



Vincotech

B0-SP10NAD600S714-PE19F13T
B0-SP10NAE600S714-PE29F13T
datasheet

flowANPC S3 split

950 V / 600 A

Topology features

- Temperature sensor
- Advanced Neutral Point Clamped topology
- Integrated Capacitor
- Split topology

Component features

- Low collector emitter saturation voltage
- High speed and smooth switching

Housing features

- Base isolation: AIN
- CTI600 housing material
- Compact, baseplate-less housing
- VINcoPress Technology
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

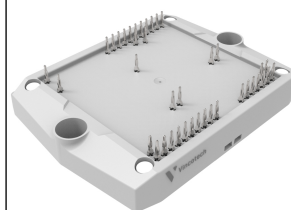
Target applications

- Solar Inverters

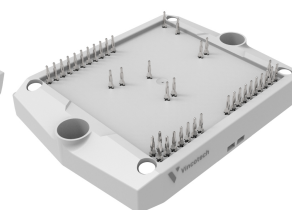
Types

- B0-SP10NAD600S714-PE19F13T
- B0-SP10NAE600S714-PE29F13T

flow S3 12 mm housing

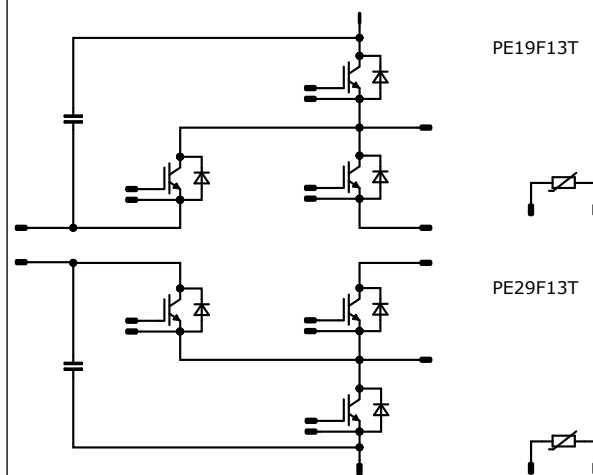


PE19F13T



PE29F13T

Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
AC Switch				
Collector-emitter voltage	V_{CES}		950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	461	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	599	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum junction temperature	T_{jmax}		175	°C

AC Diode

Peak repetitive reverse voltage	V_{RRM}		950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	191	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	365	W
Maximum junction temperature	T_{jmax}		175	°C

Neutral Point Switch

Collector-emitter voltage	V_{CES}		950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	282	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	539	W
Gate-emitter voltage	V_{GES}		± 20	V
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
DC-Link Diode				
Peak repetitive reverse voltage	V_{RRM}		950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	191	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	365	W
Maximum junction temperature	T_{jmax}		175	°C

DC-Link Switch

Collector-emitter voltage	V_{CES}		950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	382	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	704	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C

Neutral Point Diode

Peak repetitive reverse voltage	V_{RRM}		1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	205	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	1144	A
Surge current capability	I^2t		6528	A²s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	444	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
Capacitor (DC)				
Maximum DC voltage	V_{MAX}		750	V
		$T_j = 125\text{ °C}$	1000	
		$T_j = 150\text{ °C}$	750	
Operation Temperature	T_{op}		-55 ... 150	°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* $t_p = 2\text{ s}$	6800	V
Creepage distance			>12,7	mm
Clearance			11,99 / 11,39	mm
Comparative Tracking Index	CTI		≥ 600	

*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	

AC Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0065	25	4,15	4,85	5,65	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,21 1,23 1,24	1,4 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	950		25			8	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							0,75		Ω
Input capacitance	C_{ies}	$f = 100$ kHz	0	25		25		49200		pF
Output capacitance	C_{oes}							530		pF
Reverse transfer capacitance	C_{res}							220		pF
Gate charge	Q_g		±15		0	25		4100		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,16		K/W
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AC Diode

Static

Forward voltage	V_F				300	25 125 150	2,1	2,59 2,43 2,37	2,8 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 950$ V				25			12	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,26		K/W
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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	

Neutral Point Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0065	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		400	25 125 150		1,82 2,07 2,13	2,25 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	950		25			8	μA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							0,75		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$	0	25		25		25200		pF
Output capacitance	C_{oes}							540		pF
Reverse transfer capacitance	C_{res}							80		pF
Gate charge	Q_g		±15		0	25		900		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,18		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 2 \Omega$ $R_{goff} = 2 \Omega$	±15	600	355	25 125 150		207,36 211,69 213,64		ns
Rise time	t_r					25 125 150		36,11 38,61 39,6		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		176,43 210,44 220,65		ns
Fall time	t_f					25 125 150		26,39 46,75 56,01		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 1,08 \mu\text{C}$ $Q_{tFWD} = 1,11 \mu\text{C}$ $Q_{tFWD} = 1,12 \mu\text{C}$				25 125 150		7,81 7,54 7,55		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		12,45 17,92 20,04		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	
DC-Link Diode										
Static										
Forward voltage	V_F				300	25 125 150	2,1	2,59 2,43 2,37	2,8 ⁽¹⁾	V
Reverse leakage current	I_R	$V_r = 950$ V				25			12	µA
Thermal										
Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,26		K/W
Dynamic										
Peak recovery current	I_{RM}	$di/dt=6618$ A/µs $di/dt=5990$ A/µs $di/dt=6156$ A/µs	± 15	600	355	25 125 150		69,54 69,01 68,97		A
Reverse recovery time	t_{rr}					25 125 150		25,67 26,2 26,4		ns
Recovered charge	Q_r					25 125 150		1,08 1,11 1,12		µC
Reverse recovered energy	E_{rec}					25 125 150		0,411 0,425 0,431		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		7251,59 7000,21 6801,22		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	

DC-Link Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00975	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		600	25 125 150		1,82 2,07 2,13	2,25 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	950		25			12	μA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							0,5		Ω
Input capacitance	C_{ies}	$f = 100 \text{ kHz}$	0	25		25		37800		pF
Output capacitance	C_{oes}							810		pF
Reverse transfer capacitance	C_{res}							120		pF
Gate charge	Q_g		±15		0	25		1350		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,14		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 12,8 \Omega$ $R_{goff} = 12,8 \Omega$	±15	600	355	25 125 150		1049,23 1031,6 1026,15		ns
Rise time	t_r					25 125 150		101,09 112,67 116,86		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		670,29 713,66 726,72		ns
Fall time	t_f					25 125 150		21,15 34,95 40,24		ns
Turn-on energy (per pulse)	E_{on}					25 125 150		51,44 46,87 45,74		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		14,99 17,06 17,41		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	

Neutral Point Diode

Static

Forward voltage	V_F				160	25 125 150		1,43 1,7 1,81	1,6 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25 150		1,6 112	640	µA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,21		K/W
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Dynamic

Peak recovery current	I_{RM}	$di/dt=3254$ A/µs $di/dt=3111$ A/µs $di/dt=2139$ A/µs	± 15	600	355	25 125 150		40,45 37,13 38,73		A
Reverse recovery time	t_{rr}					25 125 150		28,8 29,39 31,55		ns
Recovered charge	Q_r					25 125 150		0,71 0,657 0,722		µC
Reverse recovered energy	E_{rec}					25 125 150		0,121 0,105 0,115		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		3078,94 3425,41 3106,84		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	

Capacitor (DC)

Static

Capacitance	C	DC bias voltage = 0 V				25		33		nF
Tolerance							-5		5	%
Dissipation factor		$f = 1$ kHz				25		0,1		%

Thermistor

Static

Rated resistance	R					25		22		k Ω
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. ± 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.



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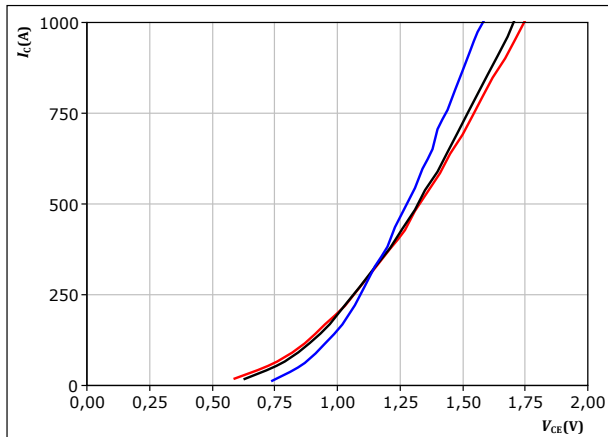
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AC Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

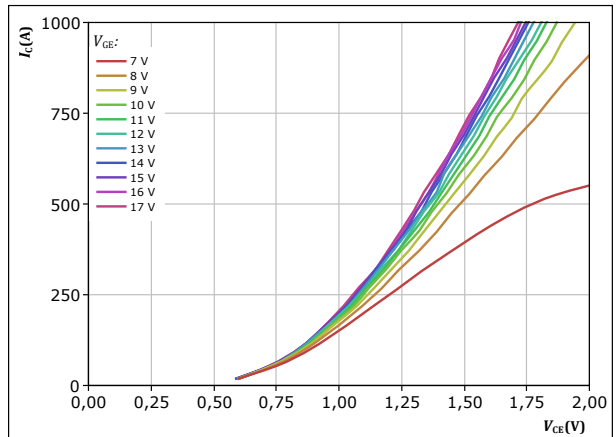


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

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

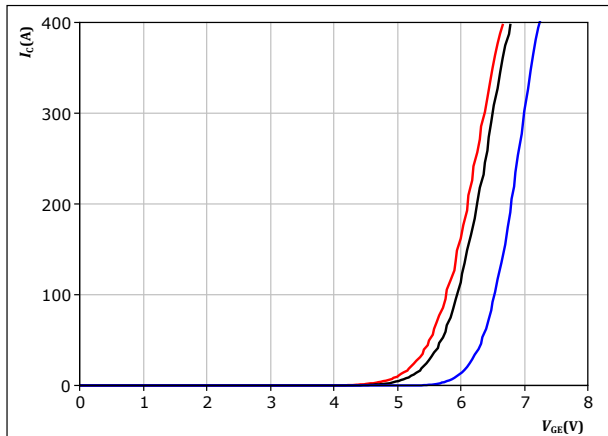


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

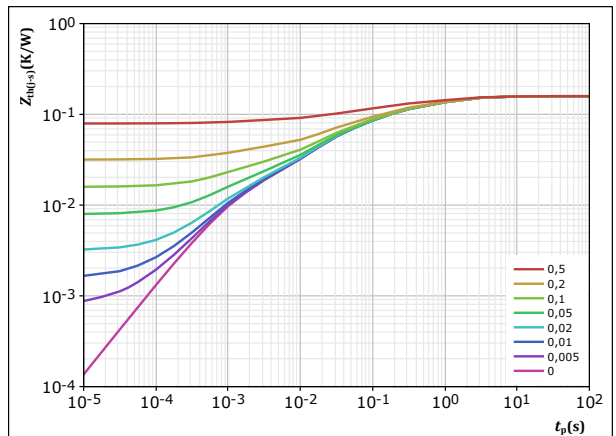


$t_p = 250 \mu s$
 $V_{CE} = 10 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,158 K/W$
IGBT thermal model values

$R (K/W)$	$\tau (s)$
9,88E-03	4,48E+00
4,29E-02	9,18E-01
5,31E-02	1,30E-01
4,03E-02	2,06E-02
1,24E-02	1,11E-03



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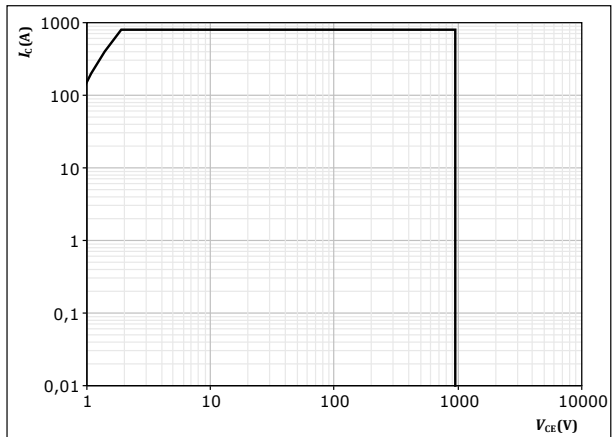
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AC Switch Characteristics

figure 5. IGBT

Safe operating area

$I_C = f(V_{CE})$



$D = \text{single pulse}$

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

$V_{GE} = 15 \text{ V}$

$T_j = T_{jmax}$



AC Diode Characteristics

figure 6. FWD

Typical forward characteristics

$I_F = f(V_F)$

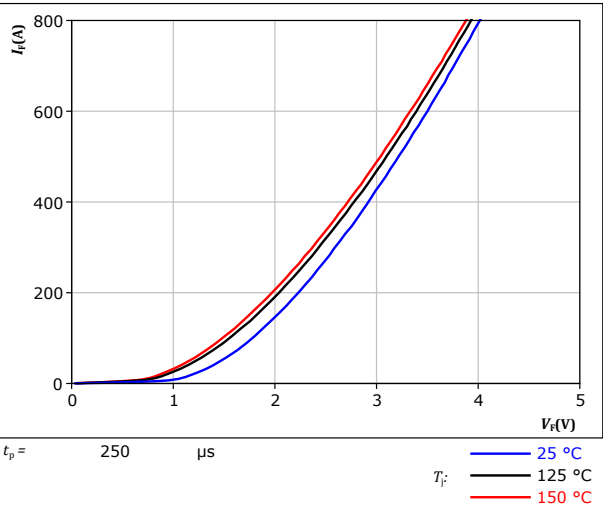
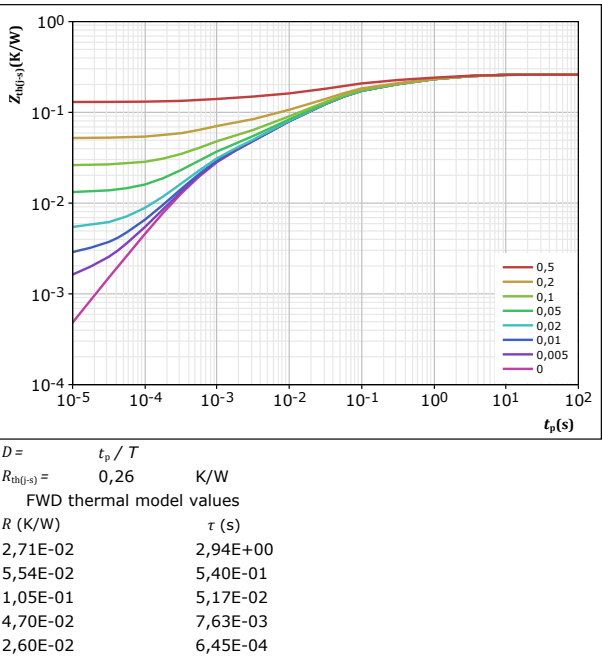


figure 7. FWD

Transient thermal impedance as a function of pulse width

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





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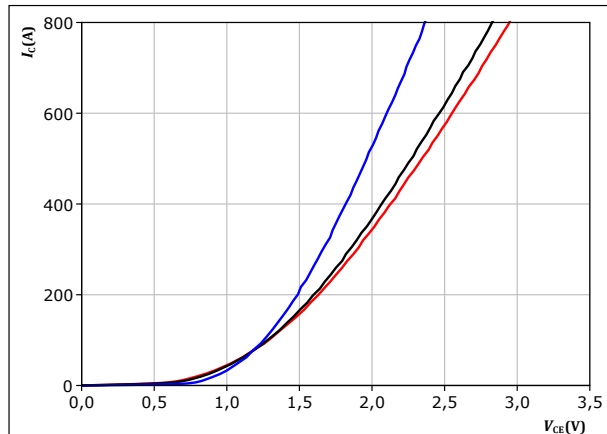
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Neutral Point Switch Characteristics

figure 8. IGBT

Typical output characteristics

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

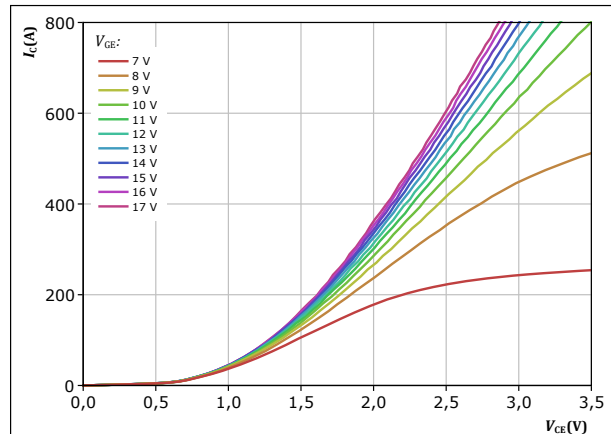


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 9. IGBT

Typical output characteristics

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

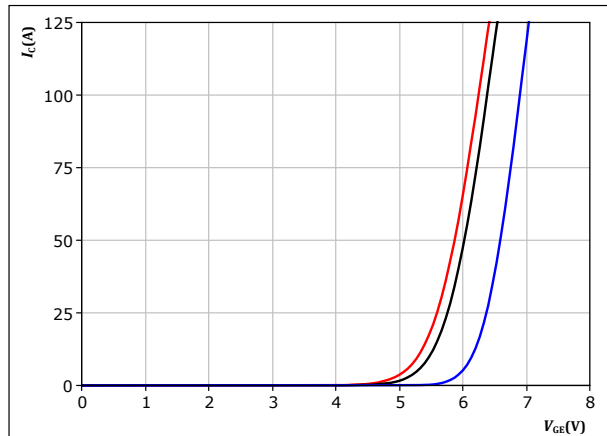


$t_p = 250 \mu s$
 $T_j = 150 ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 10. IGBT

Typical transfer characteristics

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

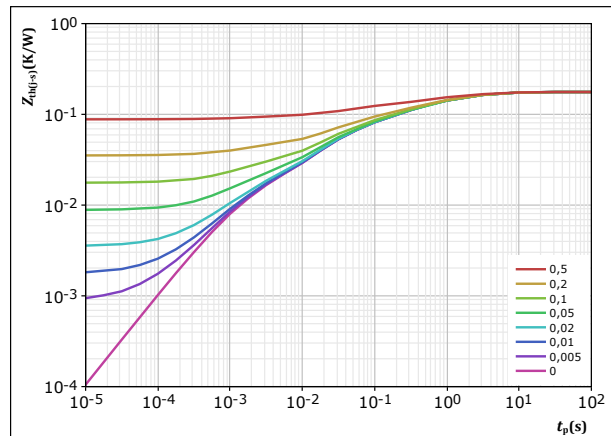


$t_p = 250 \mu s$
 $V_{CE} = 24 V$
 $T_j:$ 25 °C, 125 °C, 150 °C

figure 11. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 0,176 K/W$
IGBT thermal model values

$R (K/W)$	$\tau (s)$
1,35E-02	5,32E+00
4,39E-02	1,45E+00
5,74E-02	2,58E-01
4,99E-02	2,79E-02
1,17E-02	1,38E-03



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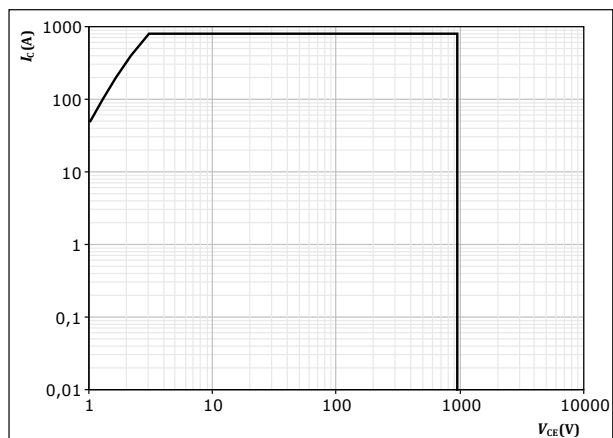
Neutral Point Switch Characteristics

figure 12.

IGBT

Safe operating area

$I_C = f(V_{CE})$



$D = \text{single pulse}$

$T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$



DC-Link Diode Characteristics

figure 13. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

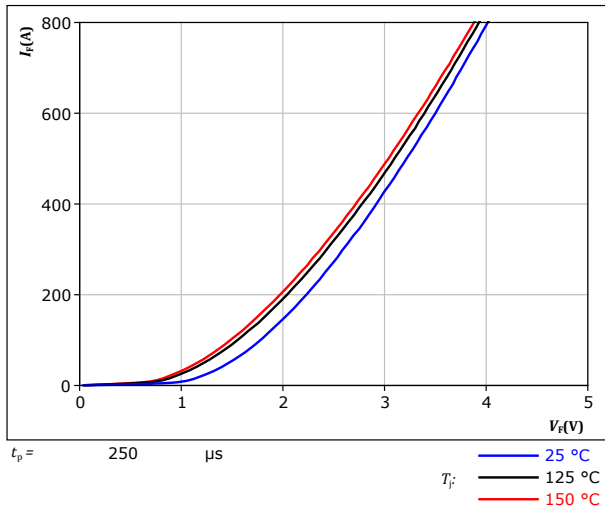
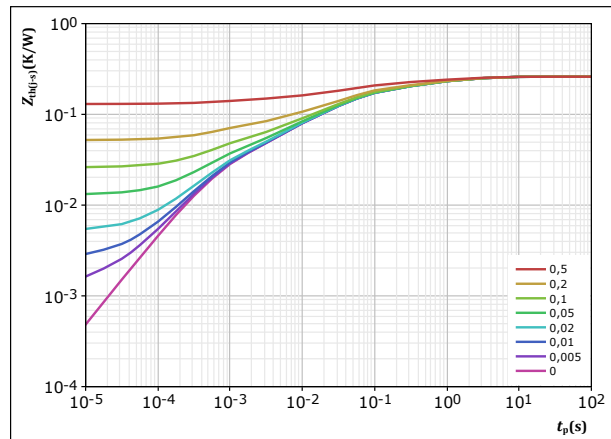


figure 14. FWD

Transient thermal impedance as a function of pulse width

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



FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
2,71E-02	2,94E+00
5,54E-02	5,40E-01
1,05E-01	5,17E-02
4,70E-02	7,63E-03
2,60E-02	6,45E-04



DC-Link Switch Characteristics

figure 15. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

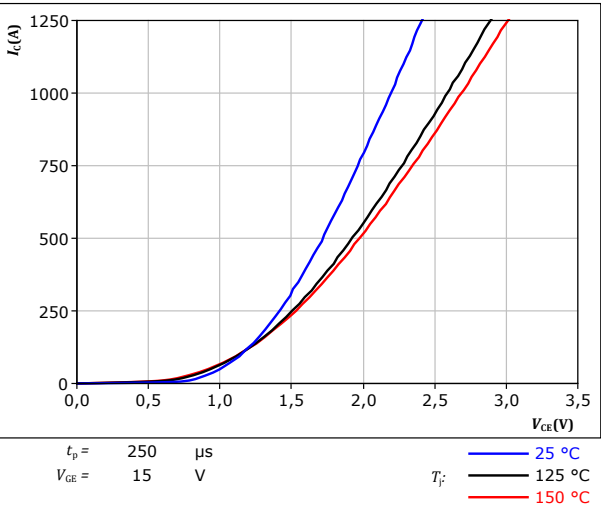


figure 17. IGBT

Typical transfer characteristics
 $I_C = f(V_{GE})$

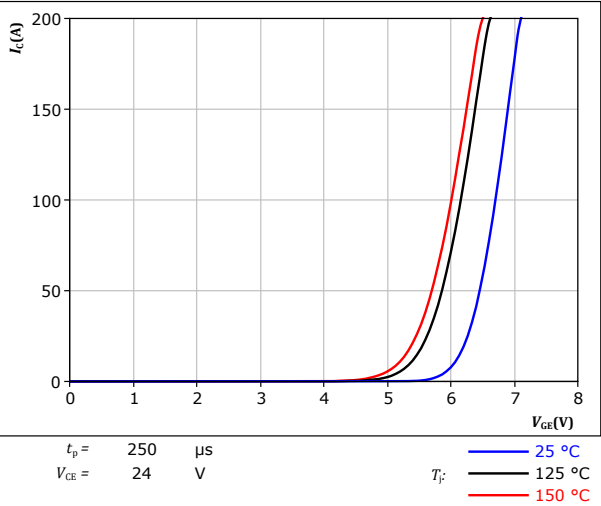


figure 16. IGBT

Typical output characteristics
 $I_C = f(V_{CE})$

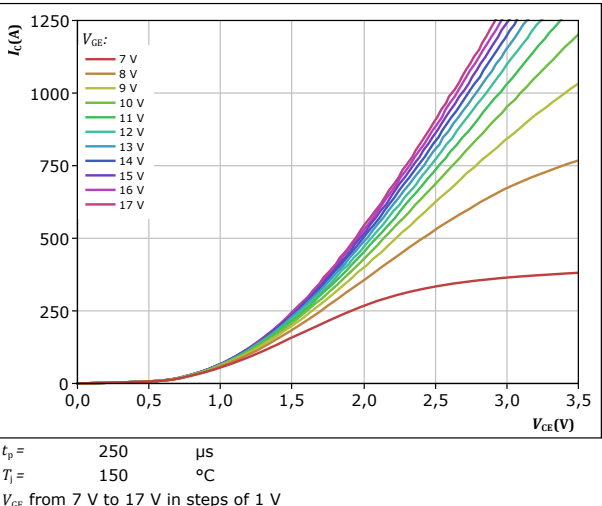
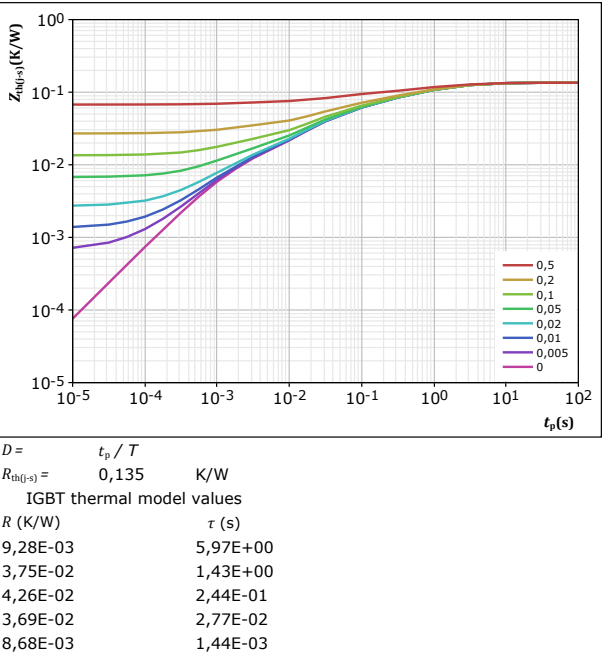


figure 18. IGBT

Transient thermal impedance as a function of pulse width
 $Z_{th(j-s)} = f(t_p)$





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datasheet

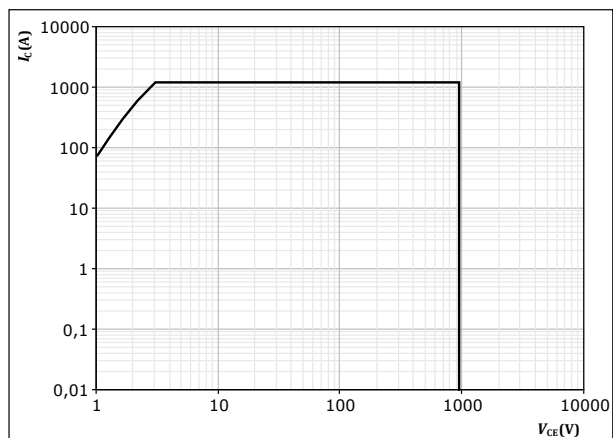
DC-Link Switch Characteristics

figure 19.

IGBT

Safe operating area

$I_C = f(V_{CE})$



$D = \text{single pulse}$

$T_s = 80 \text{ } ^\circ\text{C}$
 $V_{GE} = 15 \text{ V}$
 $T_j = T_{jmax}$



Neutral Point Diode Characteristics

figure 20. FWD

Typical forward characteristics
 $I_F = f(V_F)$

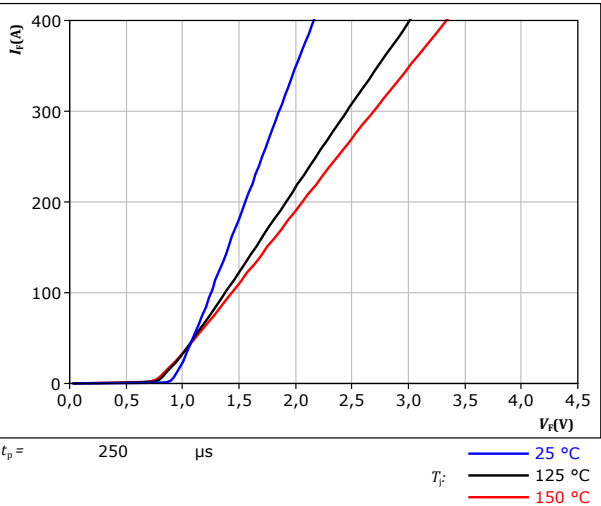
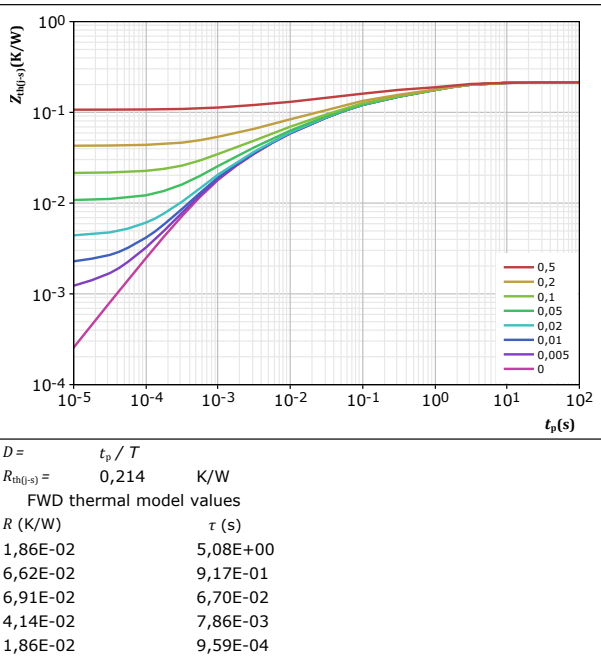


figure 21. FWD

Transient thermal impedance as a function of pulse width
 $Z_{th(j-s)} = f(t_p)$





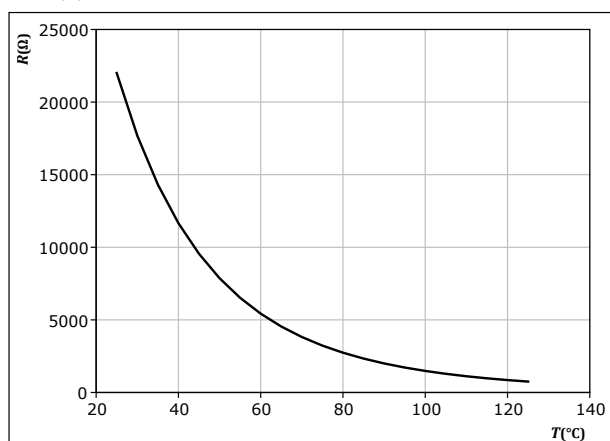
Thermistor Characteristics

figure 22.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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datasheet

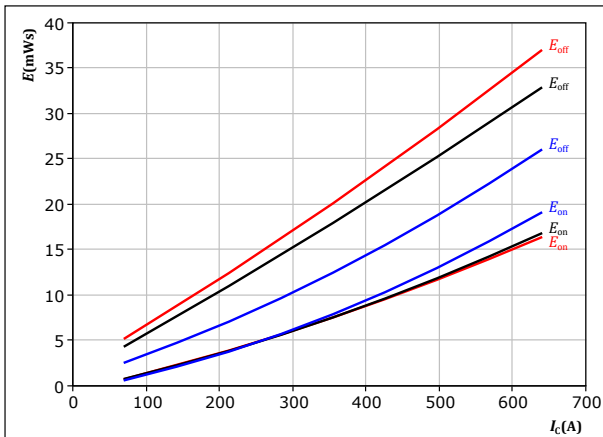
Neutral Point Switching Characteristics

figure 23.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$

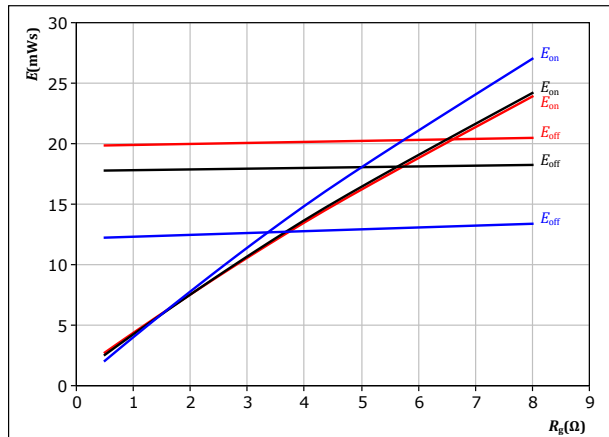
T_j : 25 °C
125 °C
150 °C

figure 24.

IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 355 \text{ A}$

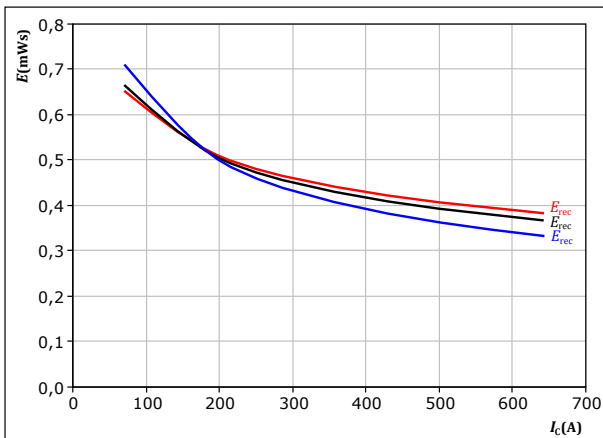
T_j : 25 °C
125 °C
150 °C

figure 25.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$

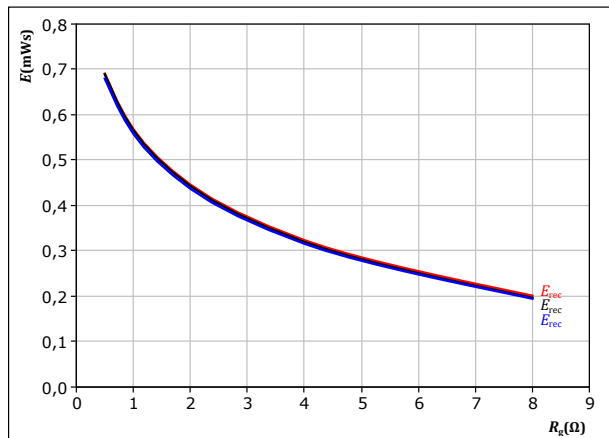
T_j : 25 °C
125 °C
150 °C

figure 26.

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

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 355 \text{ A}$

T_j : 25 °C
125 °C
150 °C



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datasheet

Neutral Point Switching Characteristics

figure 27.

IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$

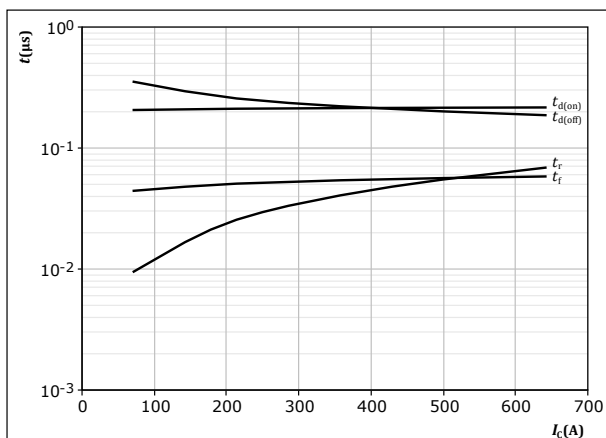


figure 28.

IGBT

Typical switching times as a function of IGBT turn on gate resistor

$$t = f(R_g)$$

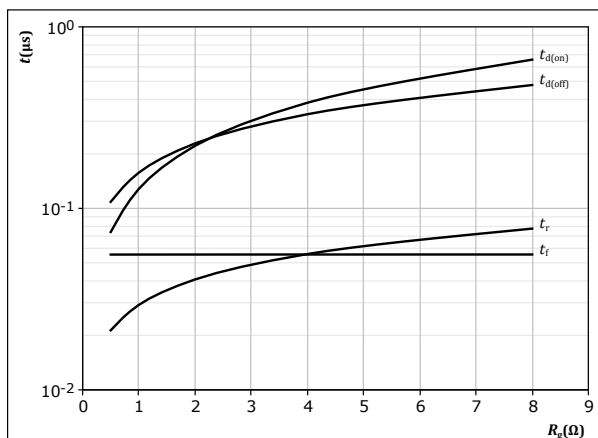


figure 29.

FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$

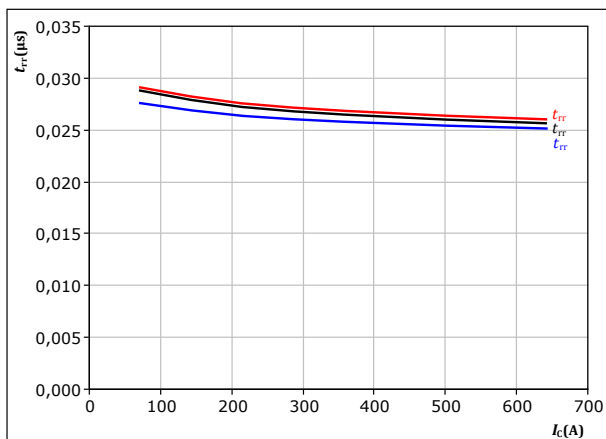
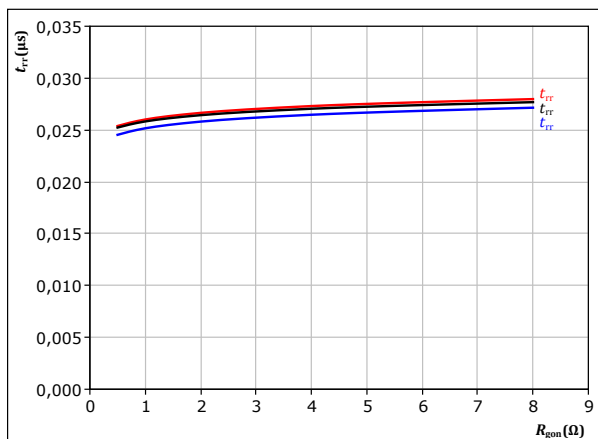


figure 30.

FWD

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

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





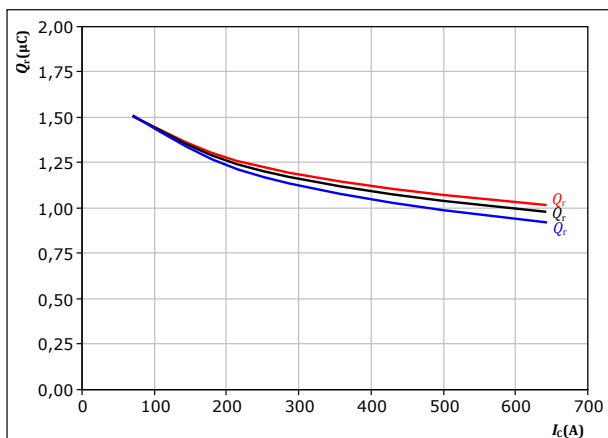
Neutral Point Switching Characteristics

figure 31.

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
 $R_{gon} = 2$ Ω

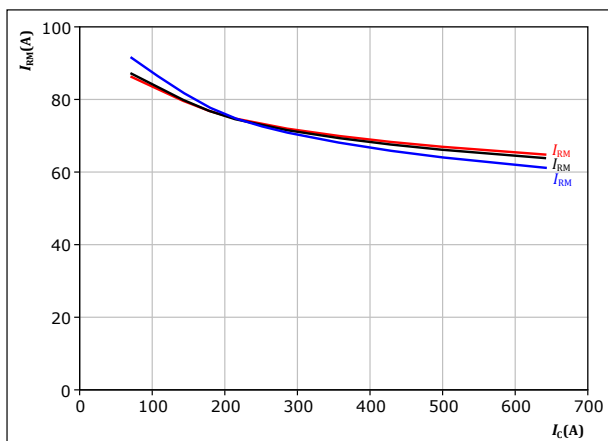
T_j : 25 °C
125 °C
150 °C

figure 33.

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
 $R_{gon} = 2$ Ω

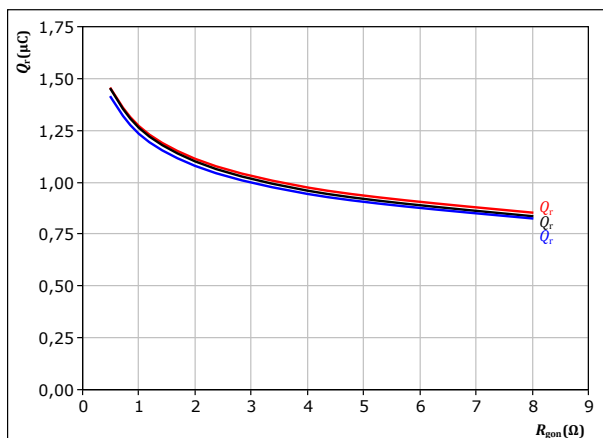
T_j : 25 °C
125 °C
150 °C

figure 32.

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
 $I_c = 355$ A

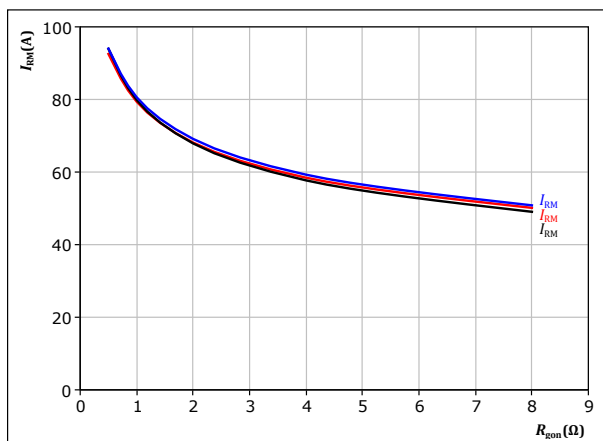
T_j : 25 °C
125 °C
150 °C

figure 34.

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
 $I_c = 355$ A

T_j : 25 °C
125 °C
150 °C



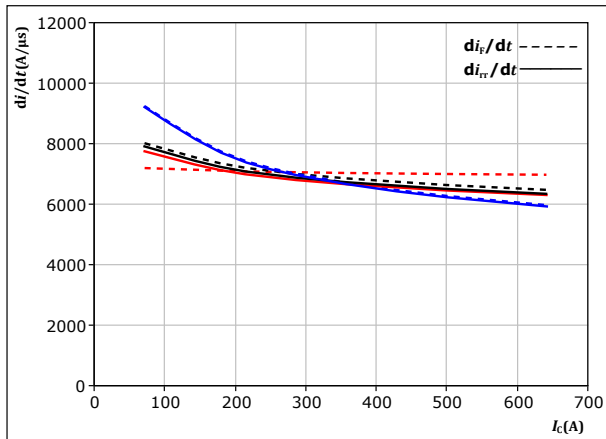
Vincotech

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datasheet

Neutral Point Switching Characteristics

figure 35. FWD

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

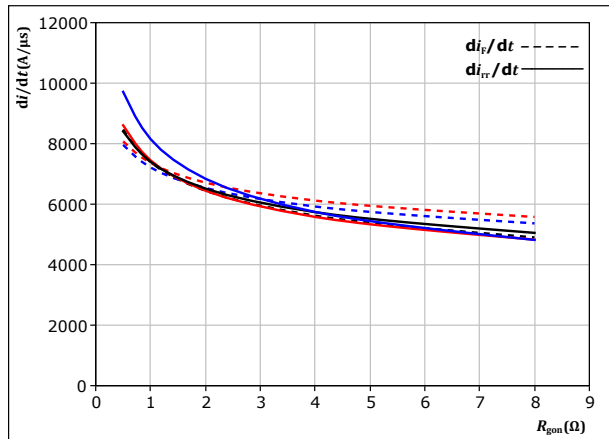


With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 2 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 36. FWD

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



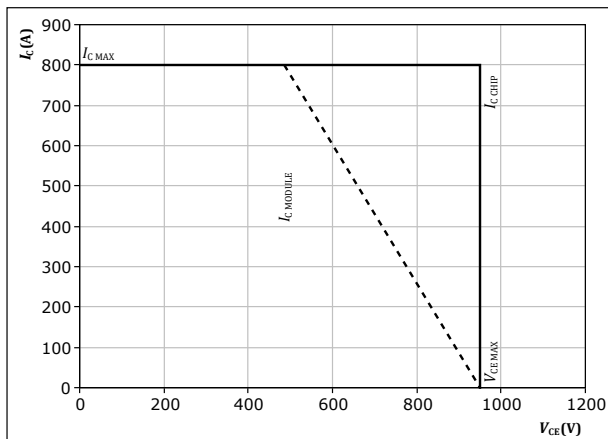
With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 355 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 37. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



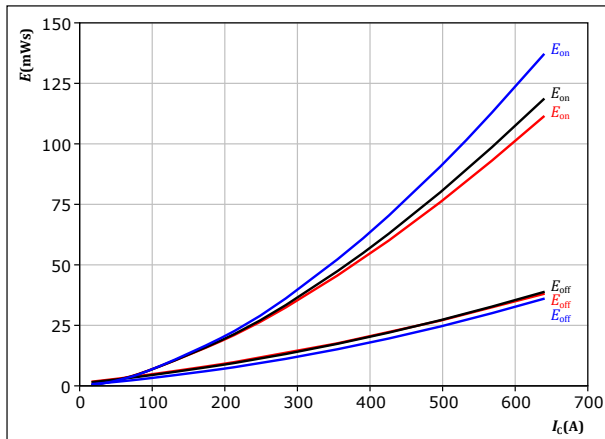
At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{gon} = 2 \text{ } \Omega$
 $R_{goff} = 2 \text{ } \Omega$



DC-Link Switching Characteristics

figure 38. IGBT

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

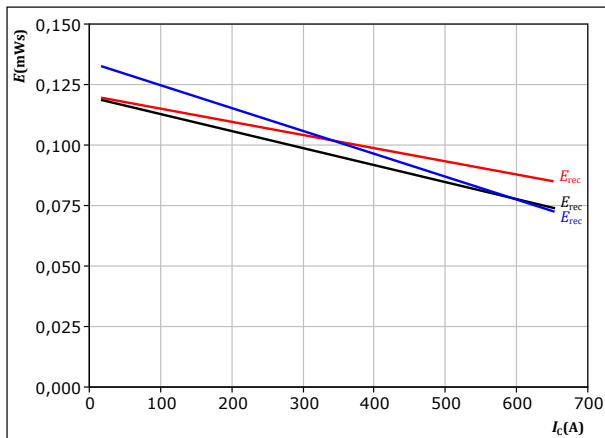


With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 12,8 \text{ } \Omega$
 $R_{goff} = 12,8 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 40. FWD

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

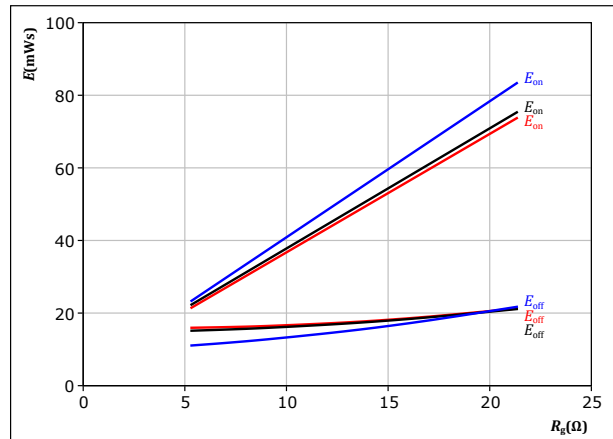


With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 12,8 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 39. IGBT

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

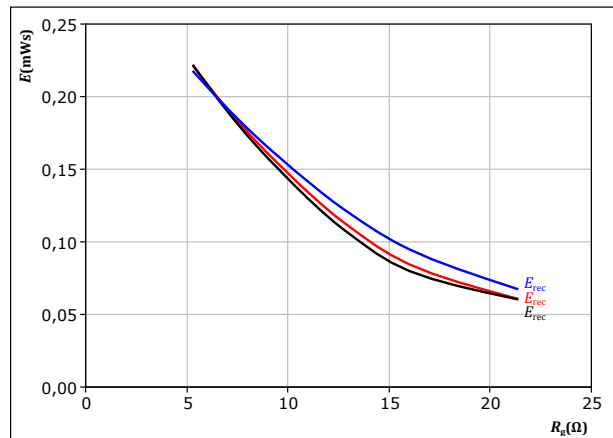


With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 355 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 41. 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

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 355 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$



Vincotech

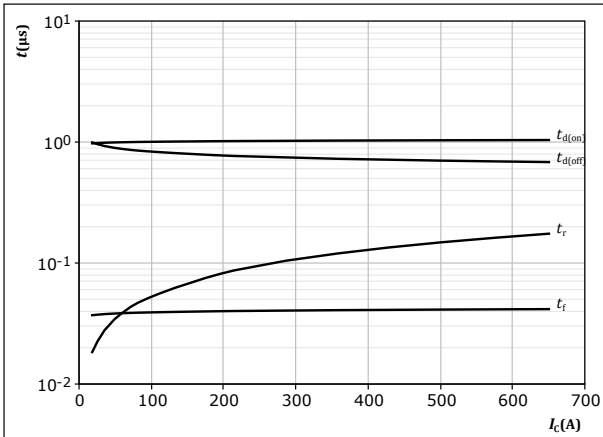
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B0-SP10NAE600S714-PE29F13T
 datasheet

DC-Link Switching Characteristics

figure 42.

IGBT

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



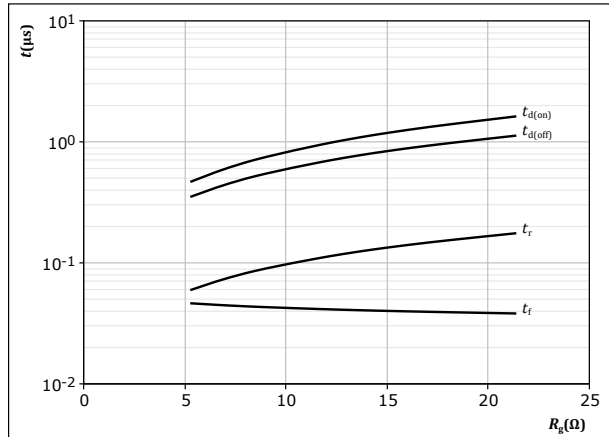
With an inductive load at

$T_j = 150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 12,8 \text{ } \Omega$
 $R_{goff} = 12,8 \text{ } \Omega$

figure 43.

IGBT

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



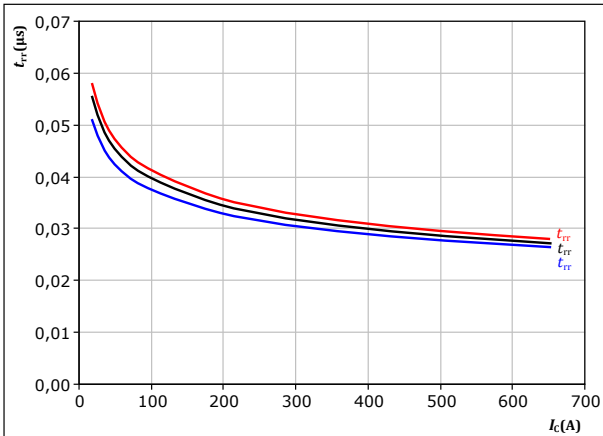
With an inductive load at

$T_j = 150 \text{ } ^\circ\text{C}$
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 355 \text{ A}$

figure 44.

FWD

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



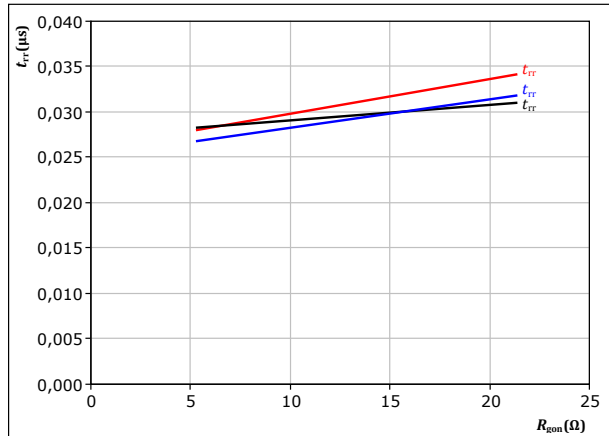
With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 12,8 \text{ } \Omega$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

figure 45.

FWD

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 355 \text{ A}$
 $T_j: 25 \text{ } ^\circ\text{C}$
 $125 \text{ } ^\circ\text{C}$
 $150 \text{ } ^\circ\text{C}$

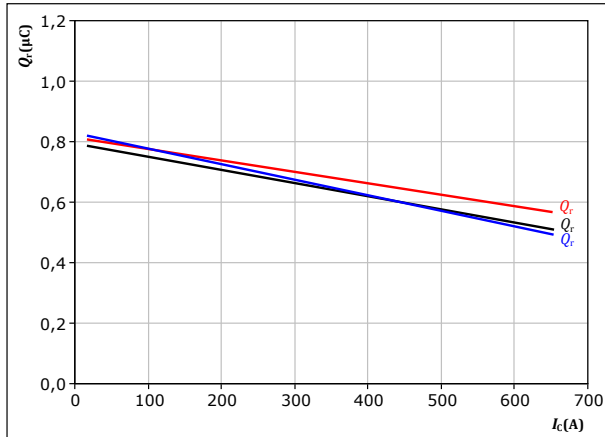


DC-Link Switching Characteristics

figure 46. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

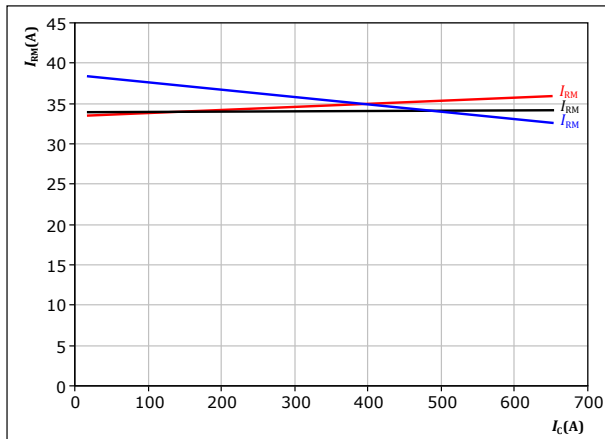
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 12,8 \text{ } \Omega$

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

figure 48. FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

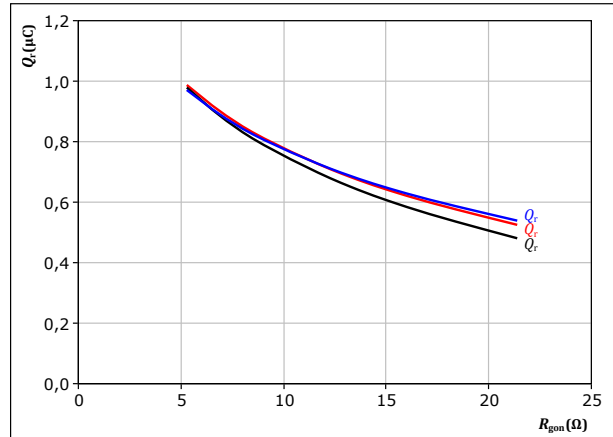
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 12,8 \text{ } \Omega$

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

figure 47. FWD

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

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



With an inductive load at

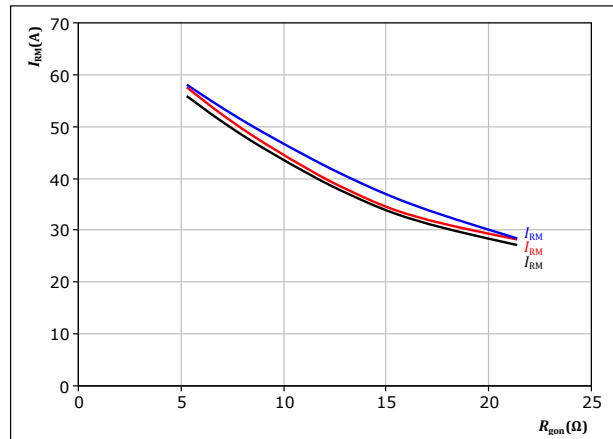
$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 355 \text{ A}$

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

figure 49. 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

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 355 \text{ A}$

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



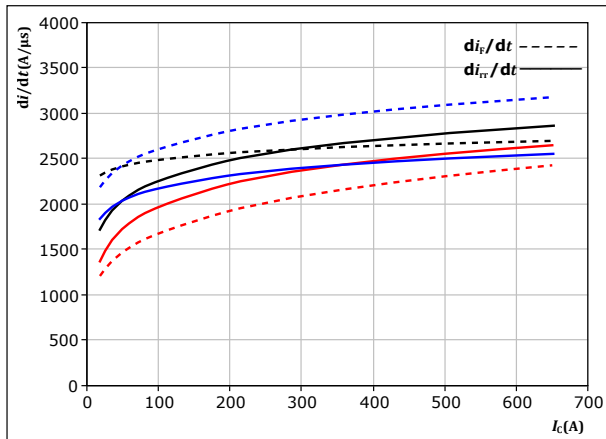
Vincotech

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datasheet

DC-Link Switching Characteristics

figure 50. FWD

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



With an inductive load at

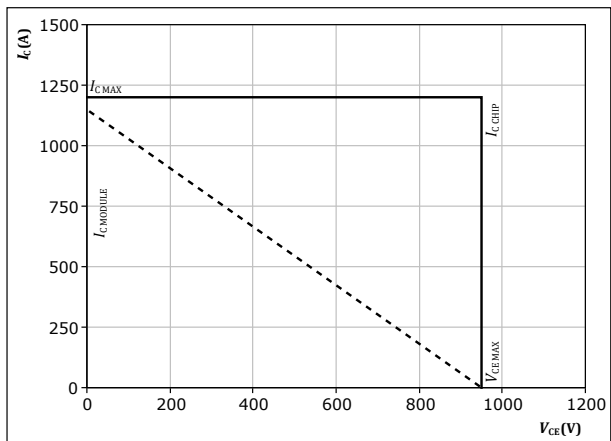
$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 12,8$ Ω

T_j :
— 25 °C
— 125 °C
— 150 °C

figure 51. FWD

Reverse bias safe operating area

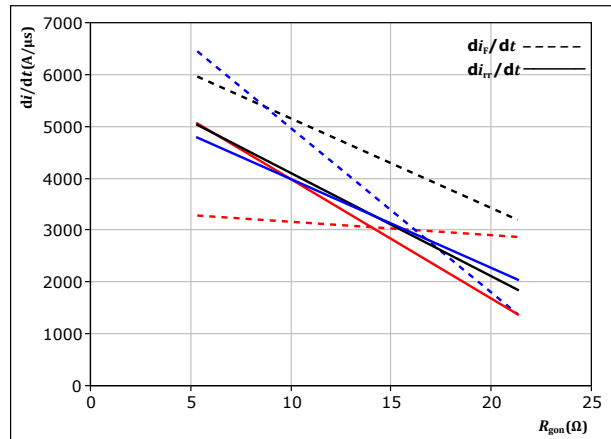
$I_C = f(V_{CE})$



At $T_j = 150$ °C
 $R_{gon} = 12,8$ Ω
 $R_{goff} = 12,8$ Ω

figure 51. FWD

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 355$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



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B0-SP10NAE600S714-PE29F13T
 datasheet

Switching Definitions

figure 53. IGBT

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

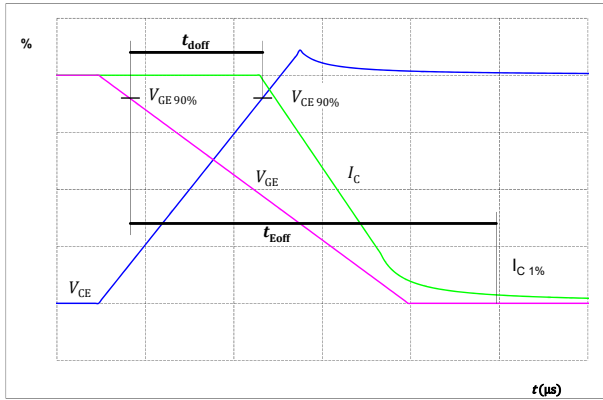


figure 54. IGBT

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

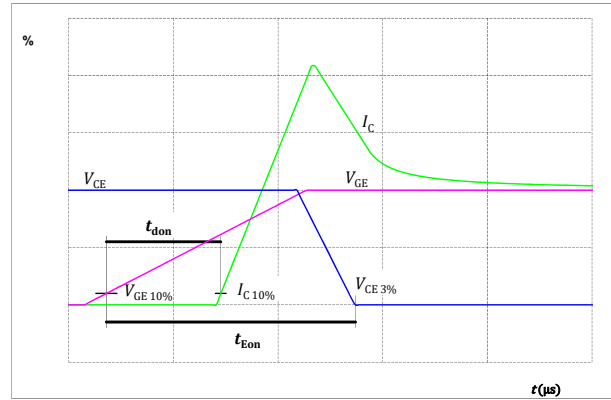


figure 55. IGBT

Turn-off Switching Waveforms & definition of t_f

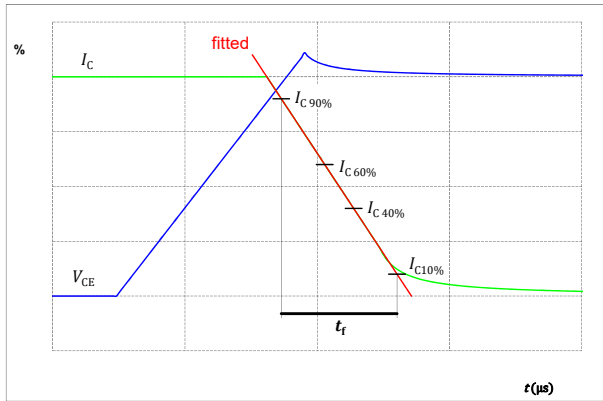
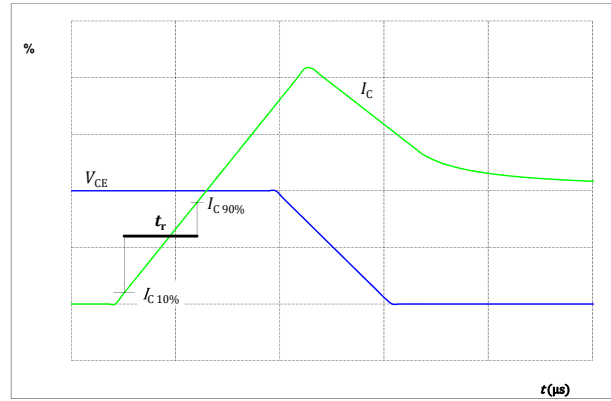


figure 56. IGBT

Turn-on Switching Waveforms & definition of t_r





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datasheet

Switching Definitions

figure 57.

FWD

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

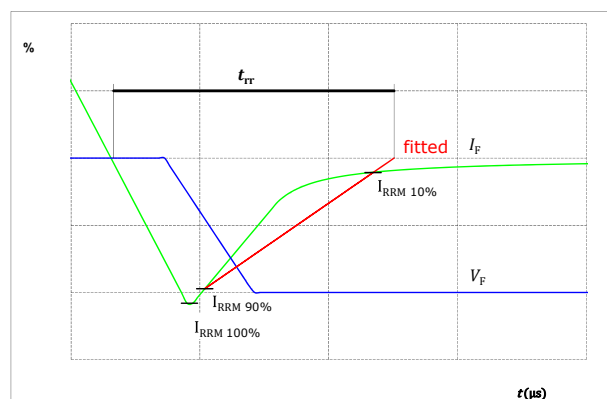
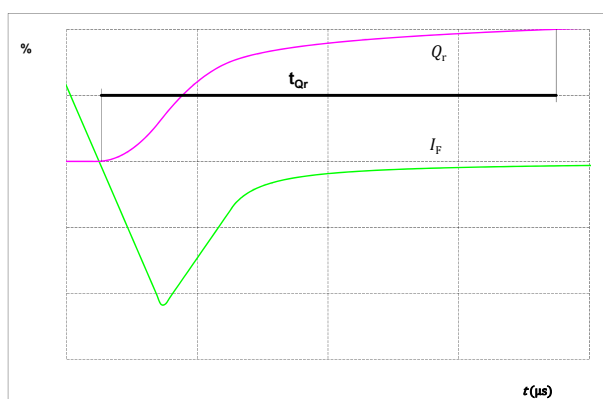


figure 58.

FWD

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



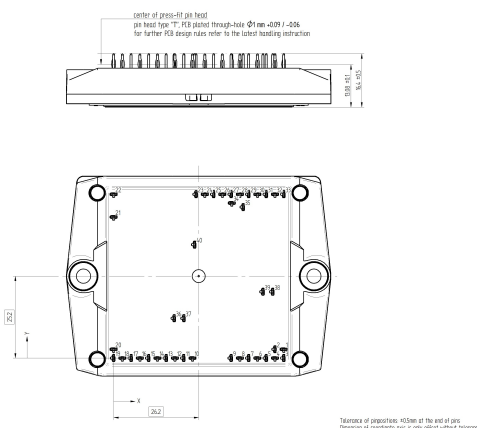


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B0-SP10NAE600S714-PE29F13T
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	B0-SP10NAD600S714-PE19F13T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP10NAD600S714-PE19F13T-/7/

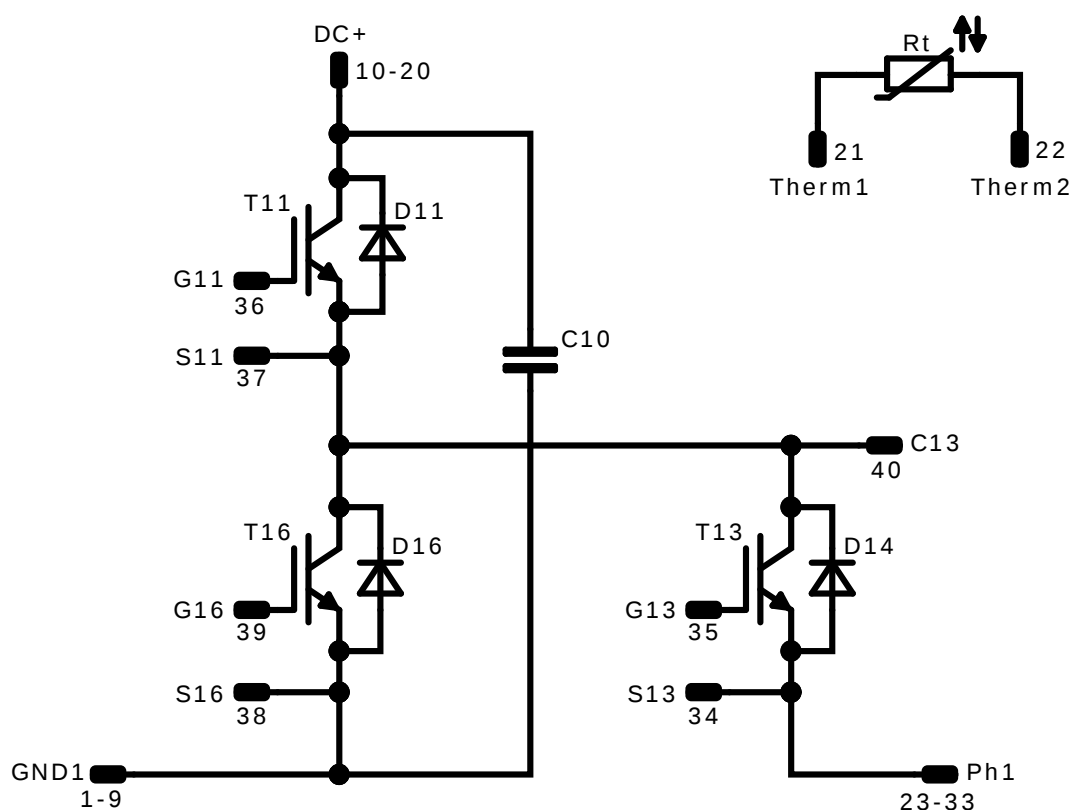
Marking						
	Text	Name	Date code	UL & VIN	Lot	Serial
		NN-NNNNNNNNNNNNNN- TTTTTVV	WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	Type&Ver	Lot number	Serial	Date code	
		TTTTTTVV	LLLLL	SSSS	WWYY	

Outline				
Pin table [mm]				B0-SP10NAD600S714-PE19F13T  center of press-fit pin head pin head type "P" PCB plated through-hole Ø1 mm J297-1 - 2006 for further PCB design rules refer to the latest handling instruction Tolerance of position: ±0.05mm at the end of pins Dimension of coordinate axis is only offset without tolerance
Pin	X	Y	Function	
1	52,4	2,7	GND1	
2	49,7	2,7	GND1	
3	52,4	0	GND1	
4	49,7	0	GND1	
5	47	0	GND1	
6	44,3	0	GND1	
7	41,6	0	GND1	
8	38,9	0	GND1	
9	36,2	0	GND1	
10	24,3	0	DC+	
11	21,6	0	DC+	
12	18,9	0	DC+	
13	16,2	0	DC+	
14	13,5	0	DC+	
15	10,8	0	DC+	
16	8,1	0	DC+	
17	5,4	0	DC+	
18	2,7	0	DC+	
19	0	0	DC+	
20	0	2,7	DC+	
21	0	43,4	Therm1	
22	0	50,4	Therm2	
23	25,4	50,4	Ph1	
24	28,1	50,4	Ph1	
25	30,8	50,4	Ph1	
26	33,5	50,4	Ph1	
27	36,2	50,4	Ph1	
28	38,9	50,4	Ph1	
29	41,6	50,4	Ph1	
30	44,3	50,4	Ph1	
31	47	50,4	Ph1	
32	49,7	50,4	Ph1	
33	52,4	50,4	Ph1	
34	36,4	47,7	S13	
35	39,9	46,45	G13	
36	18,65	12,25	G11	
37	21,65	12,25	S11	
38	49	20,4	S16	
39	46	20,4	G16	
40	24,95	34,9	C13	



datasheet

B0-SP10NAD600S714-PE19F13T



Identification					
ID	Component	Voltage	Current	Function	Comment
T13	IGBT	950 V	400 A	AC Switch	
D14	FWD	950 V	300 A	AC Diode	
T16	IGBT	950 V	400 A	Neutral Point Switch	
D11	FWD	950 V	300 A	DC-Link Diode	
T11	IGBT	950 V	600 A	DC-Link Switch	
D16	FWD	1200 V	160 A	Neutral Point Diode	
C10	Capacitor	1000 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	



Vincotech

B0-SP10NAD600S714-PE19F13T
B0-SP10NAE600S714-PE29F13T
datasheet

Ordering Code	
Version	Ordering Code
Without thermal paste	B0-SP10NAE600S714-PE29F13T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP10NAE600S714-PE29F13T-/-/

Marking						
	Text	Name NN-NNNNNNNNNNNNNNNN- TTTTIVV	Date code WWYY	UL & VIN UL VIN	Lot LLLLL	Serial SSSS
	Datamatrix	Type&Ver TTTTITTVV	Lot number LLLLL	Serial SSSS	Date code WWYY	

Outline																																																																																																																																																																											
B0-SP10NAE600S714-PE29F13T																																																																																																																																																																											
<table><tr><th colspan="4">Pin table [mm]</th></tr><tr><th>Pin</th><th>X</th><th>Y</th><th>Function</th></tr><tr><td>1</td><td>52,4</td><td>2,7</td><td>DC-</td></tr><tr><td>2</td><td>52,4</td><td>0</td><td>DC-</td></tr><tr><td>3</td><td>49,7</td><td>0</td><td>DC-</td></tr><tr><td>4</td><td>47</td><td>0</td><td>DC-</td></tr><tr><td>5</td><td>44,3</td><td>0</td><td>DC-</td></tr><tr><td>6</td><td>41,6</td><td>0</td><td>DC-</td></tr><tr><td>7</td><td>38,9</td><td>0</td><td>DC-</td></tr><tr><td>8</td><td>36,2</td><td>0</td><td>DC-</td></tr><tr><td>9</td><td>33,5</td><td>0</td><td>DC-</td></tr><tr><td>10</td><td>30,8</td><td>0</td><td>DC-</td></tr><tr><td>11</td><td>28,1</td><td>0</td><td>DC-</td></tr><tr><td>12</td><td>16,2</td><td>0</td><td>GND2</td></tr><tr><td>13</td><td>13,5</td><td>0</td><td>GND2</td></tr><tr><td>14</td><td>10,8</td><td>0</td><td>GND2</td></tr><tr><td>15</td><td>8,1</td><td>0</td><td>GND2</td></tr><tr><td>16</td><td>5,4</td><td>0</td><td>GND2</td></tr><tr><td>17</td><td>2,7</td><td>0</td><td>GND2</td></tr><tr><td>18</td><td>0</td><td>0</td><td>GND2</td></tr><tr><td>19</td><td>2,7</td><td>2,7</td><td>GND2</td></tr><tr><td>20</td><td>0</td><td>2,7</td><td>GND2</td></tr><tr><td>21</td><td>0</td><td>50,4</td><td>Ph2</td></tr><tr><td>22</td><td>2,7</td><td>50,4</td><td>Ph2</td></tr><tr><td>23</td><td>5,4</td><td>50,4</td><td>Ph2</td></tr><tr><td>24</td><td>8,1</td><td>50,4</td><td>Ph2</td></tr><tr><td>25</td><td>10,8</td><td>50,4</td><td>Ph2</td></tr><tr><td>26</td><td>13,5</td><td>50,4</td><td>Ph2</td></tr><tr><td>27</td><td>16,2</td><td>50,4</td><td>Ph2</td></tr><tr><td>28</td><td>18,9</td><td>50,4</td><td>Ph2</td></tr><tr><td>29</td><td>21,6</td><td>50,4</td><td>Ph2</td></tr><tr><td>30</td><td>24,3</td><td>50,4</td><td>Ph2</td></tr><tr><td>31</td><td>27</td><td>50,4</td><td>Ph2</td></tr><tr><td>32</td><td>52,4</td><td>50,4</td><td>Therm1</td></tr><tr><td>33</td><td>52,4</td><td>43,4</td><td>Therm2</td></tr><tr><td>34</td><td>12,5</td><td>34,5</td><td>G14</td></tr><tr><td>35</td><td>16</td><td>33,2</td><td>S14</td></tr><tr><td>36</td><td>46</td><td>26,4</td><td>G12</td></tr><tr><td>37</td><td>49</td><td>26,4</td><td>S12</td></tr><tr><td>38</td><td>23,5</td><td>17,5</td><td>S15</td></tr><tr><td>39</td><td>20,5</td><td>17,5</td><td>G15</td></tr><tr><td>40</td><td>24,85</td><td>29,85</td><td>C12</td></tr></table>				Pin table [mm]				Pin	X	Y	Function	1	52,4	2,7	DC-	2	52,4	0	DC-	3	49,7	0	DC-	4	47	0	DC-	5	44,3	0	DC-	6	41,6	0	DC-	7	38,9	0	DC-	8	36,2	0	DC-	9	33,5	0	DC-	10	30,8	0	DC-	11	28,1	0	DC-	12	16,2	0	GND2	13	13,5	0	GND2	14	10,8	0	GND2	15	8,1	0	GND2	16	5,4	0	GND2	17	2,7	0	GND2	18	0	0	GND2	19	2,7	2,7	GND2	20	0	2,7	GND2	21	0	50,4	Ph2	22	2,7	50,4	Ph2	23	5,4	50,4	Ph2	24	8,1	50,4	Ph2	25	10,8	50,4	Ph2	26	13,5	50,4	Ph2	27	16,2	50,4	Ph2	28	18,9	50,4	Ph2	29	21,6	50,4	Ph2	30	24,3	50,4	Ph2	31	27	50,4	Ph2	32	52,4	50,4	Therm1	33	52,4	43,4	Therm2	34	12,5	34,5	G14	35	16	33,2	S14	36	46	26,4	G12	37	49	26,4	S12	38	23,5	17,5	S15	39	20,5	17,5	G15	40	24,85	29,85	C12
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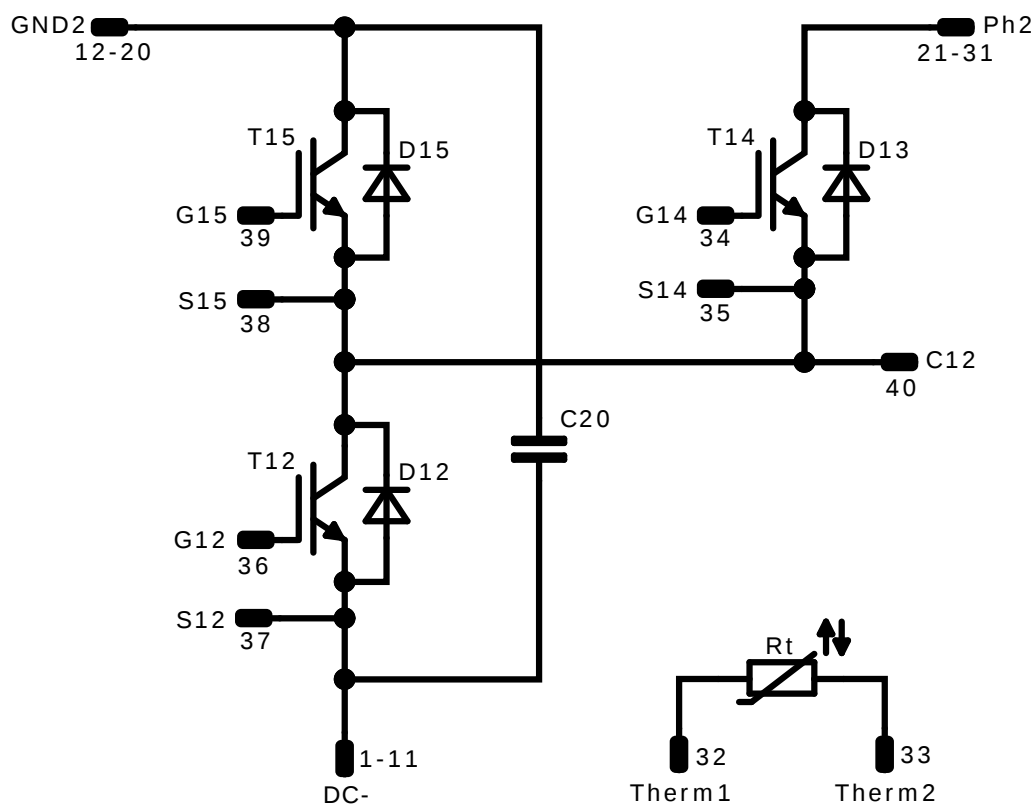


Vincotech

B0-SP10NAD600S714-PE19F13T
B0-SP10NAE600S714-PE29F13T
datasheet

Pinout

B0-SP10NAE600S714-PE29F13T



Identification

ID	Component	Voltage	Current	Function	Comment
T14	IGBT	950 V	400 A	AC Switch	
D13	FWD	950 V	300 A	AC Diode	
T15	IGBT	950 V	400 A	Neutral Point Switch	
D12	FWD	950 V	300 A	DC-Link Diode	
T12	IGBT	950 V	600 A	DC-Link Switch	
D15	FWD	1200 V	160 A	Neutral Point Diode	
C20	Capacitor	1000 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	



Vincotech

B0-SP10NAD600S714-PE19F13T
B0-SP10NAE600S714-PE29F13T

datasheet

Packaging instruction				
Standard packaging quantity (SPQ) 45	>SPQ	Standard	<SPQ	Sample
Handling instruction				
Handling instructions for <i>flow</i> S3 packages see vincotech.com website.				
Package data				
Package data for <i>flow</i> S3 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 $T_{j,sp}=150^{\circ}\text{C}$ and up to 4000VAC/1min isolation voltage. For more information see vincotech.com website.				

Document No.:	Date:	Modification:	Pages
B0-SP10NAX600S714-PEX9F13T-D3-14	15 Sep. 2026	Change Neutral Point Diode according to PCN-2026-037	

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
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.