Inverter Switch</b>				
Collector-emitter voltage	$V_{CES}$		1200	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	31	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	75	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	94	W
Gate-emitter voltage	$V_{GES}$		$\pm 20$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	10	$\mu\text{s}$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Inverter Diode

Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	24	A
Surge (non-repetitive) forward current	$I_{FSM}$	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	100	A
Surge current capability	$I^2t$		50	$\text{A}^2\text{s}$
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	61	W
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Module Properties

### Thermal Properties

Storage temperature	$T_{stg}$		-40...+125	$^{\circ}\text{C}$
Operation temperature under switching condition	$T_{jop}$		-40...+( $T_{jmax} - 25$ )	$^{\circ}\text{C}$

### Isolation Properties

Isolation voltage	$V_{isol}$	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			8,79	mm
Comparative Tracking Index	CTI		$\geq 200$	

\*100 % tested in production



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### Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$I_D$ [A]	$T_j$ [°C]	Min	Typ	Max	

#### Inverter Switch

##### Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00085	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		25	25 125 150	1,78	1,98 2,38 2,48	2,42 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	1200		25			2,4	μA
Gate-emitter leakage current	$I_{GES}$		20	0		25			120	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$							1430		pF
Output capacitance	$C_{oes}$	$f = 1$ Mhz	0	25		25		115		pF
Reverse transfer capacitance	$C_{res}$							75		pF
Gate charge	$Q_g$	$V_{CC} = 960$ V	15		25	25		115		nC

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)						1,01		K/W
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##### Dynamic

Turn-on delay time	$t_{d(on)}$					25 125 150		126,6 130,2 129,8		ns
Rise time	$t_r$	$R_{gon} = 32$ Ω $R_{goff} = 32$ Ω				25 125 150		35,4 36,8 36,8		ns
Turn-off delay time	$t_{d(off)}$		±15	600	25	25 125 150		210 265 277		ns
Fall time	$t_f$					25 125 150		49,1 92,91 103,86		ns
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD} = 1,61$ μC $Q_{tFWD} = 3,15$ μC $Q_{tFWD} = 3,96$ μC				25 125 150		1,94 2,58 2,86		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		1 1,69 1,88		mWs



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**10-PC126PA025SH-LA09F58Y**  
datasheet

### 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		
<b>Inverter Diode</b>										
<b>Static</b>										
Forward voltage	$V_F$				25 125 150		2,43 2,55 2,44	2,74 <sup>(1)</sup> 2,79 <sup>(1)</sup>		V
Reverse leakage current	$I_R$	$V_r = 1200$ V			25 150		1600	60 3300		μA
<b>Thermal</b>										
Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,56			K/W
<b>Dynamic</b>										
Peak recovery current	$I_{RM}$				25 125 150		11,95 15,64 17,43			A
Reverse recovery time	$t_{rr}$				25 125 150		340,65 502,02 590,86			ns
Recovered charge	$Q_r$	$di/dt=559$ A/μs $di/dt=571$ A/μs $di/dt=555$ A/μs	±15	600	25		1,61 3,15 3,96			μC
Reverse recovered energy	$E_{rec}$				25 125 150		0,603 1,25 1,59			mWs
Peak rate of fall of recovery current	$(di_r/dt)_{max}$				25 125 150		96,11 54,44 59,67			A/μs



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### Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		$V_{GS}$ [V]	$V_{GE}$ [V]	$V_{DS}$ [V]	$V_{CE}$ [V]	$T_j$ [°C]	Min	Typ	Max	

### Thermistor

#### Static

Rated resistance	$R$					25		22		kΩ
Deviation of R100	$A_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	$P$					25		130		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	

<sup>(1)</sup> Value at chip level

<sup>(2)</sup> Only valid with pre-applied Vincotech thermal interface material.

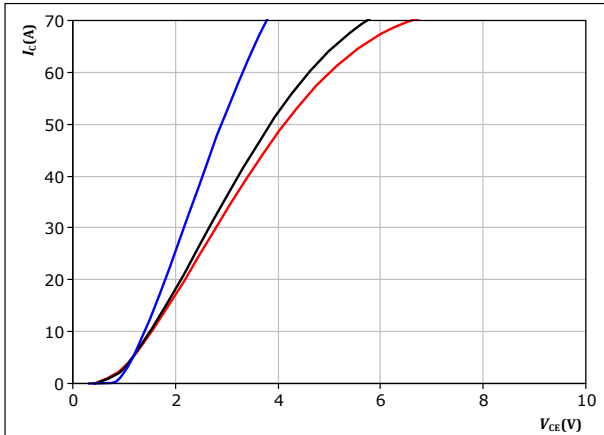


## Inverter Switch Characteristics

**figure 1.** IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$



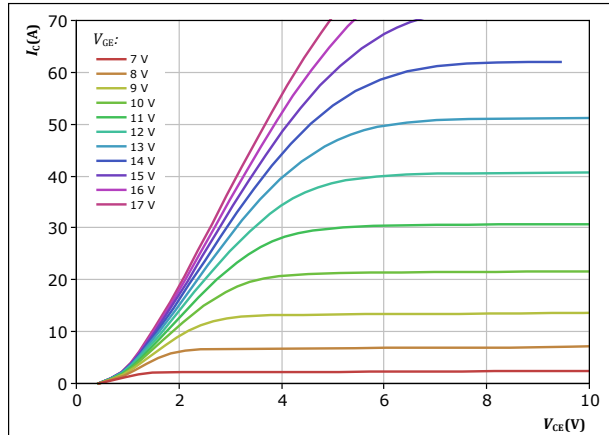
$t_p = 250 \mu s$   
 $V_{GE} = 15 V$

$T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)

**figure 2.** IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

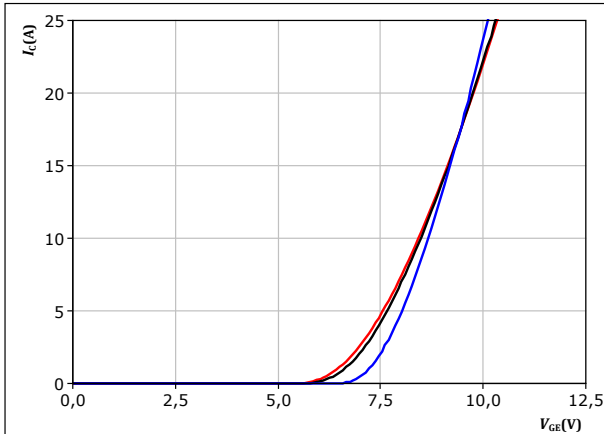


$t_p = 250 \mu s$   
 $T_j = 150 \text{ °C}$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

**figure 3.** IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$



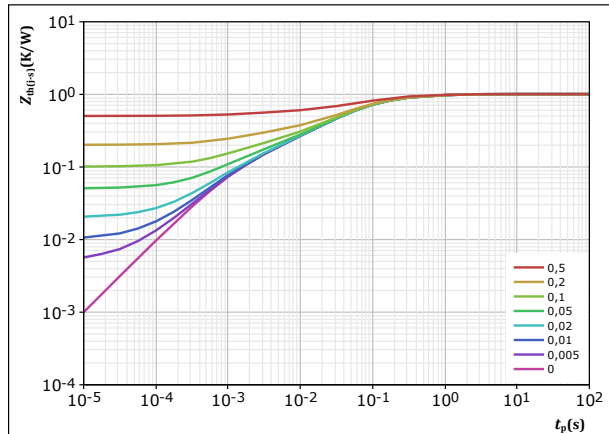
$t_p = 250 \mu s$   
 $V_{CE} = 10 V$

$T_j$ : 25 °C (blue), 125 °C (black), 150 °C (red)

**figure 4.** IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,009 K/W$

IGBT thermal model values

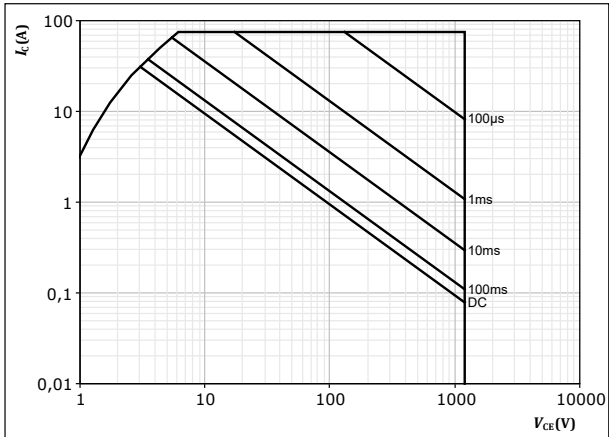
R (K/W)	$\tau$ (s)
8,44E-02	1,03E+00
2,46E-01	1,79E-01
4,48E-01	5,38E-02
1,38E-01	1,04E-02
5,48E-02	1,66E-03
3,85E-02	8,73E-04



### Inverter Switch Characteristics

**figure 5.** IGBT

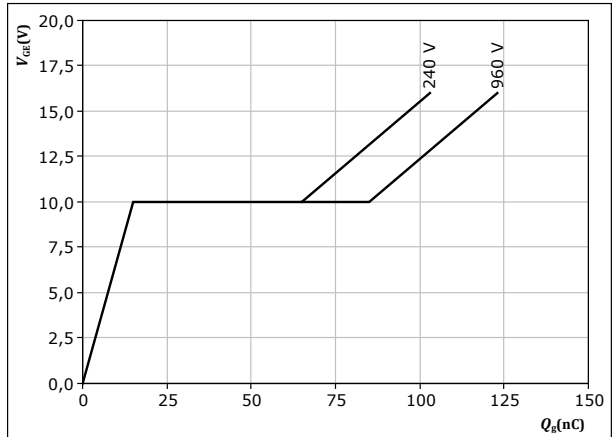
Safe operating area  
 $I_C = f(V_{CE})$



$D =$  single pulse  
 $T_s = 80$  °C  
 $V_{GE} = 15$  V  
 $T_j = T_{jmax}$

**figure 6.** IGBT

Gate voltage vs gate charge  
 $V_{GE} = f(Q_g)$



$I_C = 25$  A  
 $T_j = 25$  °C



### Inverter Diode Characteristics

figure 7. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

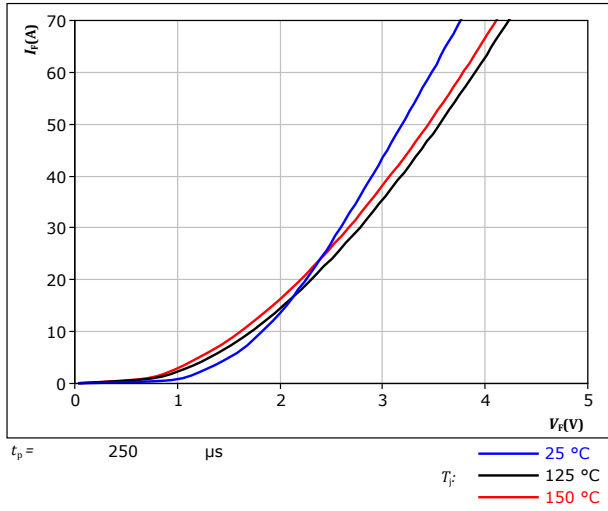
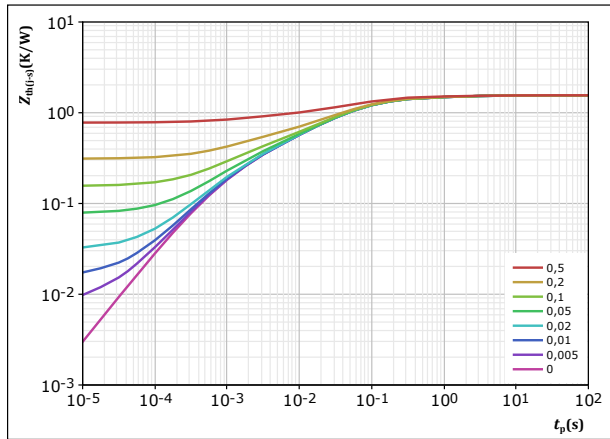


figure 8. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 1,556 \text{ K/W}$   
 FWD thermal model values

$R$ (K/W)	$\tau$ (s)
4,65E-02	4,86E+00
1,06E-01	8,11E-01
4,71E-01	1,09E-01
4,83E-01	3,07E-02
2,34E-01	7,03E-03
1,81E-01	1,25E-03
3,38E-02	3,28E-04

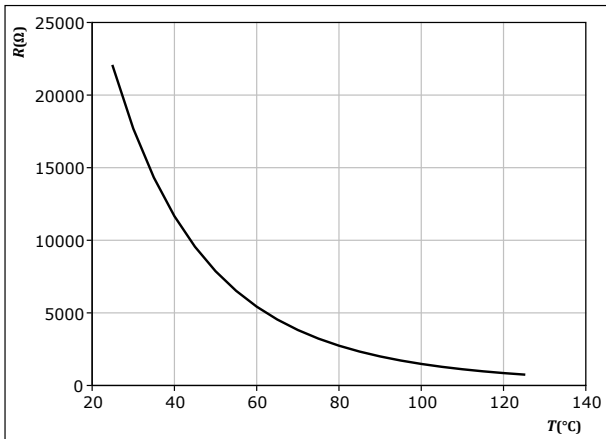




### Thermistor Characteristics

figure 9. Thermistor

Typical NTC characteristic as function of temperature  
 $R_T = f(T)$

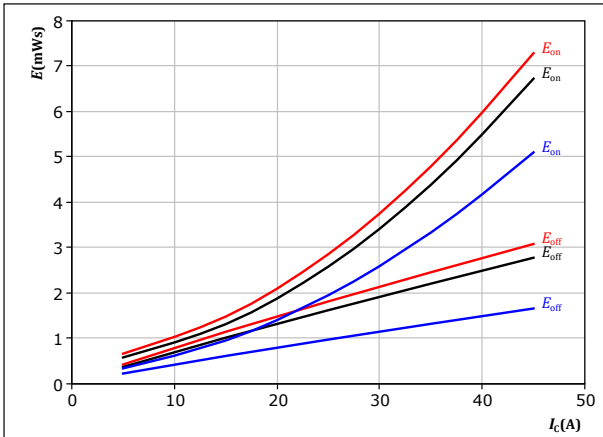




## Inverter Switching Characteristics

**figure 10.** IGBT

Typical switching energy losses as a function of collector current  
 $E = f(I_c)$

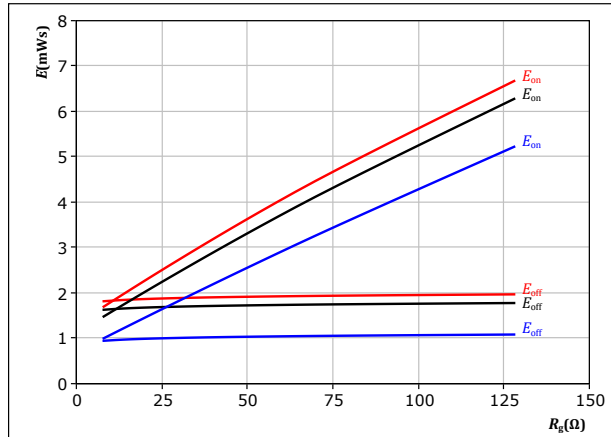


With an inductive load at  
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 32 \ \Omega$   
 $R_{goff} = 32 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 11.** IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor  
 $E = f(R_g)$

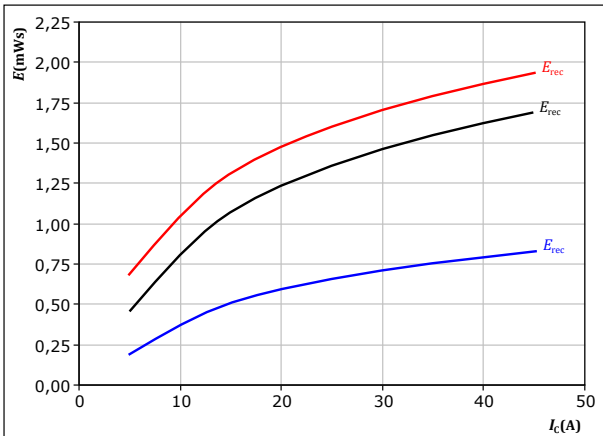


With an inductive load at  
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 25 \text{ A}$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 12.** FWD

Typical reverse recovered energy loss as a function of collector current  
 $E_{rec} = f(I_c)$

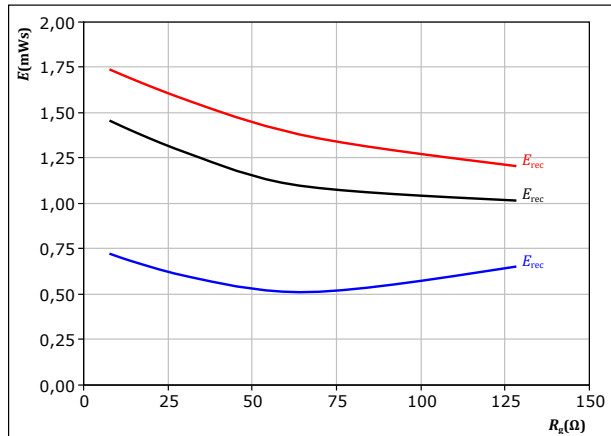


With an inductive load at  
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $R_{gon} = 32 \ \Omega$

$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

**figure 13.** FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor  
 $E_{rec} = f(R_g)$



With an inductive load at  
 $V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_c = 25 \text{ A}$

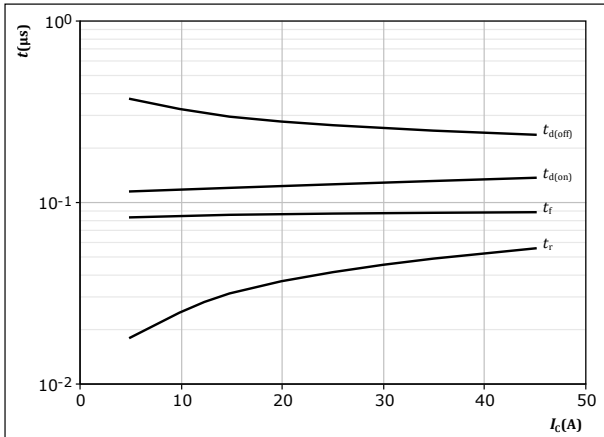
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C



## Inverter Switching Characteristics

**figure 14.** IGBT

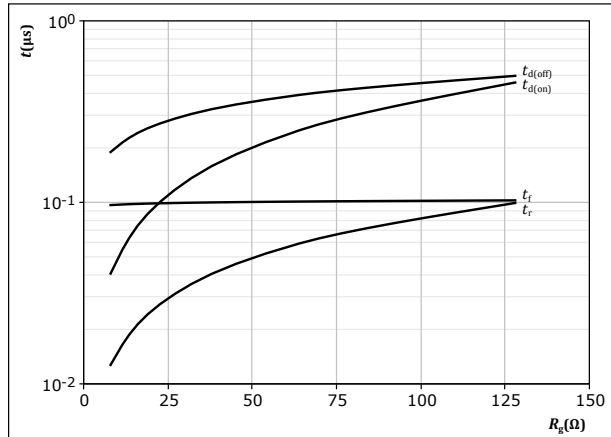
Typical switching times as a function of collector current  
 $t = f(I_c)$



With an inductive load at  
 $T_j = 150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω  
 $R_{goff} = 32$  Ω

**figure 15.** IGBT

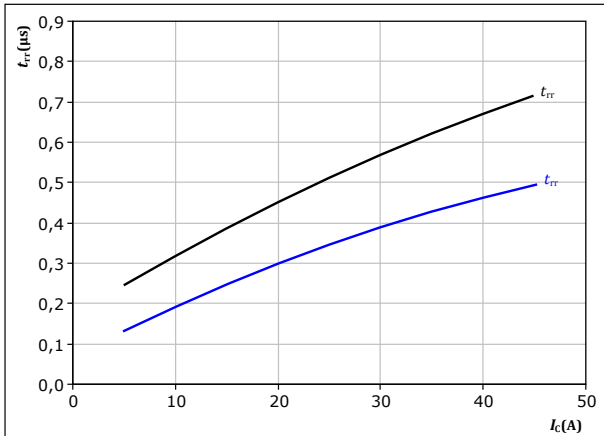
Typical switching times as a function of IGBT turn on gate resistor  
 $t = f(R_g)$



With an inductive load at  
 $T_j = 150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 25$  A

**figure 16.** FWD

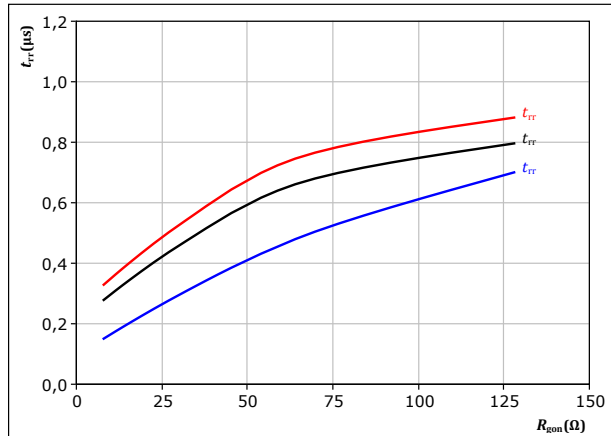
Typical reverse recovery time as a function of collector current  
 $t_{rr} = f(I_c)$



With an inductive load at  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω  
 $T_j$ : — 25 °C  
— 125 °C

**figure 17.** FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor  
 $t_{rr} = f(R_{gon})$



With an inductive load at  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 25$  A  
 $T_j$ : — 25 °C  
— 125 °C  
— 150 °C

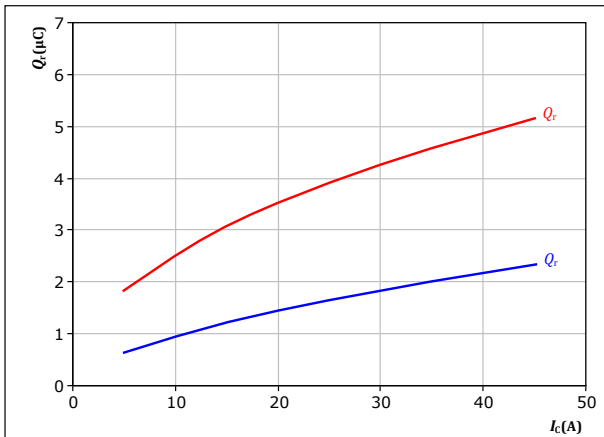


## Inverter Switching Characteristics

**figure 18.** FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

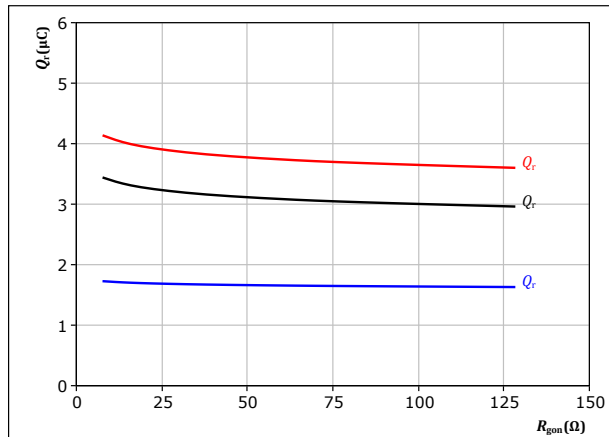
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω

$T_j$ : — 25 °C  
— 150 °C

**figure 19.** FWD

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

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



With an inductive load at

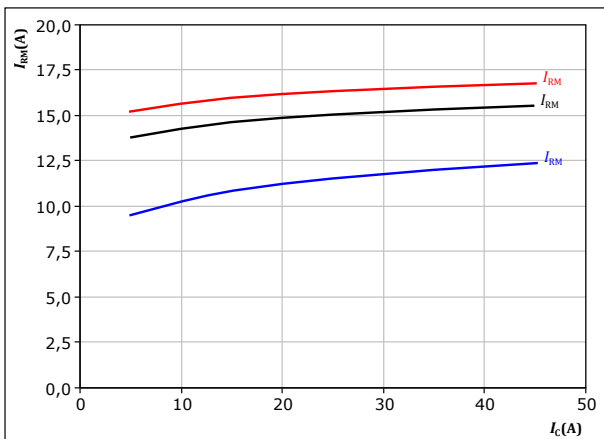
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 25$  A

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

**figure 20.** FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

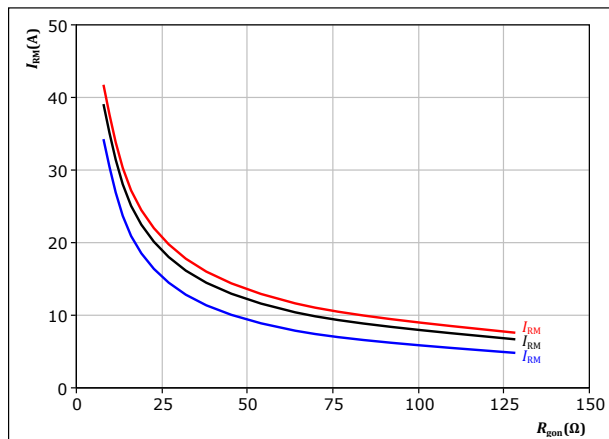
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 32$  Ω

$T_j$ : — 25 °C  
— 125 °C  
— 150 °C

**figure 21.** FWD

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

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



With an inductive load at

$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 25$  A

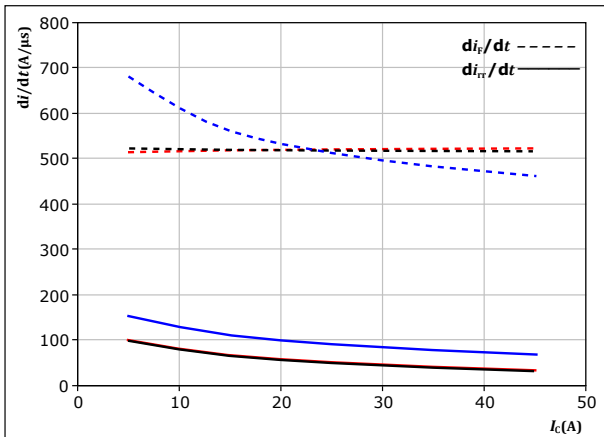
$T_j$ : — 25 °C  
— 125 °C  
— 150 °C



## Inverter Switching Characteristics

**figure 22.** FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current  
 $di_f/dt, di_{rr}/dt = f(I_c)$

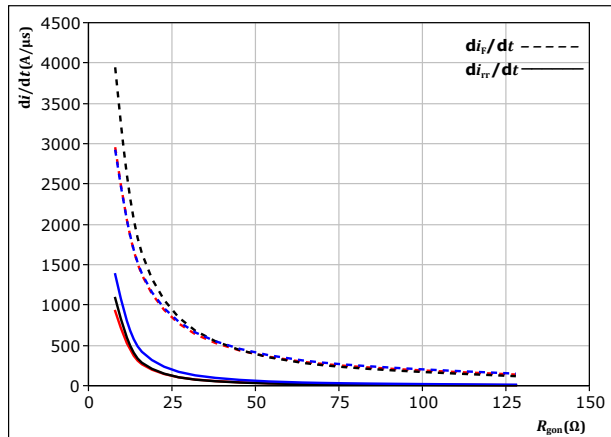


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$R_{gon} =$	32	Ω		150 °C

**figure 23.** FWD

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor  
 $di_f/dt, di_{rr}/dt = f(R_{gon})$

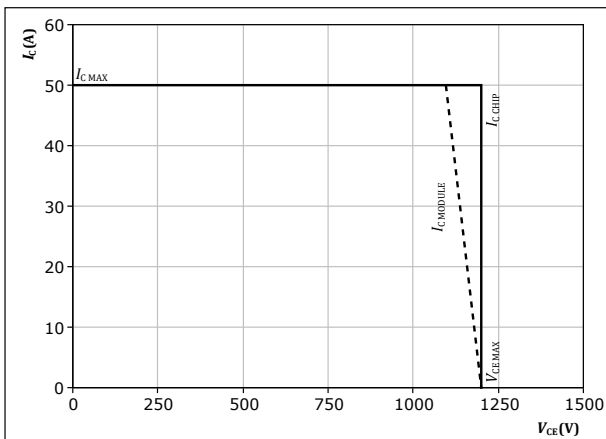


With an inductive load at

$V_{CE} =$	600	V	$T_j:$	25 °C
$V_{GE} =$	±15	V		125 °C
$I_c =$	25	A		150 °C

**figure 24.** IGBT

Reverse bias safe operating area  
 $I_c = f(V_{CE})$

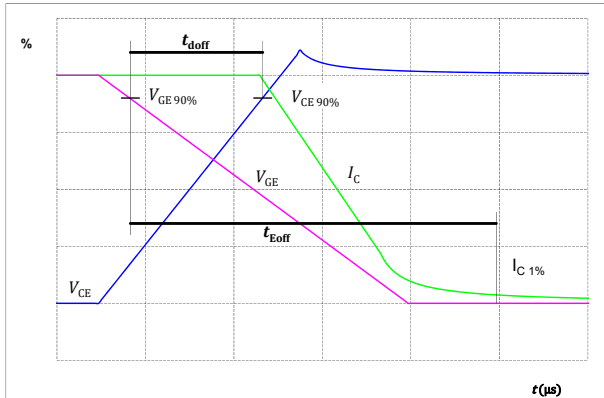


At  $T_j = 150$  °C  
 $R_{gon} = 32$  Ω  
 $R_{goff} = 32$  Ω

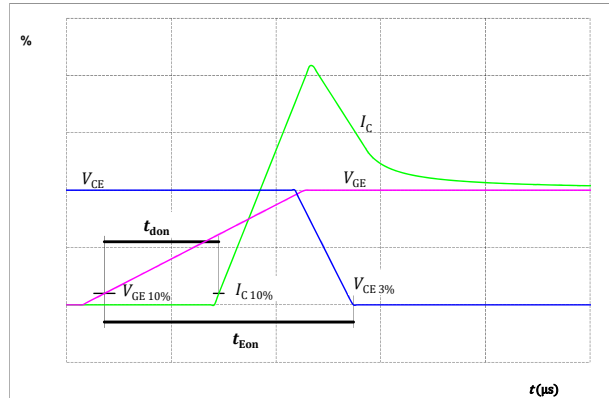


## Inverter Switching Definitions

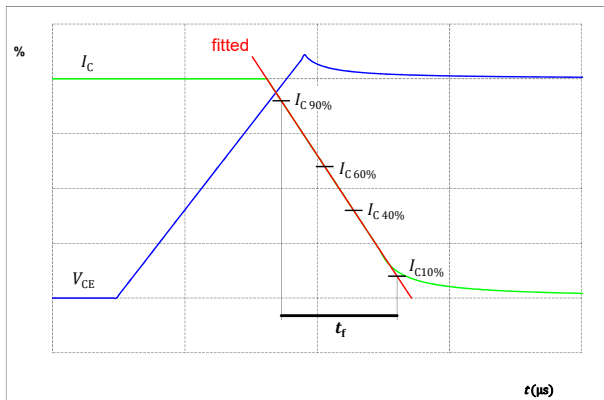
**figure 25. IGBT**  
Turn-off Switching Waveforms & definition of  $t_{doff}$ ,  $t_{Eoff}$  ( $t_{Eoff}$  = integrating time for  $E_{off}$ )



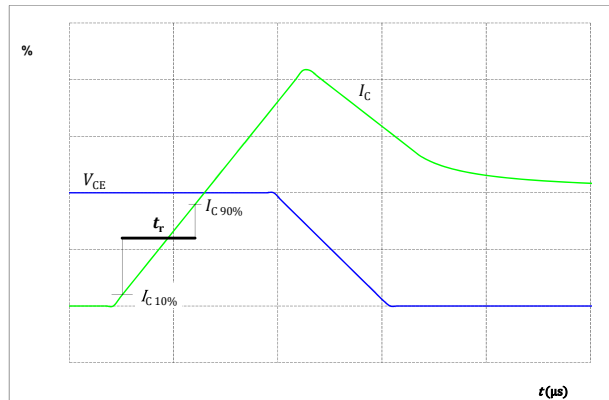
**figure 26. IGBT**  
Turn-on Switching Waveforms & definition of  $t_{don}$ ,  $t_{Eon}$  ( $t_{Eon}$  = integrating time for  $E_{on}$ )



**figure 27. IGBT**  
Turn-off Switching Waveforms & definition of  $t_f$



**figure 28. IGBT**  
Turn-on Switching Waveforms & definition of  $t_r$





### Inverter Switching Definitions

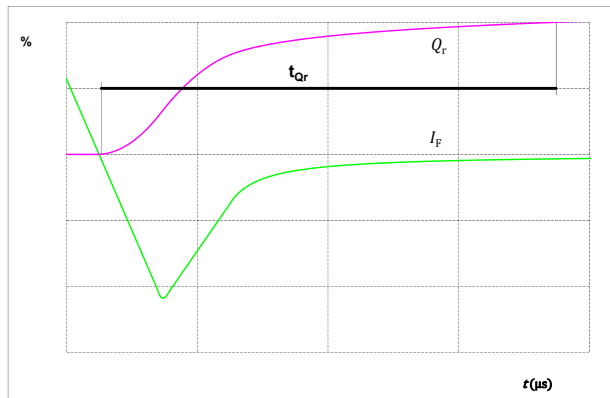
figure 29. FWD

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



figure 30. FWD

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

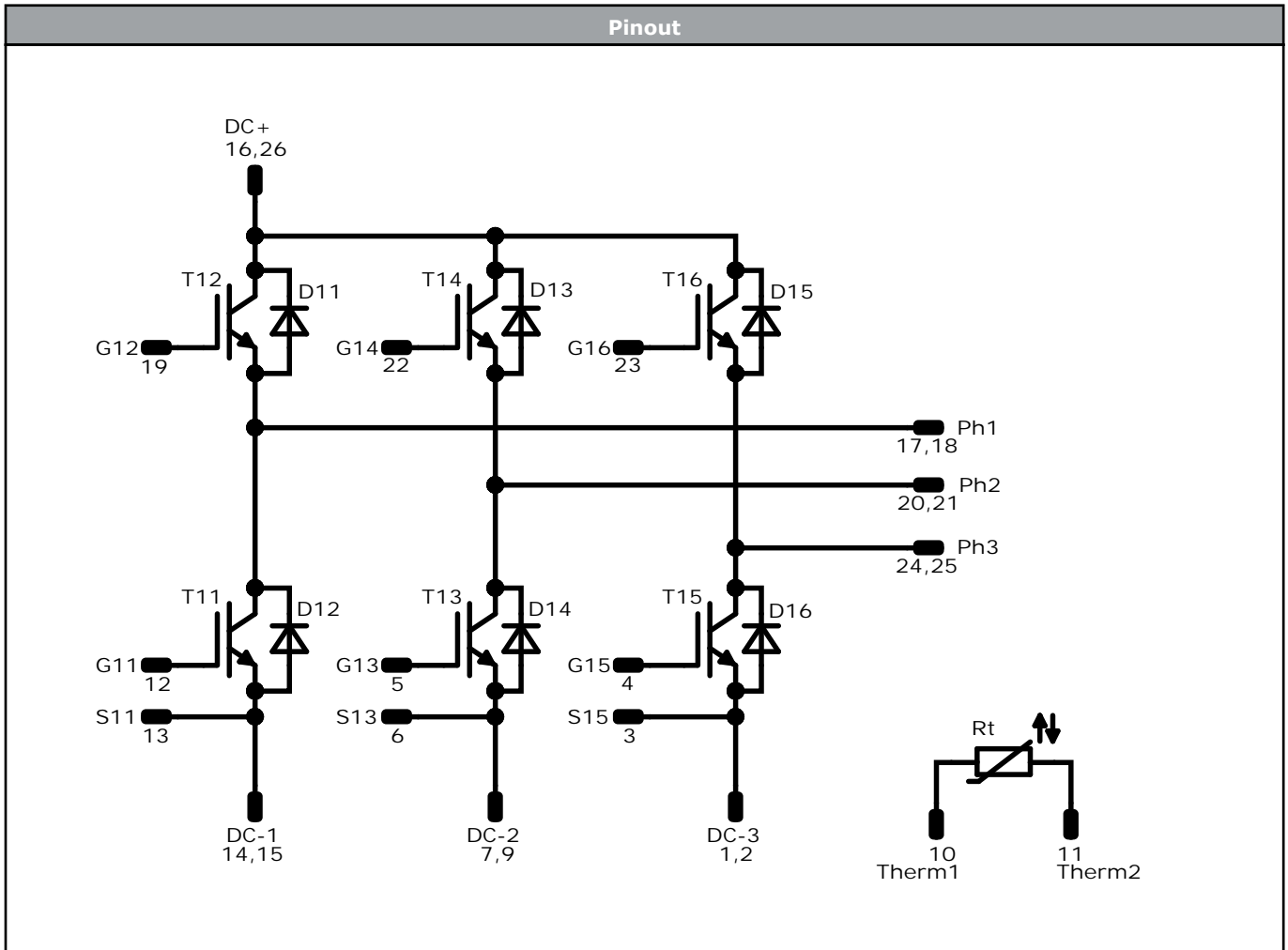








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Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	25 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	25 A	Inverter Diode	
Rt	NTC			Thermistor	



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 UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}=175^{\circ}C$ and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
10-PC126PA025SH-LA09F58Y-D1-14	11 Feb. 2025	Initial Release	

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.