



Vincotech

B0-SP126PA200M7-LR40F78T

datasheet

flowPACK S3

1200 V / 200 A

Features

- IGBT M7 with low VCEsat and improved EMC behavior
- New low inductive package
- Enhanced thermal performance

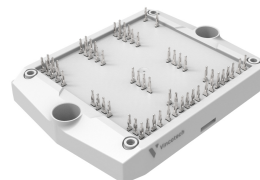
Target applications

- Embedded Drives
- Industrial Drives

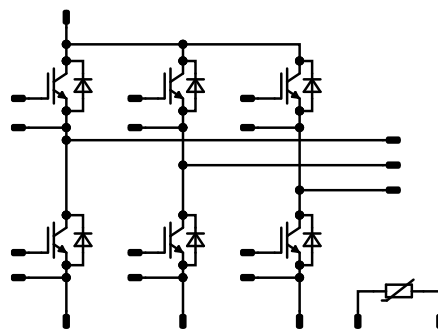
Types

- B0-SP126PA200M7-LR40F78T

flow S3 12 mm housing



Schematic





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Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ }^{\circ}\text{C}$	154	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ }^{\circ}\text{C}$	268	W
Gate-emitter voltage	V_{GES}		± 20	V
Short circuit ratings	t_{SC}	$V_{GE} = 15\text{ V}$, $V_{CC} = 800\text{ V}$ $T_j = 150\text{ }^{\circ}\text{C}$	9,5	μs
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	$T_j = T_{jmax}$ $T_s = 80\text{ }^{\circ}\text{C}$	116	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}	400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ }^{\circ}\text{C}$	184	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
Isolation voltage	V_{isol}	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			9,05	mm
Clearance			7,76	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	

Inverter Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,02	25	5,4	6	6,6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		200	25 125 150		1,69 1,88 1,93	1,85 ⁽¹⁾	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							2		Ω
Input capacitance	C_{ies}	0	10	25				37000		pF
Output capacitance	C_{oes}							1100		pF
Reverse transfer capacitance	C_{res}							420		pF
Gate charge	Q_g	$V_{CC} = 600$ V	15		200	25		1200		nC

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						0,35		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 4$ Ω $R_{goff} = 4$ Ω	±15	600	200	25 125 150		461 468 469		ns
Rise time	t_r					25 125 150		107 122 127		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		318 357 367		ns
Fall time	t_f					25 125 150		91,6 125 136		ns
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 15,1$ µC $Q_{tFWD} = 23,7$ µC $Q_{tFWD} = 26,1$ µC				25 125 150		29,5 36,6 38,8		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		15,2 21,7 23,4		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	

Inverter Diode

Static

Forward voltage	V_F				200	25 125 150		1,86 1,99 1,98	2,1 ⁽¹⁾	V
Reverse leakage current	I_R	$V_i = 1200$ V				25			40	μA

Thermal

Thermal resistance junction to sink ⁽²⁾	$R_{th(j-s)}$	$\lambda_{paste} = 4,4$ W/mK (PTM)						0,52		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt=1580$ A/μs $di/dt=1360$ A/μs $di/dt=1330$ A/μs	± 15	600	200	25 125 150		75,42 84,36 87,8		A
Reverse recovery time	t_{rr}					25 125 150		371 498 539		ns
Recovered charge	Q_r					25 125 150		15,1 23,7 26,1		μC
Reverse recovered energy	E_{rec}					25 125 150		4,59 7,82 8,65		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		476 298 275		A/μs



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Characteristic Values

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

Thermistor

Static

Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$				100	-5		5	%
Power dissipation	P							5		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 1 \%$						3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$						4000		K
Vincotech Thermistor Reference									I	

⁽¹⁾ Value at chip level

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



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Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

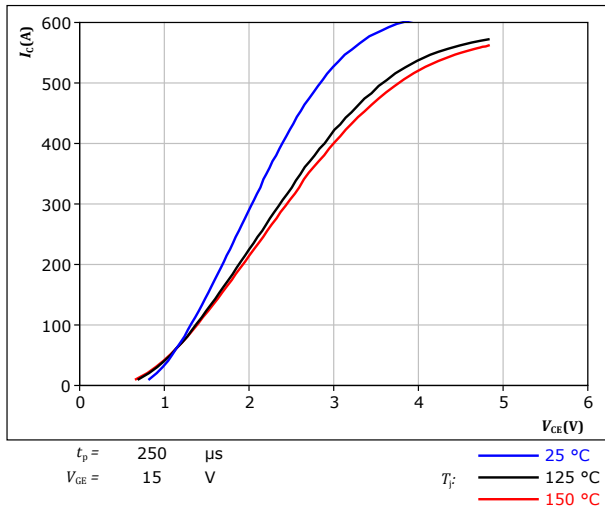


figure 2. IGBT

Typical output characteristics

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

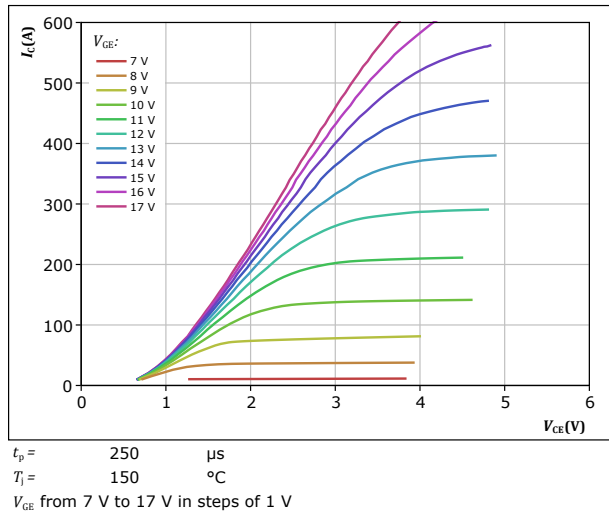


figure 3. IGBT

Typical transfer characteristics

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

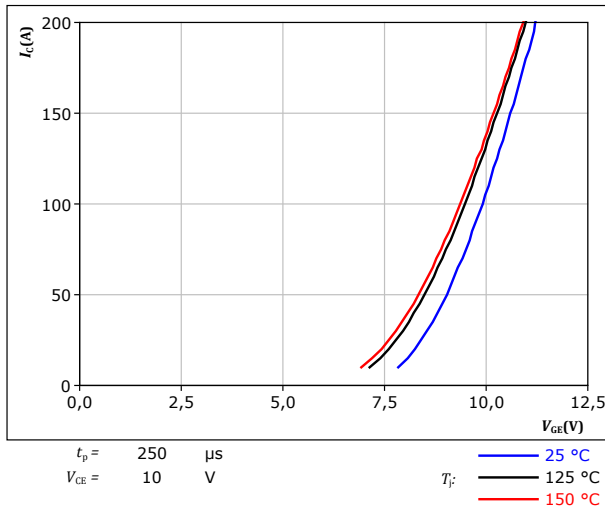
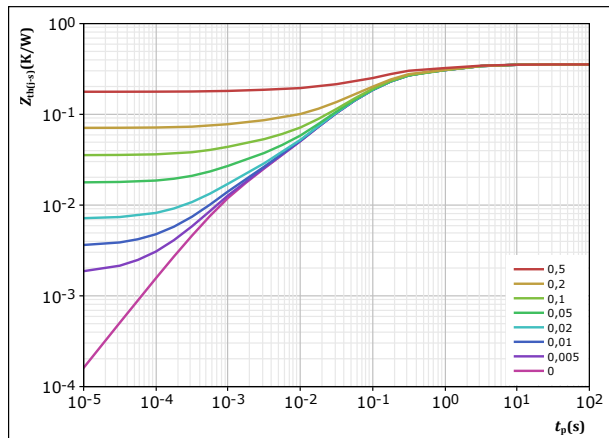


figure 4. IGBT

Transient thermal impedance as a function of pulse width

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





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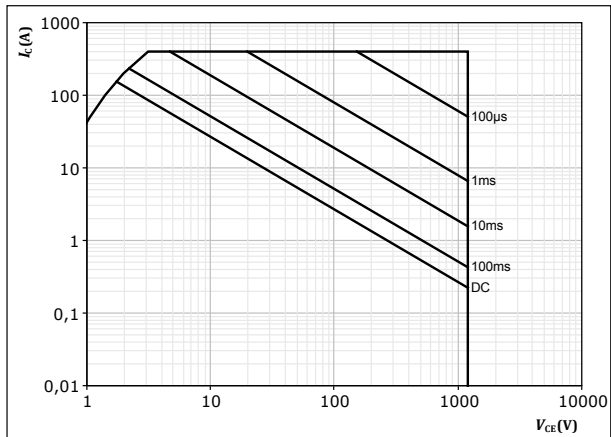
Inverter Switch Characteristics

figure 5.

IGBT

Safe operating area

$I_C = f(V_{CE})$



$D = \text{single pulse}$

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

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

$T_j = T_{jmax}$



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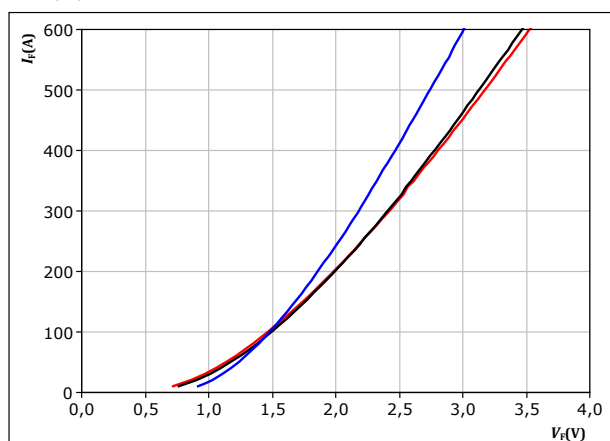
Inverter Diode Characteristics

figure 6.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$



$t_p = 250 \mu s$

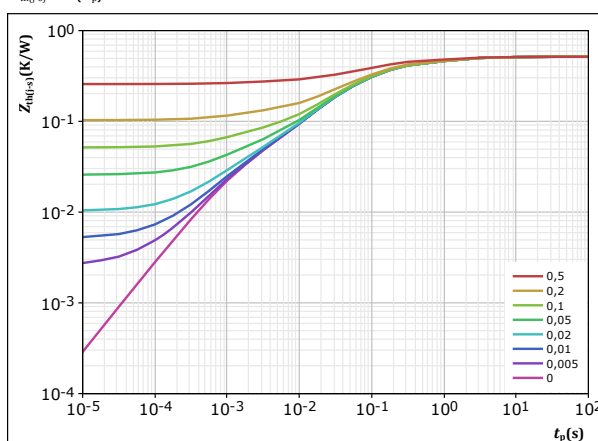
$T_j:$
— 25 °C
— 125 °C
— 150 °C

figure 7.

FWD

Transient thermal impedance as a function of pulse width

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



$D =$	t_p / T
$R_{th(j-s)} =$	0,515 K/W
FWD thermal model values	
R (K/W)	τ (s)
1,11E-02	9,73E+00
9,80E-02	1,24E+00
2,54E-01	1,11E-01
1,26E-01	2,22E-02
2,60E-02	1,25E-03



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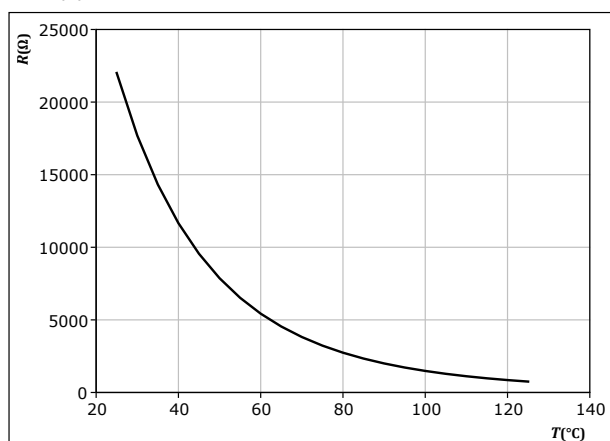
Thermistor Characteristics

figure 8.

Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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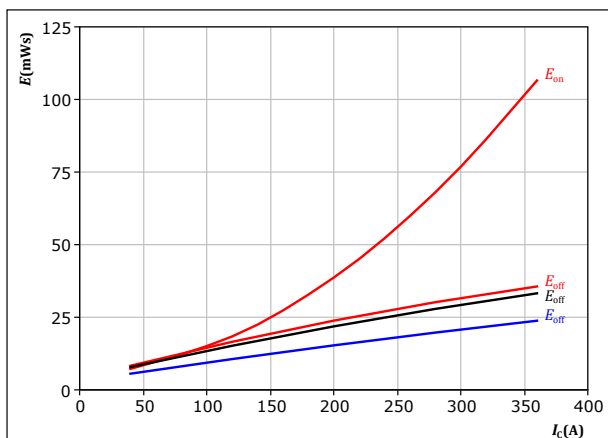
Inverter Switching Characteristics

figure 9.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$
 $R_{goff} = 4 \text{ } \Omega$

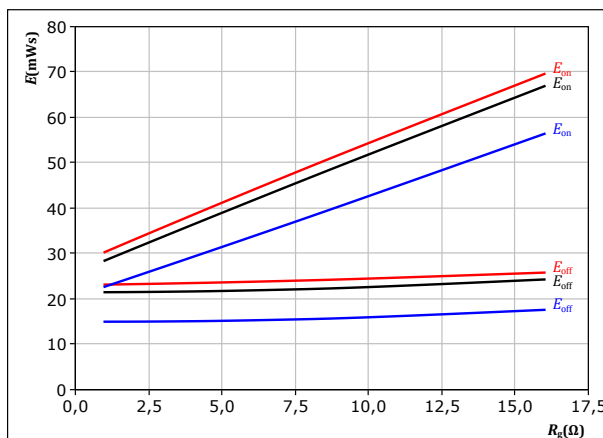
T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)

figure 10.

IGBT

Typical switching energy losses as a function of gate resistor

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 200 \text{ A}$

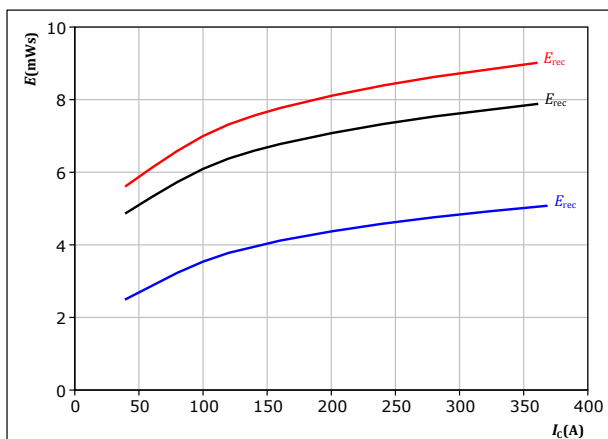
T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)

figure 11.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 4 \text{ } \Omega$

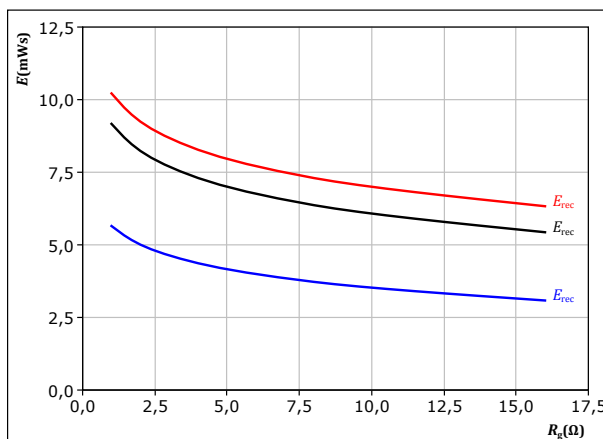
T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)

figure 12.

FWD

Typical reverse recovered energy loss as a function of gate resistor

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



With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 200 \text{ A}$

T_j : $25 \text{ } ^\circ\text{C}$ (blue)
 $125 \text{ } ^\circ\text{C}$ (black)
 $150 \text{ } ^\circ\text{C}$ (red)



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Inverter Switching Characteristics

figure 13.

IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$

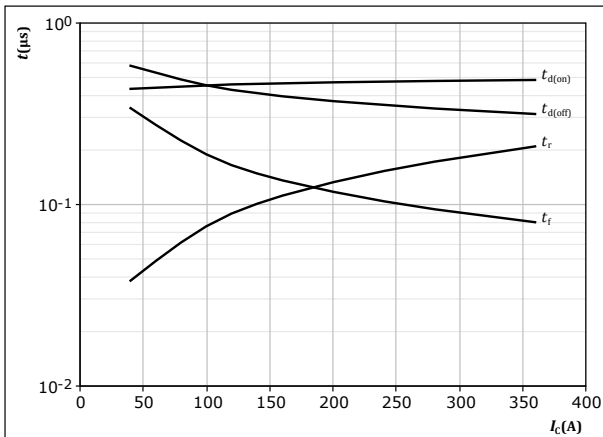


figure 14.

IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$

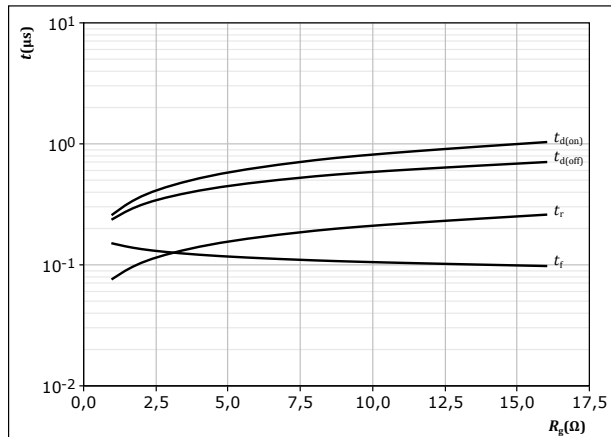


figure 15.

FWD

Typical reverse recovery time as a function of collector current

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

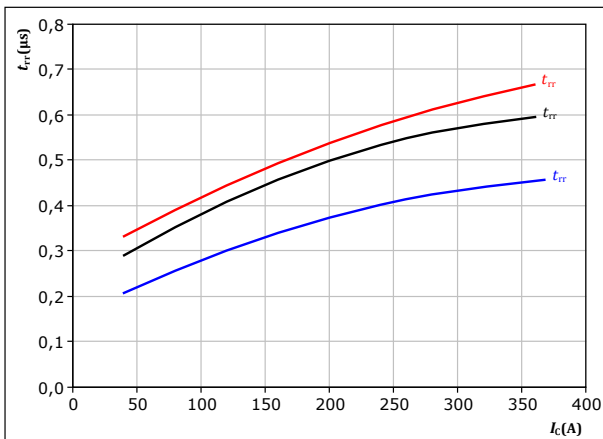
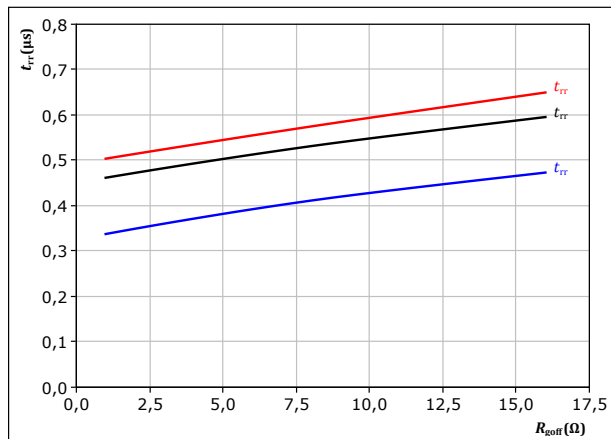


figure 16.

FWD

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

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





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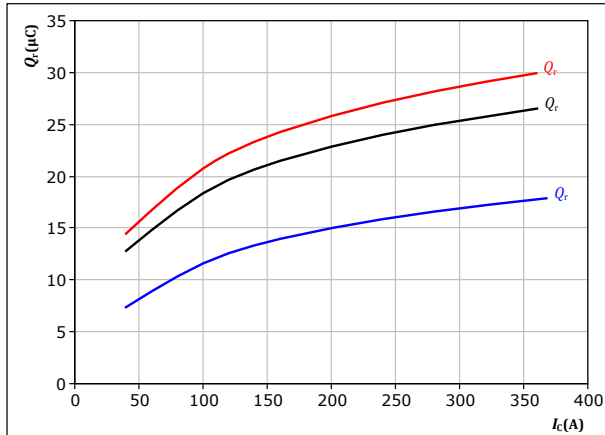
Inverter Switching Characteristics

figure 17.

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
 $R_{gon} = 4$ Ω

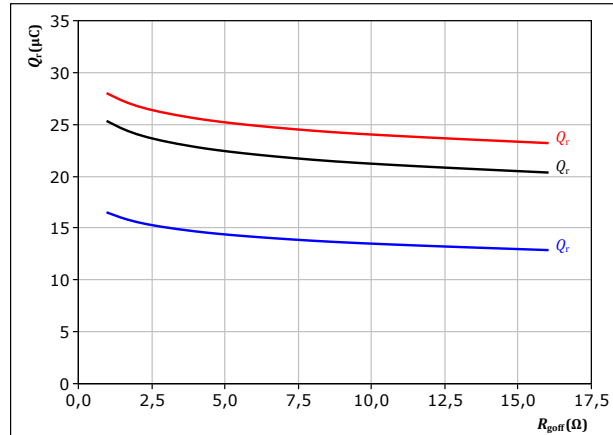
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 18.

FWD

Typical recovered charge as a function of turn off gate resistor

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A

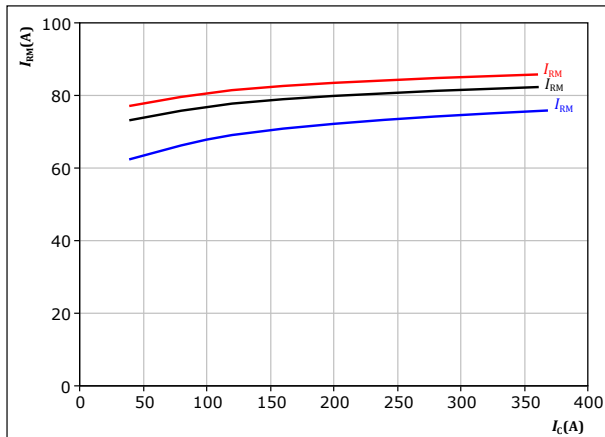
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 19.

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
 $R_{gon} = 4$ Ω

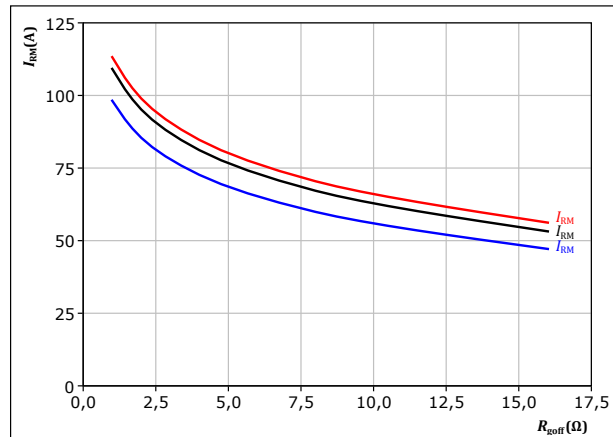
T_j :
— 25 °C
— 125 °C
— 150 °C

figure 20.

FWD

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

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



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_c = 200$ A

T_j :
— 25 °C
— 125 °C
— 150 °C



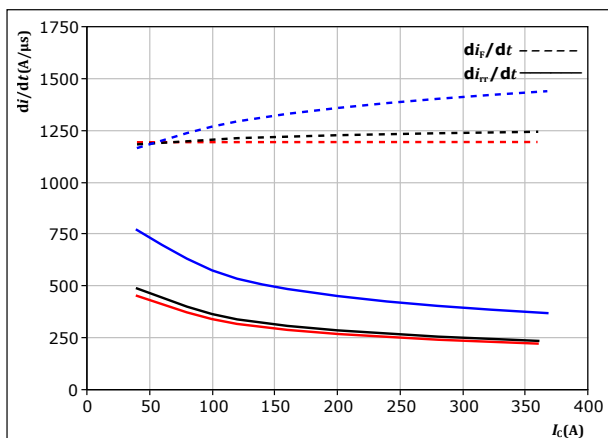
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Inverter Switching Characteristics

figure 21. FWD

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

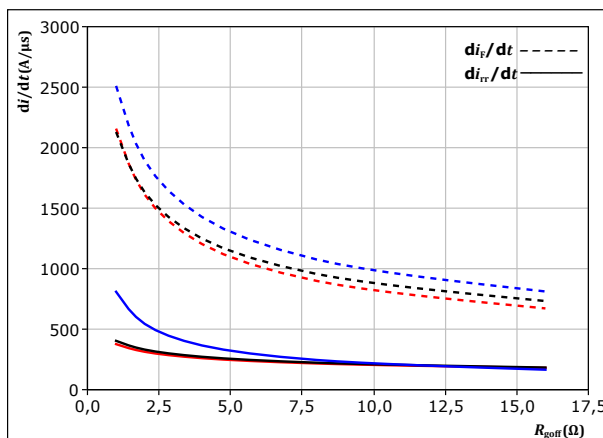


With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{goff} = 4 \text{ } \Omega$
 $T_j = 25 \text{ } ^\circ\text{C}$
 $T_j = 125 \text{ } ^\circ\text{C}$
 $T_j = 150 \text{ } ^\circ\text{C}$

figure 22. FWD

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



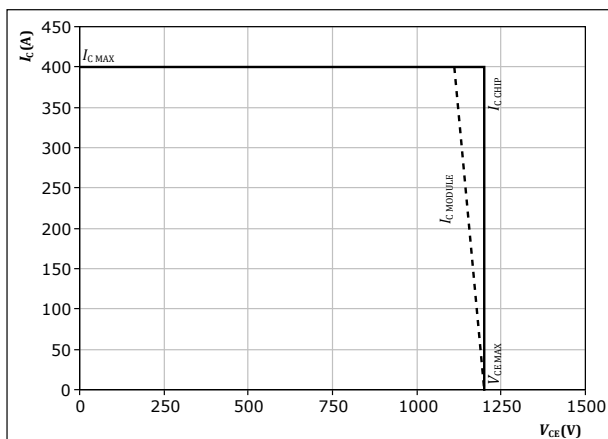
With an inductive load at

$V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 200 \text{ A}$
 $T_j = 25 \text{ } ^\circ\text{C}$
 $T_j = 125 \text{ } ^\circ\text{C}$
 $T_j = 150 \text{ } ^\circ\text{C}$

figure 23. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At $T_j = 150 \text{ } ^\circ\text{C}$
 $R_{goff} = 4 \text{ } \Omega$
 $R_{goff} = 4 \text{ } \Omega$



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Inverter Switching Definitions

figure 24. IGBT

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

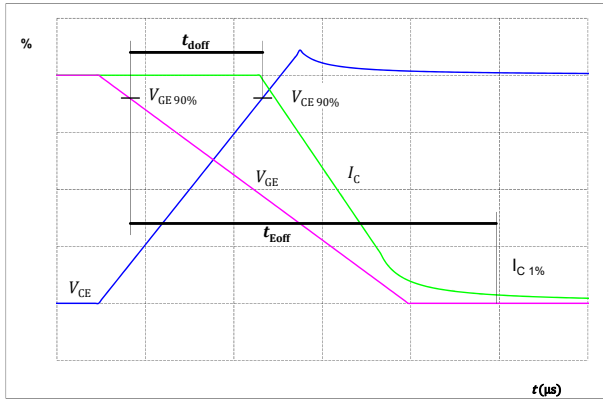


figure 25. IGBT

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

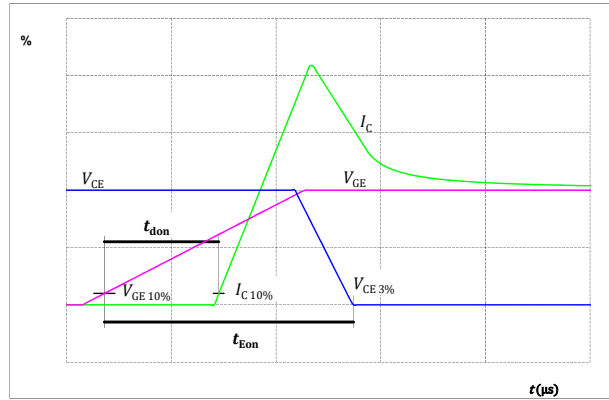


figure 26. IGBT

Turn-off Switching Waveforms & definition of t_f

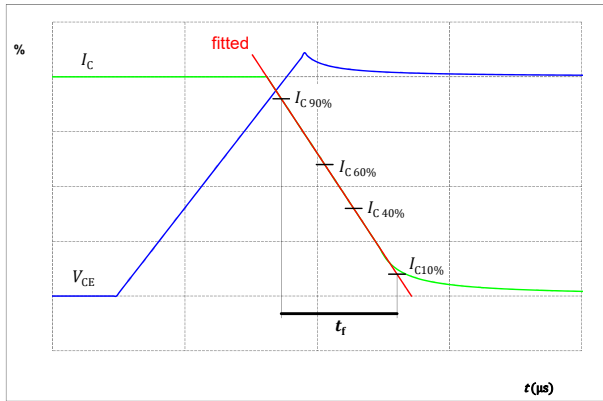
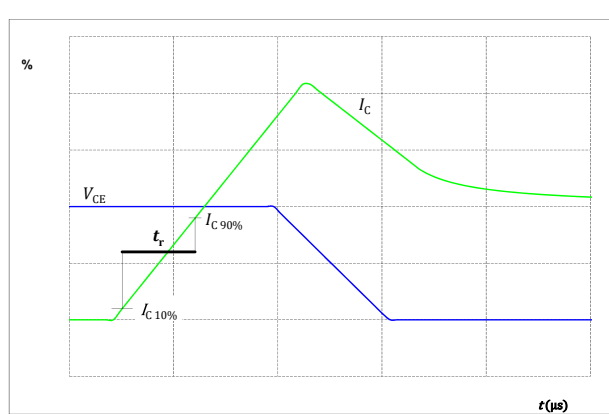


figure 27. IGBT

Turn-on Switching Waveforms & definition of t_r





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Inverter Switching Definitions

figure 28.

FWD

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

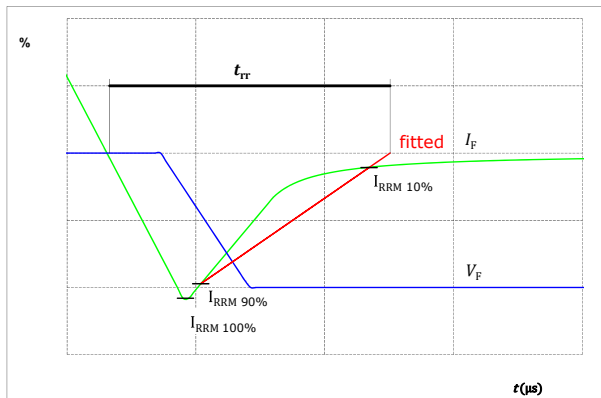
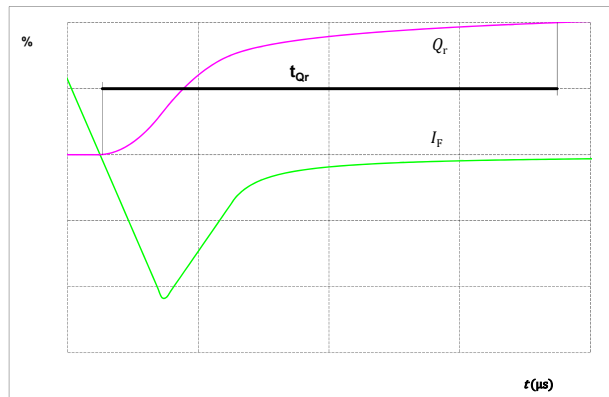


figure 29.

FWD

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





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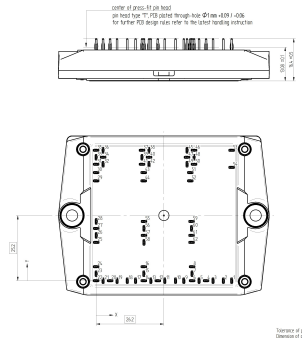
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datasheet

Ordering Code	
Version	Ordering Code
With thermal paste (4,4 W/mK, PTM6000)	B0-SP126PA200M7-LR40F78T-/7/

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

Outline							
Pin table [mm]							
Pin	X	Y	Function	32	2,7	45	Ph1
1	52,4	0	G15	33	0	47,7	Ph1
2	49,2	0	S15	34	2,7	47,7	Ph1
3	45,2	0	DC-3	35	0	50,4	Ph1
4	42,5	0	DC-3	36	2,7	50,4	Ph1
5	39,8	0	DC-3	37	17,75	50,4	Ph2
6	37,1	0	DC-3	38	20,45	50,4	Ph2
7	37,1	2,7	DC-3	39	17,75	47,7	Ph2
8	37,1	5,4	DC-3	40	20,45	47,7	Ph2
9	33,9	0	G13	41	17,75	45	Ph2
10	30,7	0	S13	42	20,45	45	Ph2
11	26,55	0	DC-2	43	18,4	41,8	S14
12	23,85	0	DC-2	44	18,4	38,6	G14
13	21,15	0	DC-2	45	35,15	50,4	Ph3
14	18,45	0	DC-2	46	37,85	50,4	Ph3
15	18,45	2,7	DC-2	47	35,15	47,7	Ph3
16	18,45	5,4	DC-2	48	37,85	47,7	Ph3
17	15,25	0	G11	49	35,15	45	Ph3
18	12,05	0	S11	50	37,85	45	Ph3
19	8,1	0	DC-1	51	36,4	41,8	S16
20	5,4	0	DC-1	52	36,4	38,6	G16
21	2,7	0	DC-1	53	52,4	50,4	Therm1
22	0	0	DC-1	54	52,4	43,8	Therm2
23	0	2,7	DC-1	55	18,5	22,9	DC+
24	0	5,4	DC-1	56	18,5	20,2	DC+
25	0,05	14,8	DC+	57	18,5	17,5	DC+
26	0,05	17,5	DC+	58	18,5	14,8	DC+
27	0,05	20,2	DC+	59	36,9	22,9	DC+
28	0,05	22,9	DC+	60	36,9	20,2	DC+
29	0	38,6	G12	61	36,9	17,5	DC+
30	0	41,8	S12	62	36,9	14,8	DC+
31	0	45	Ph1				



TOP VIEW OF PACKAGE (mm)

Pin 1 is located at the top left corner.

Pin 31 is located at the bottom center.

Pin 2 is located at the top right corner.

Pin 30 is located at the bottom right corner.

Pin 3 is located at the top left corner.

Pin 29 is located at the bottom left corner.

Pin 4 is located at the top left corner.

Pin 28 is located at the bottom left corner.

Pin 5 is located at the top left corner.

Pin 27 is located at the bottom left corner.

Pin 6 is located at the top left corner.

Pin 26 is located at the bottom left corner.

Pin 7 is located at the top left corner.

Pin 25 is located at the bottom left corner.

Pin 8 is located at the top left corner.

Pin 24 is located at the bottom left corner.

Pin 9 is located at the top left corner.

Pin 23 is located at the bottom left corner.

Pin 10 is located at the top left corner.

Pin 22 is located at the bottom left corner.

Pin 11 is located at the top left corner.

Pin 21 is located at the bottom left corner.

Pin 12 is located at the top left corner.

Pin 20 is located at the bottom left corner.

Pin 13 is located at the top left corner.

Pin 19 is located at the bottom left corner.

Pin 14 is located at the top left corner.

Pin 18 is located at the bottom left corner.

Pin 15 is located at the top left corner.

Pin 17 is located at the bottom left corner.

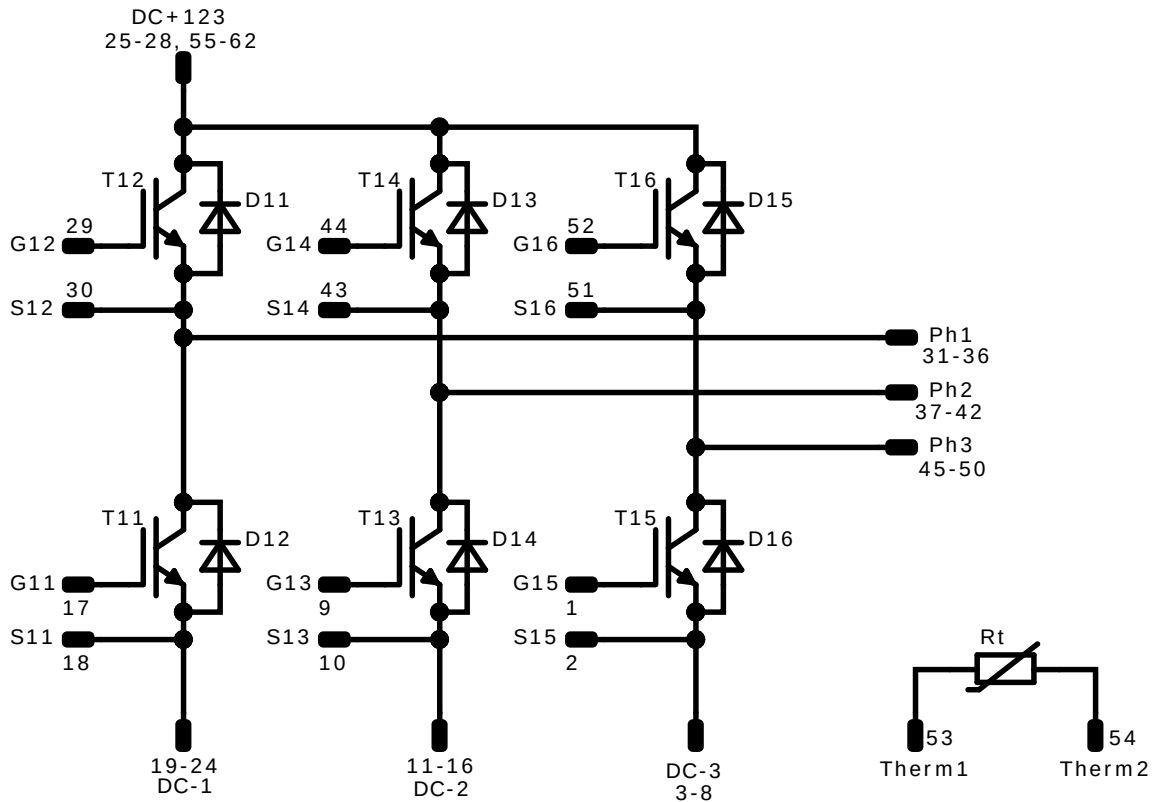
Pin 16 is located at the top left corner.

Pin 16 is located at the top left corner.



Vincotech

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	200 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	200 A	Inverter Diode	
Rt	Thermistor			Thermistor	



Vincotech

B0-SP126PA200M7-LR40F78T
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 certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.



Document No.:	Date:	Modification:	Pages
B0-SP126PA200M7-LR40F78T-D1-14	18 Mar. 2021		
B0-SP126PA200M7-LR40F78T-D2-14	7 Jul. 2021	Module marking is updated with UL logo, product is unchanged	

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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.