



Vincotech

# A0-VP12PMA075RA-LF16A80T

datasheet

VINcoPIM E3

1200 V / 75 A

## Topology features

- Common Emitter configuration
- Converter+Brake+Inverter
- Temperature sensor

## Component features

- Easy paralleling
- Low collector emitter saturation voltage
- Low turn-off losses

## Housing features

- Base isolation: IMB
- SoLid Cover Technology
- Standard mid-power industry package
- Driver pins are available in press-fit and solder pin
- M6 High Power Screw Contact
- Reliable cold welding connection to PCB
- Press-fit terminals

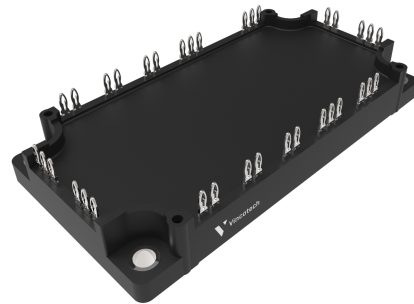
## Target applications

- Elevator Drives
- General Purpose Drives
- Industrial Drives
- Servo Drives

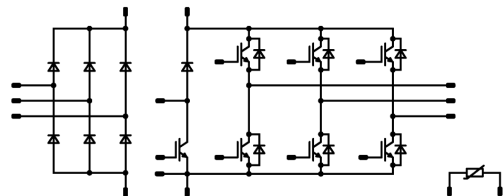
## Types

- A0-VP12PMA075RA-LF16A80T

## VINco E3s 17 mm housing



## Schematic





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## 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)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	115	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	225	A
Turn off safe operating area		$T_j = 150\text{ °C}$ , $V_{CE} = 1200\text{ V}$	225	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	240	W
Gate-emitter voltage	$V_{GES}$		$\pm 30$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	8	$\mu\text{s}$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Inverter Diode

Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	84	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	225	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	182	W
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$

## Brake Switch

Collector-emitter voltage	$V_{CES}$		1200	V
Collector current (DC current)	$I_C$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	76	A
Repetitive peak collector current	$I_{CRM}$	$t_p$ limited by $T_{jmax}$	150	A
Turn off safe operating area		$T_j = 150\text{ °C}$ , $V_{CE} = 1200\text{ V}$	150	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	173	W
Gate-emitter voltage	$V_{GES}$		$\pm 30$	V
Short circuit ratings	$t_{SC}$	$V_{GE} = 15\text{ V}$ , $V_{CC} = 800\text{ V}$ $T_j = 150\text{ °C}$	8	$\mu\text{s}$
Maximum junction temperature	$T_{jmax}$		175	$^{\circ}\text{C}$



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## Maximum Ratings

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

Parameter	Symbol	Conditions	Value	Unit
<b>Brake Diode</b>				
Peak repetitive reverse voltage	$V_{RRM}$		1200	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	41	A
Repetitive peak forward current	$I_{FRM}$	$t_p$ limited by $T_{jmax}$	75	A
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	89	W
Maximum junction temperature	$T_{jmax}$		175	°C

## Rectifier Diode

Peak repetitive reverse voltage	$V_{RRM}$		1600	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	119	A
Surge (non-repetitive) forward current	$I_{FSM}$	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	600	A
Surge current capability	$I^2t$		1800	A <sup>2</sup> s
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	148	W
Maximum junction temperature	$T_{jmax}$		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* $t_p = 2\text{ s}$	6000	V
Creepage distance			>12,7	mm
Clearance			9	mm
Comparative Tracking Index	CTI		≥ 200	

\*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	$V_{GE(th)}$			5	0,0093	25	5,5	6,3	7,1	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		75	25 125 150		1,45 1,62 1,66	1,95 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	1200		25			10	µA
Gate-emitter leakage current	$I_{GES}$		30	0		25			500	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$	$f = 1 \text{ Mhz}$	0	30	25			12541		pF
Output capacitance	$C_{oes}$							285		pF
Reverse transfer capacitance	$C_{res}$							104		pF
Gate charge	$Q_g$		0/15	600	75	25		456		nC

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,4		K/W
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#### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 8 \Omega$ $R_{goff} = 8 \Omega$	$\pm 15$	600	75	25 125 150		239,9 240,01 240,11		ns
Rise time	$t_r$					25 125 150		35,02 42,88 44,29		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		227,56 261,66 271,86		ns
Fall time	$t_f$					25 125 150		128,63 179,07 191,31		ns
Turn-on energy (per pulse)	$E_{on}$					25 125 150		5,01 7,7 8,64		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		6,44 9,26 10,18		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	$V_F$				75	25 125 150		1,71 1,95 1,97	2,1 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_i = 1200$ V				25			10	µA

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,52		K/W
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#### Dynamic

Peak recovery current	$I_{RM}$	$di/dt=2324$ A/µs $di/dt=1879$ A/µs $di/dt=1803$ A/µs	$\pm 15$	600	75	25 125 150		72,94 73,53 74,64		A
Reverse recovery time	$t_{rr}$					25 125 150		212,5 414,9 475,71		ns
Recovered charge	$Q_r$					25 125 150		5,04 9,95 11,87		µC
Reverse recovered energy	$E_{rec}$					25 125 150		1,72 3,76 4,53		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		1892,83 986,66 767,04		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	

### Brake Switch

#### Static

Gate-emitter threshold voltage	$V_{GE(th)}$			5	0,0059	25	5,5	6,3	7,1	V
Collector-emitter saturation voltage	$V_{CE(sat)}$		15		50	25 125 150		1,49 1,72 1,79	1,95 <sup>(1)</sup>	V
Collector-emitter cut-off current	$I_{CES}$		0	1200		25			10	µA
Gate-emitter leakage current	$I_{GES}$		30	0		25			500	nA
Internal gate resistance	$r_g$							None		Ω
Input capacitance	$C_{ies}$	$f = 1 \text{ Mhz}$	0	30	25			8530		pF
Output capacitance	$C_{oes}$							193		pF
Reverse transfer capacitance	$C_{res}$							67		pF
Gate charge	$Q_g$		0/15	600	100	25		319		nC

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 5,2 \text{ W/mK}$ (PTM)						0,55		K/W
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#### Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{gon} = 16 \Omega$ $R_{goff} = 16 \Omega$	0/15	700	25	25 125 150		103,61 100,64 98,6		ns
Rise time	$t_r$					25 125 150		24,94 29,14 31,36		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		584,52 652,17 671,49		ns
Fall time	$t_f$					25 125 150		179,16 232,22 248,5		ns
Turn-on energy (per pulse)	$E_{on}$	$Q_{tFWD}=1,21 \mu C$ $Q_{tFWD}=3,4 \mu C$ $Q_{tFWD}=4,02 \mu C$				25 125 150		1,84 2,56 2,79		mWs
Turn-off energy (per pulse)	$E_{off}$					25 125 150		3,12 4,37 4,74		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	

### Brake Diode

#### Static

Forward voltage	$V_F$				25	25 125 150		1,84 1,69 1,69	2,1 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_r = 1200$ V				25			10	µA

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						1,07		K/W
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#### Dynamic

Peak recovery current	$I_{RM}$	$di/dt=1188$ A/µs $di/dt=922$ A/µs $di/dt=780$ A/µs	0/15	700	25	25 125 150		29,55 28,35 29,1		A
Reverse recovery time	$t_{rr}$					25 125 150		64,65 334,45 384,49		ns
Recovered charge	$Q_r$					25 125 150		1,21 3,4 4,02		µC
Reverse recovered energy	$E_{rec}$					25 125 150		0,263 1,5 1,81		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		344,72 276,12 230,34		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	

### Rectifier Diode

#### Static

Forward voltage	$V_F$				50	25 125 150		1,06 0,984 0,964	1,5 <sup>(1)</sup>		V
Reverse leakage current	$I_R$	$V_r = 1600$ V				25 150			100 2		µA mA

#### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 5,2$ W/mK (PTM)						0,47			K/W
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### Thermistor

#### Static

Rated resistance	$R$					25		5			kΩ
Deviation of R100	$\Delta_{R/R}$	$R_{100} = 493$ Ω				100	-5		5		%
Power dissipation	$P$							245			mW
Power dissipation constant	$d$					25		1,4			mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %						3375			K
B-value	$B_{(25/100)}$	Tol. ±2 %						3437			K
Vincotech Thermistor Reference									K		

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

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



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# A0-VP12PMA075RA-LF16A80T

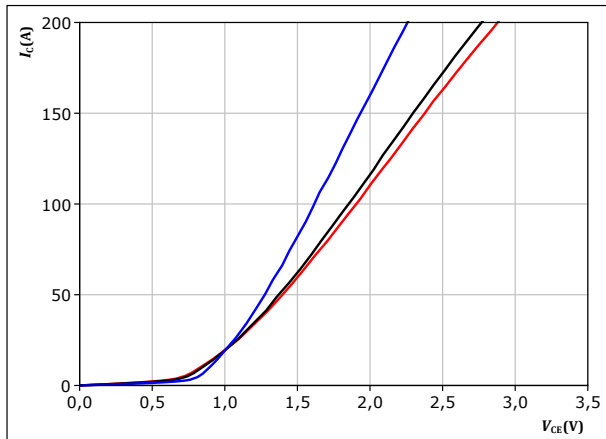
datasheet

## Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

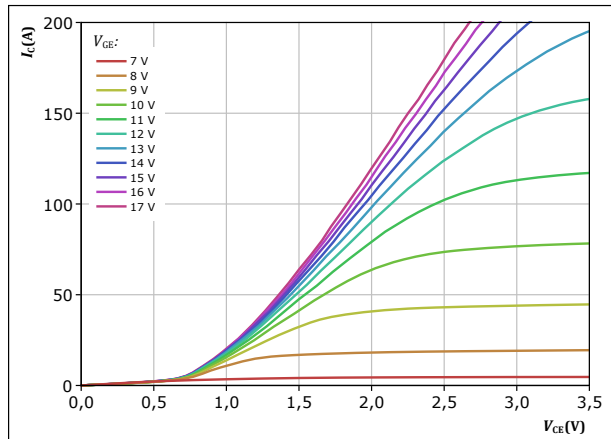


$t_p = 250 \mu s$   
 $V_{GE} = 15 V$   
 $T_j:$  25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

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

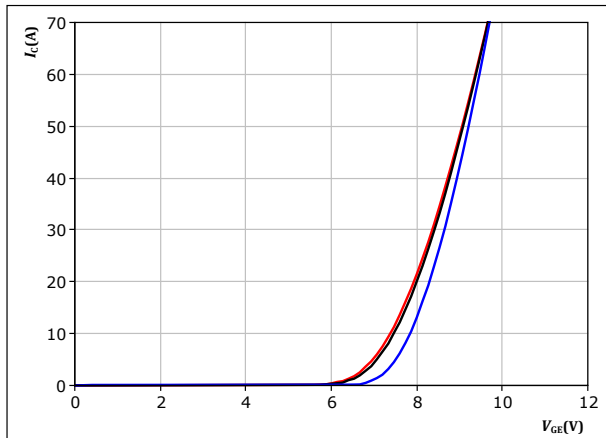


$t_p = 250 \mu s$   
 $T_j = 150 ^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

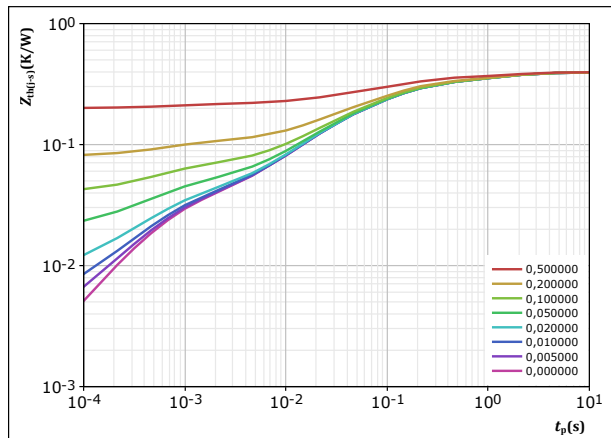


$t_p = 250 \mu s$   
 $V_{CE} = 19 V$   
 $T_j:$  25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,396 K/W$   
IGBT thermal model values  

R (K/W)	$\tau$ (s)
9,95E-03	1,52E+01
8,67E-02	1,13E+00
1,82E-01	1,09E-01
9,19E-02	2,01E-02
2,84E-02	5,83E-04



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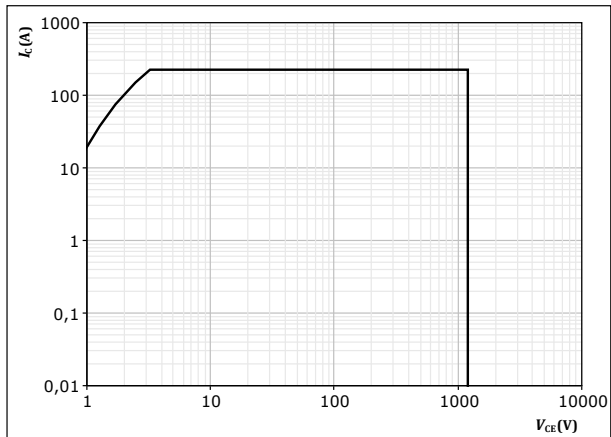
## Inverter Switch Characteristics

figure 5.

IGBT

Safe operating area

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



$D =$  single pulse

$T_s = 80$  °C

$V_{GE} = 15$  V

$T_j = T_{jmax}$



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## Inverter Diode Characteristics

figure 6.

FWD

Typical forward characteristics

$$I_F = f(V_F)$$

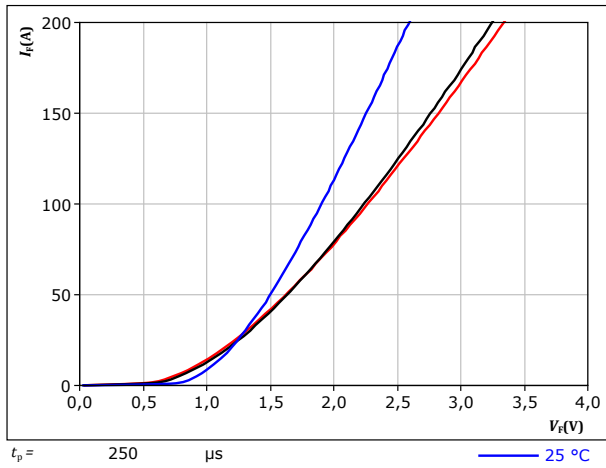
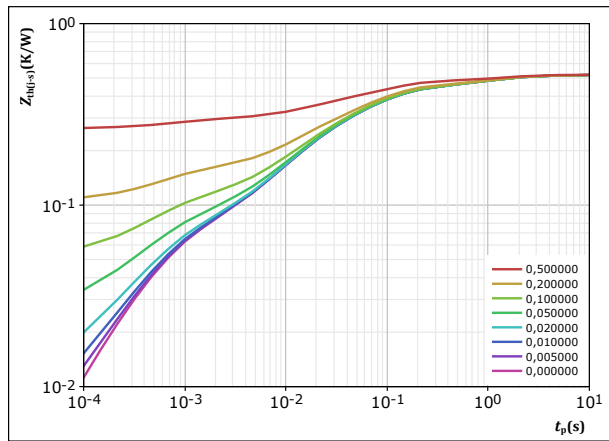


figure 7.

FWD

Transient thermal impedance as a function of pulse width

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





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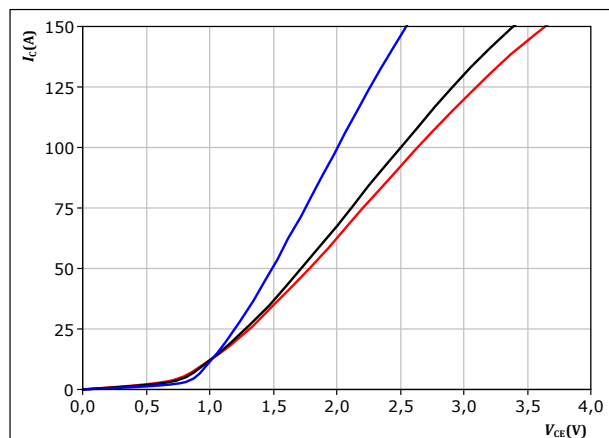
## Brake Switch Characteristics

figure 8.

IGBT

Typical output characteristics

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



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

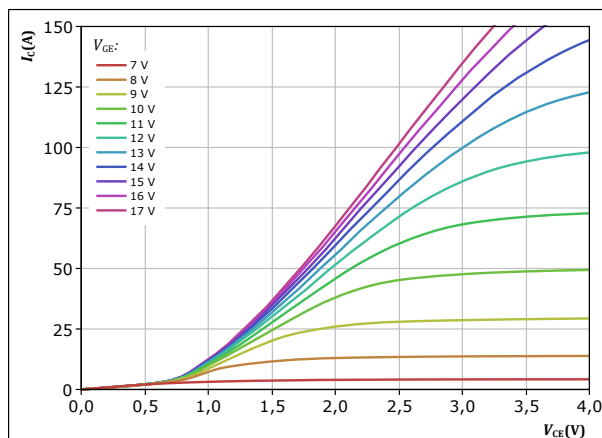
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 9.

IGBT

Typical output characteristics

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



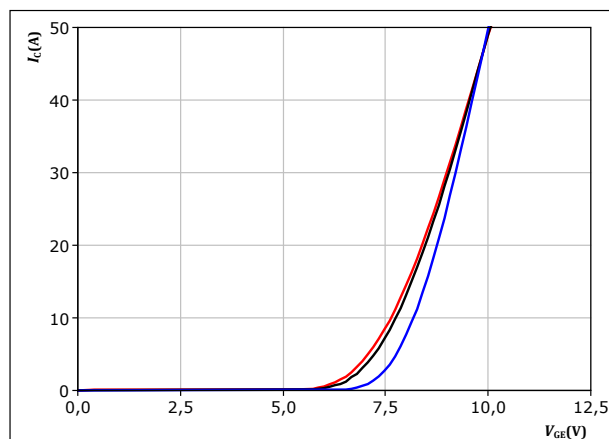
$t_p = 250 \mu s$   
 $T_j = 150 ^\circ C$   
 $V_{GE}$  from 7 V to 17 V in steps of 1 V

figure 10.

IGBT

Typical transfer characteristics

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



$t_p = 250 \mu s$   
 $V_{CE} = 9 V$

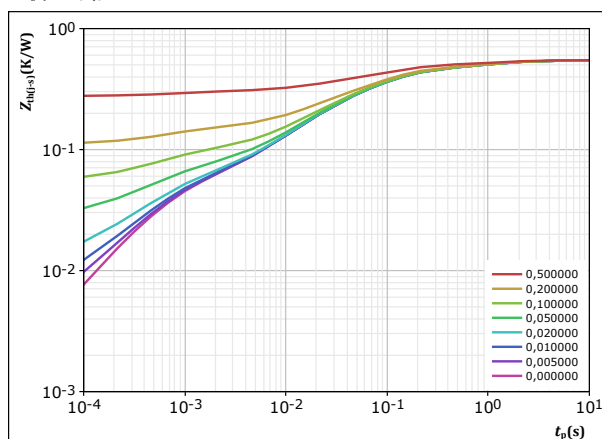
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 11.

IGBT

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$   
 $R_{th(j-s)} = 0,548 K/W$   
IGBT thermal model values  

$R (K/W)$	$\tau (s)$
1,74E-02	8,46E+00
1,01E-01	8,36E-01
2,64E-01	8,52E-02
1,26E-01	1,67E-02
4,30E-02	6,02E-04





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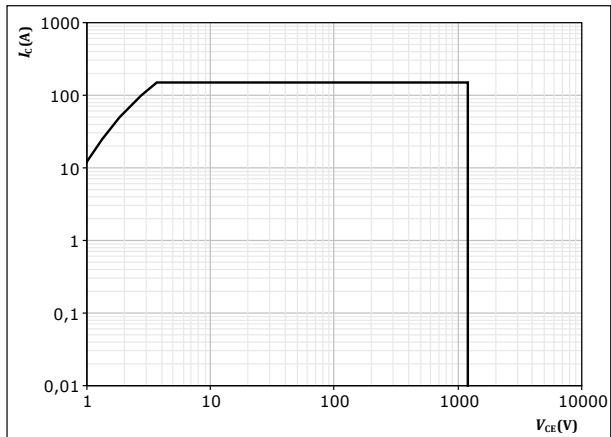
## Brake Switch Characteristics

figure 12.

IGBT

Safe operating area

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



$D =$  single pulse

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

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

$T_j = T_{jmax}$



Brake Diode Characteristics

figure 13. FWD

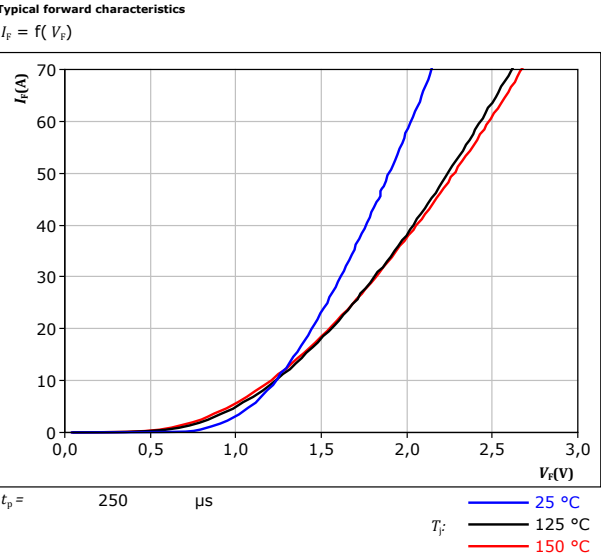
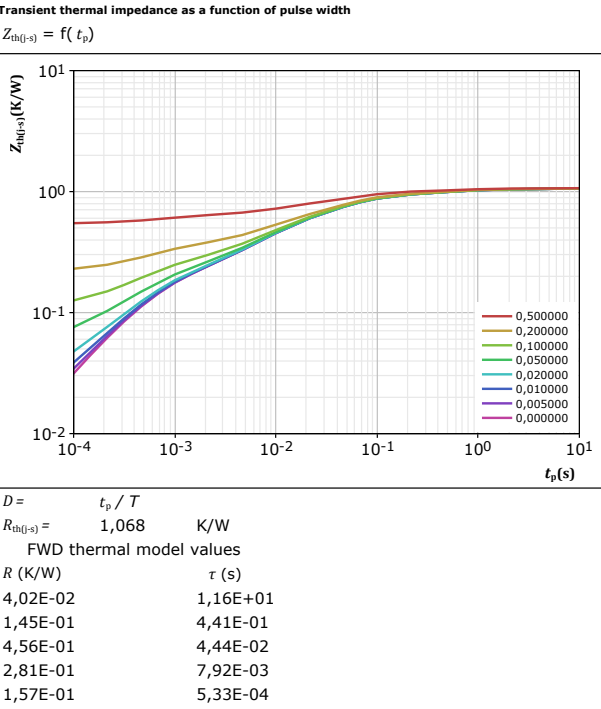


figure 14. FWD





## Rectifier Diode Characteristics

figure 15.

Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

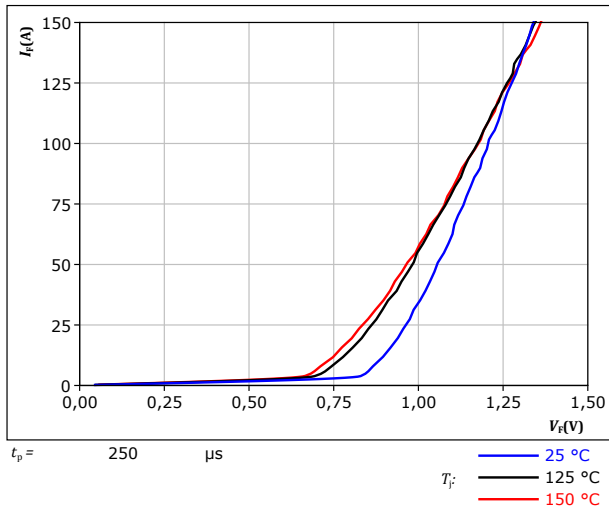
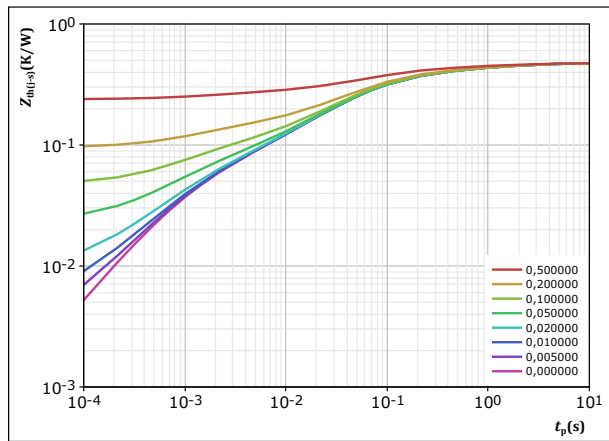


figure 16.

Rectifier

Transient thermal impedance as a function of pulse width

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





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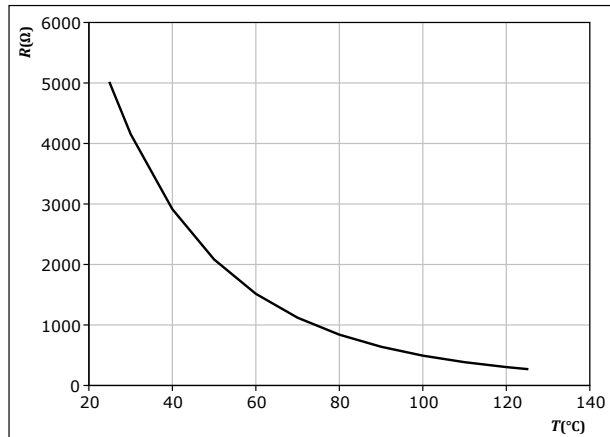
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datasheet

## Thermistor Characteristics

**figure 17.** Thermistor

Typical NTC characteristic as function of temperature

$$R_T = f(T)$$





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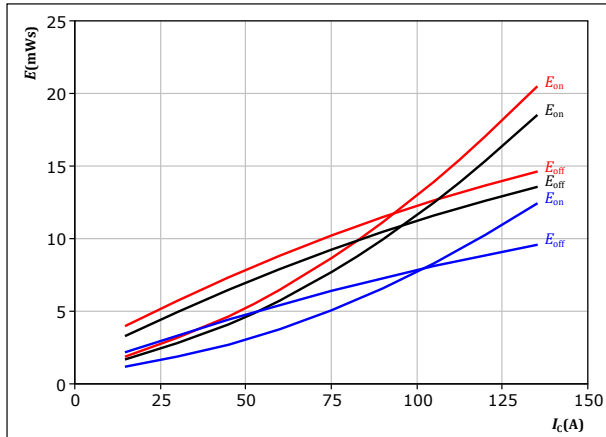
## Inverter Switching Characteristics

figure 18.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$



With an inductive load at

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

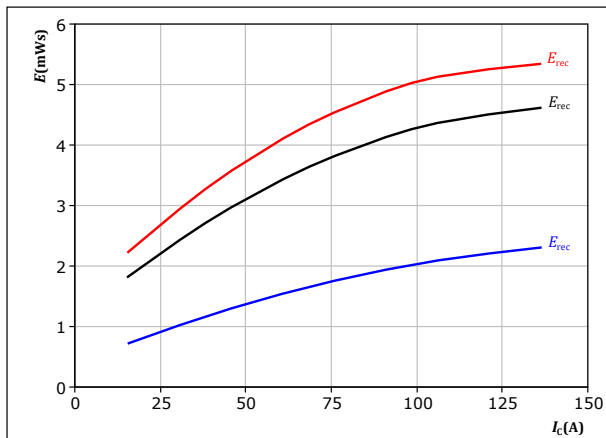
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 20.

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  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 8$   $\Omega$

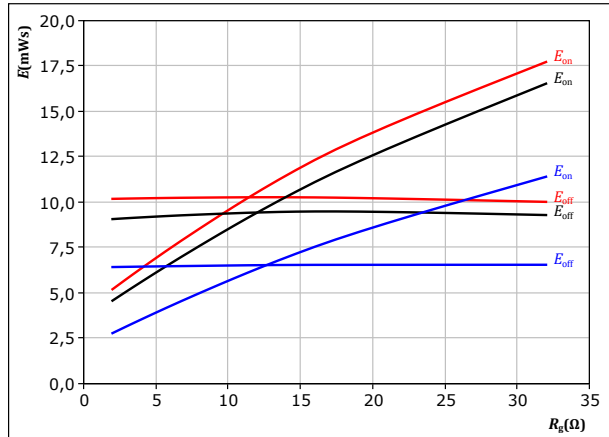
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 19.

IGBT

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

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 75$  A

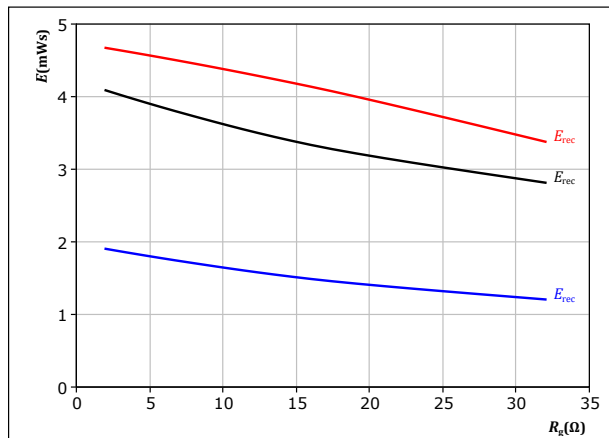
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 21.

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

$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_C = 75$  A

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



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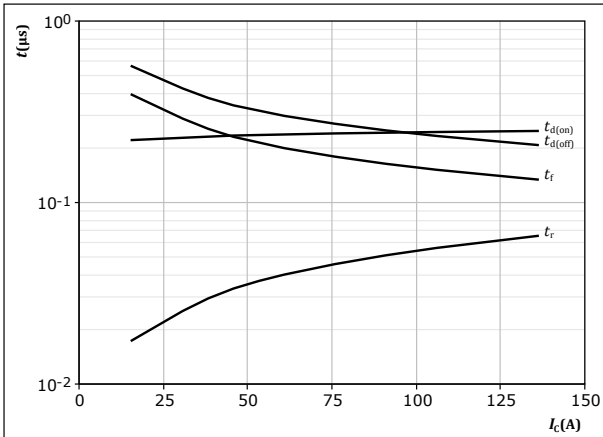
# A0-VP12PMA075RA-LF16A80T datasheet

## Inverter Switching Characteristics

figure 22.

IGBT

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



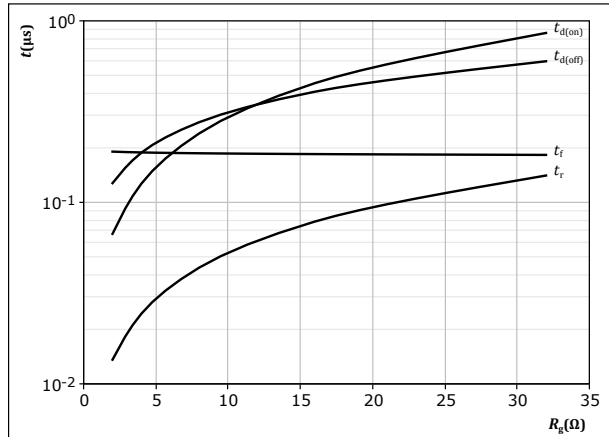
With an inductive load at

$T_j = 150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 8$   $\Omega$   
 $R_{goff} = 8$   $\Omega$

figure 23.

IGBT

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



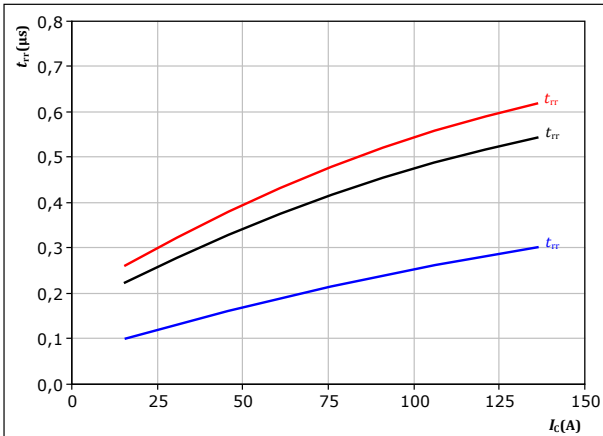
With an inductive load at

$T_j = 150$  °C  
 $V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $I_c = 75$  A

figure 24.

FWD

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



With an inductive load at

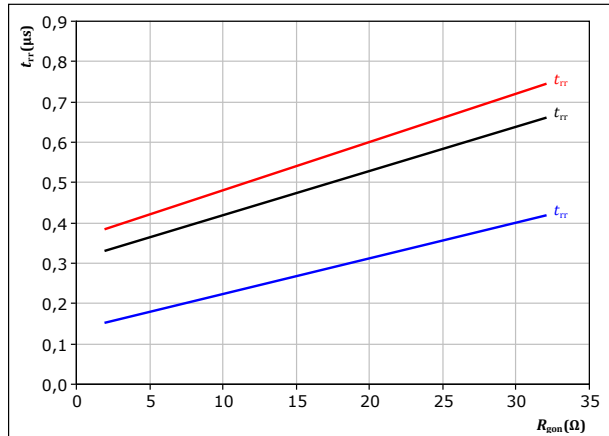
$V_{CE} = 600$  V  
 $V_{GE} = \pm 15$  V  
 $R_{gon} = 8$   $\Omega$

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

figure 25.

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  
 $I_c = 75$  A

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



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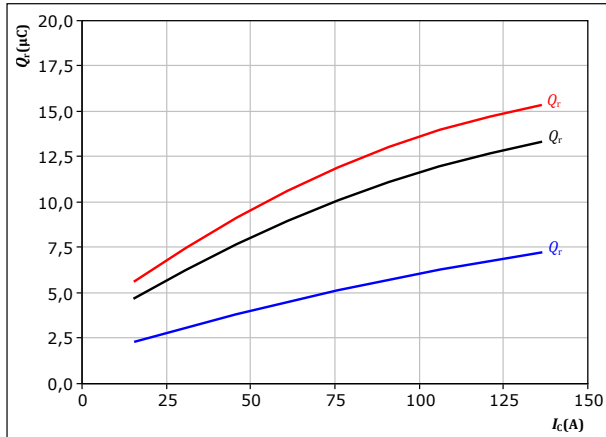
## Inverter Switching Characteristics

figure 26.

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  
 $R_{gon} = 8$   $\Omega$

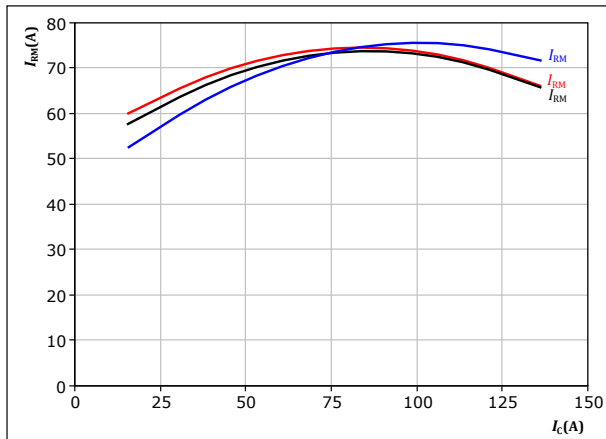
$T_j$ : 25 °C  
125 °C  
150 °C

figure 28.

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  
 $R_{gon} = 8$   $\Omega$

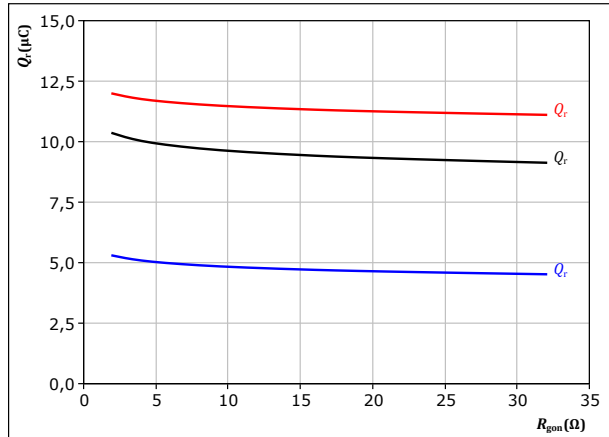
$T_j$ : 25 °C  
125 °C  
150 °C

figure 27.

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  
 $I_c = 75$  A

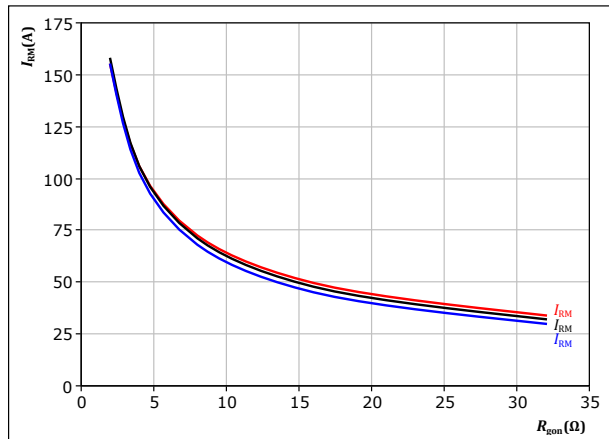
$T_j$ : 25 °C  
125 °C  
150 °C

figure 29.

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  
 $I_c = 75$  A

$T_j$ : 25 °C  
125 °C  
150 °C



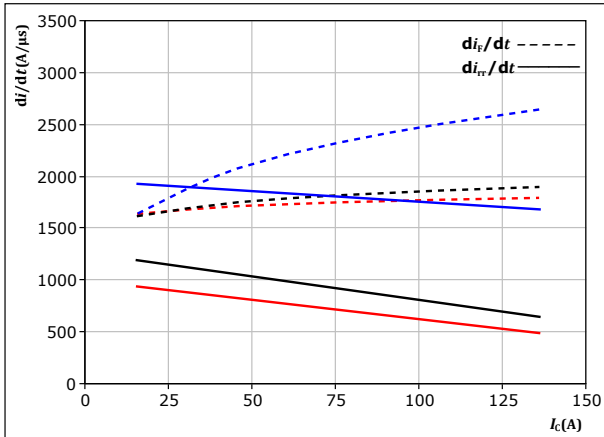
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datasheet

## Inverter Switching Characteristics

**figure 30.** FWD

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

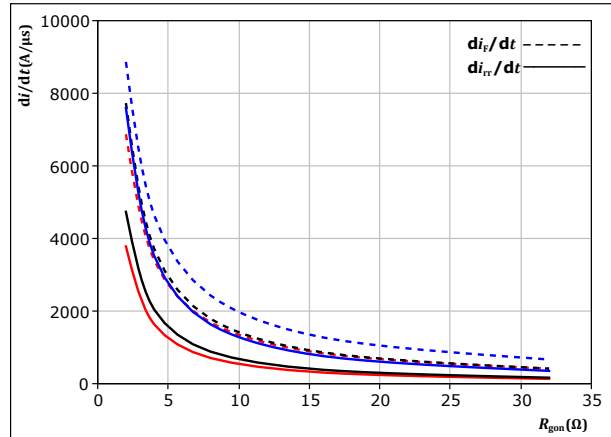


With an inductive load at

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

**figure 31.** FWD

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



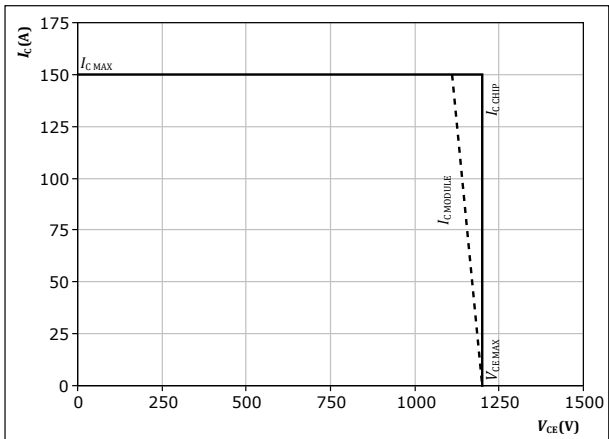
With an inductive load at

$V_{CE} = 600 \text{ V}$   
 $V_{GE} = \pm 15 \text{ V}$   
 $I_C = 75 \text{ A}$   
 $T_j = 25 \text{ } ^\circ\text{C}$   
 $T_j = 125 \text{ } ^\circ\text{C}$   
 $T_j = 150 \text{ } ^\circ\text{C}$

**figure 32.** IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At  $T_j = 150 \text{ } ^\circ\text{C}$   
 $R_{gon} = 8 \text{ } \Omega$   
 $R_{goff} = 8 \text{ } \Omega$





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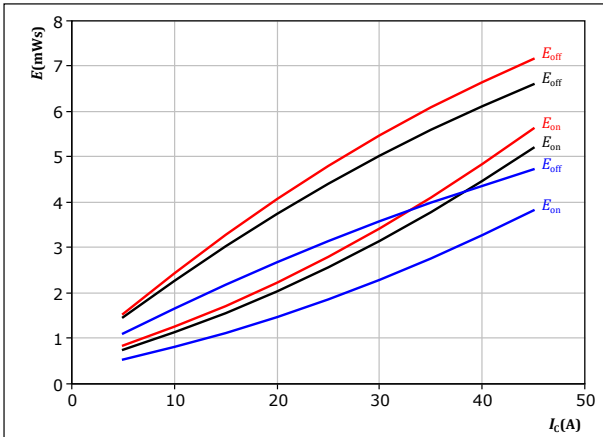
## Brake Switching Characteristics

figure 33.

IGBT

Typical switching energy losses as a function of collector current

$$E = f(I_c)$$



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $R_{gon} = 16$   $\Omega$   
 $R_{goff} = 16$   $\Omega$

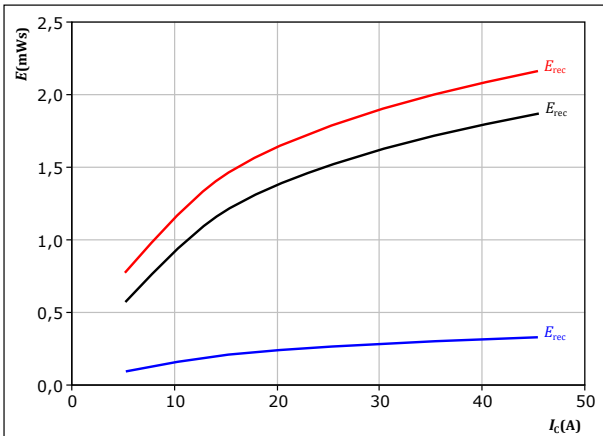
$T_j$ : 25 °C  
125 °C  
150 °C

figure 35.

FWD

Typical reverse recovered energy loss as a function of collector current

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



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $R_{gon} = 16$   $\Omega$

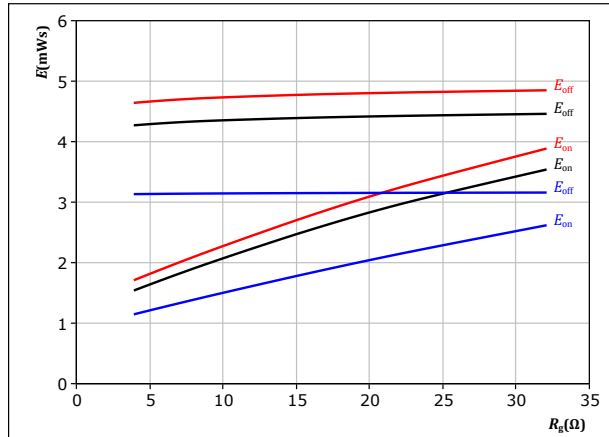
$T_j$ : 25 °C  
125 °C  
150 °C

figure 34.

IGBT

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

$$E = f(R_g)$$



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $I_c = 25$  A

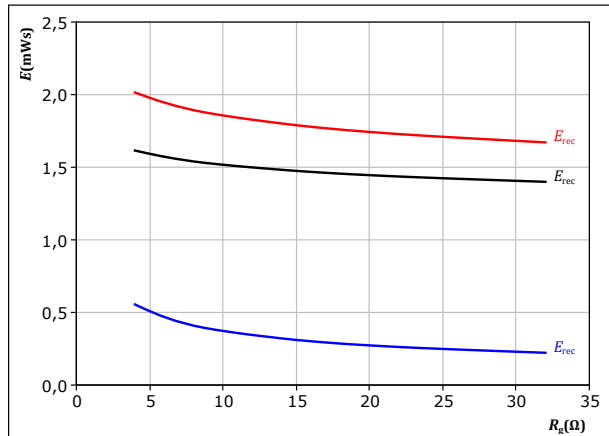
$T_j$ : 25 °C  
125 °C  
150 °C

figure 36.

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

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $I_c = 25$  A

$T_j$ : 25 °C  
125 °C  
150 °C



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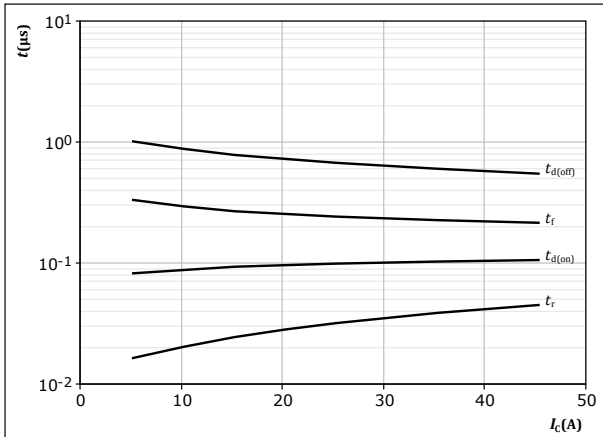
## Brake Switching Characteristics

figure 37.

IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



With an inductive load at

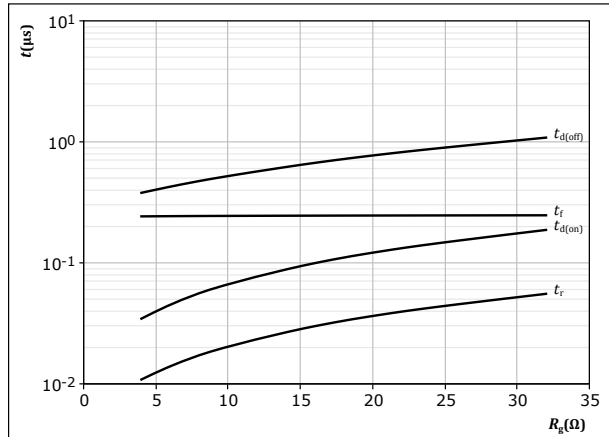
$T_j = 150$  °C  
 $V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $R_{gon} = 16$   $\Omega$   
 $R_{goff} = 16$   $\Omega$

figure 38.

IGBT

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

$$t = f(R_g)$$



With an inductive load at

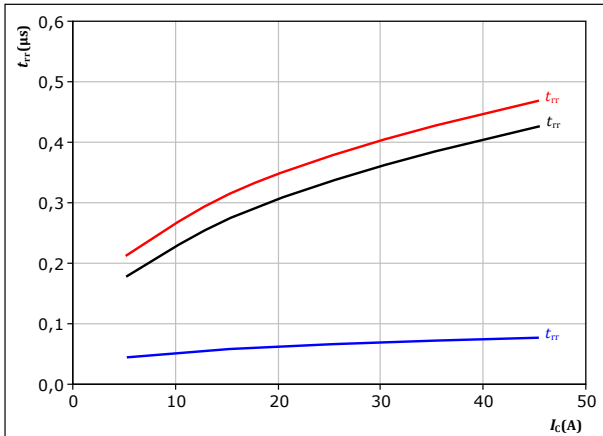
$T_j = 150$  °C  
 $V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $I_C = 25$  A

figure 39.

FWD

Typical reverse recovery time as a function of collector current

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



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $R_{gon} = 16$   $\Omega$

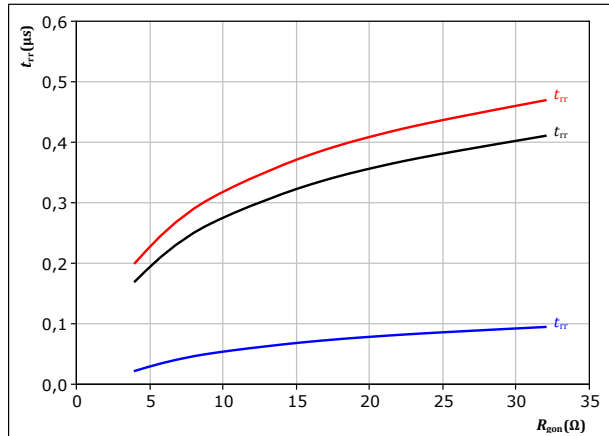
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 40.

FWD

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

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



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $I_C = 25$  A

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



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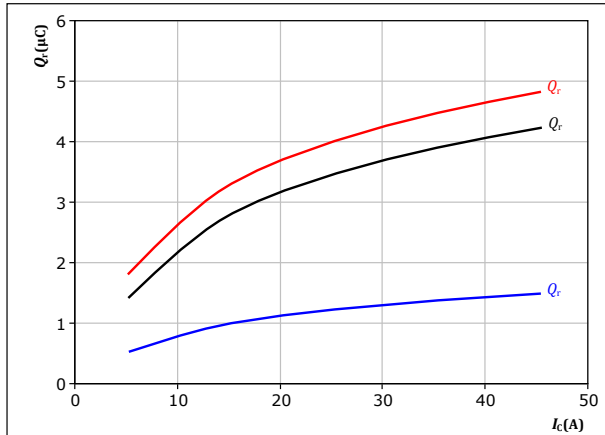
## Brake Switching Characteristics

figure 41.

FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $R_{gon} = 16$  Ω

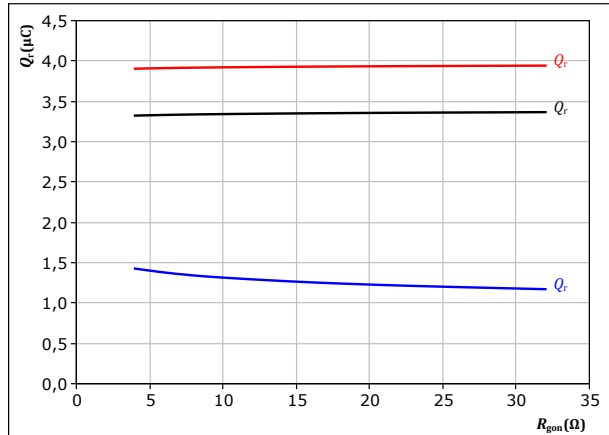
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 42.

FWD

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

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



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $I_c = 25$  A

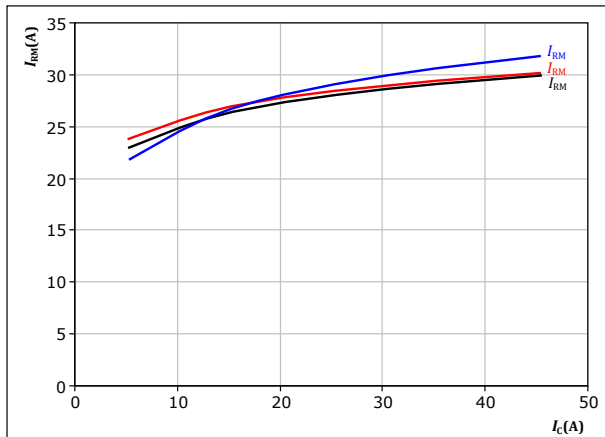
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 43.

FWD

Typical peak reverse recovery current as a function of collector current

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



With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $R_{gon} = 16$  Ω

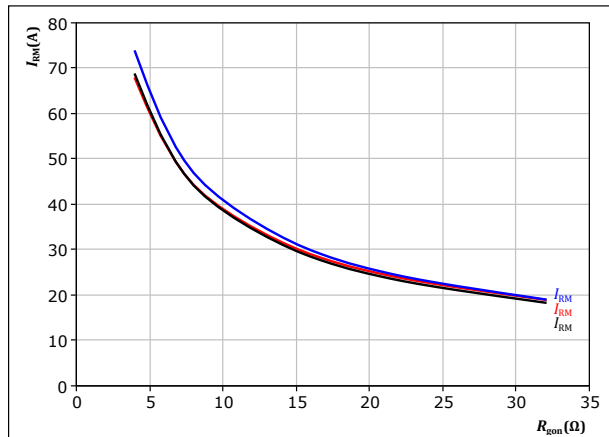
$T_j$ :  
— 25 °C  
— 125 °C  
— 150 °C

figure 44.

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

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $I_c = 25$  A

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



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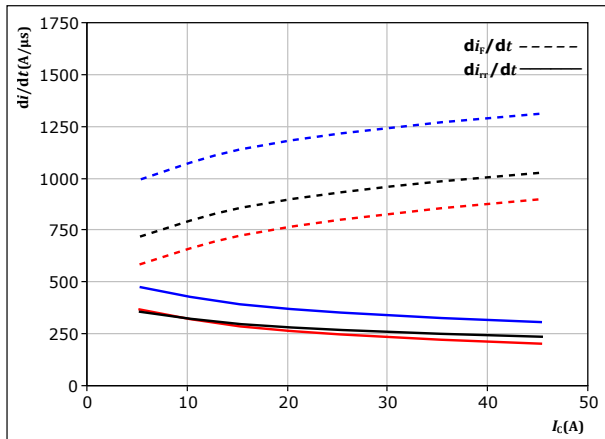
# A0-VP12PMA075RA-LF16A80T

datasheet

## Brake Switching Characteristics

figure 45. FWD

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

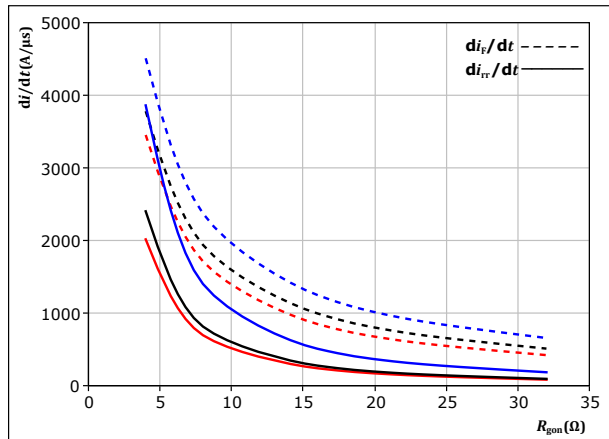


With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $R_{gon} = 16$   $\Omega$   
 $T_j = 25$  °C  
 $T_j = 125$  °C  
 $T_j = 150$  °C

figure 46. FWD

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



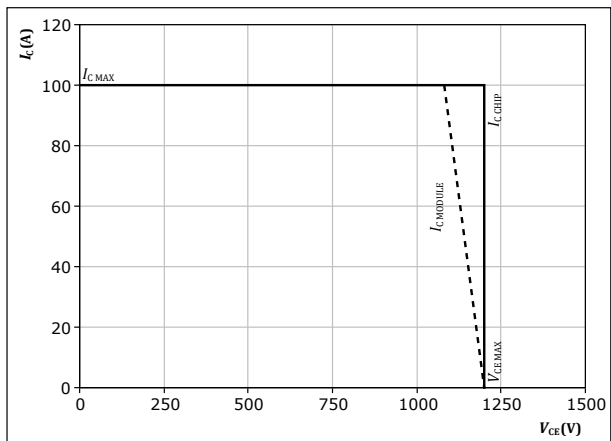
With an inductive load at

$V_{CE} = 700$  V  
 $V_{GE} = 0/15$  V  
 $I_C = 25$  A  
 $T_j = 25$  °C  
 $T_j = 125$  °C  
 $T_j = 150$  °C

figure 47. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At  $T_j = 150$  °C  
 $R_{gon} = 16$   $\Omega$   
 $R_{goff} = 16$   $\Omega$



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# A0-VP12PMA075RA-LF16A80T datasheet

## Switching Definitions

figure 48. IGBT

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

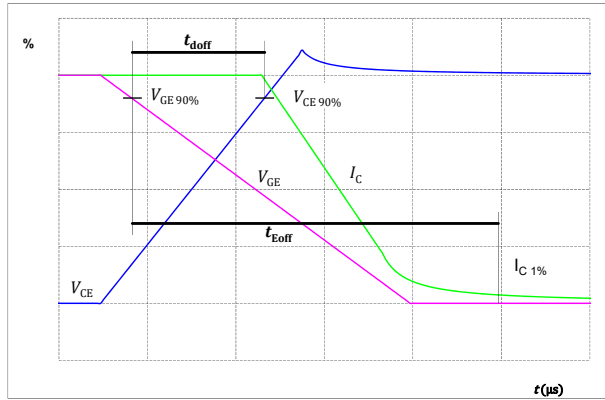


figure 49. IGBT

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



figure 50. IGBT

Turn-off Switching Waveforms & definition of  $t_f$

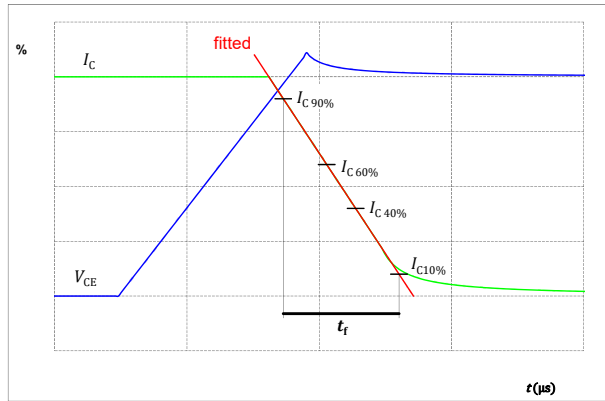
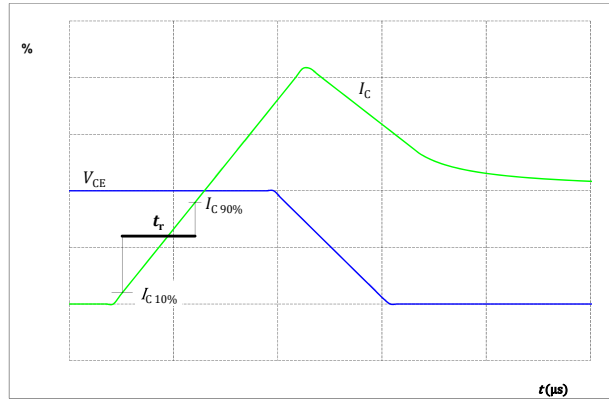


figure 51. IGBT

Turn-on Switching Waveforms & definition of  $t_r$





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## Switching Definitions

figure 52.

FWD

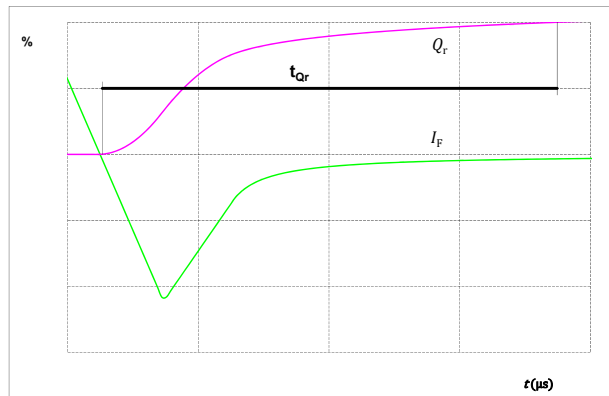
Turn-off Switching Waveforms & definition of  $t_{rr}$



figure 53.

FWD

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






# A0-VP12PMA075RA-LF16A80T

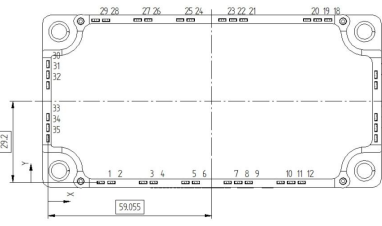
datasheet

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Ordering Code	
Version	Ordering Code
Without thermal paste	A0-VP12PMA075RA-LF16A80T
With thermal paste (5,2 W/mK, PTM6000HV)	A0-VP12PMA075RA-LF16A80T-/7/

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

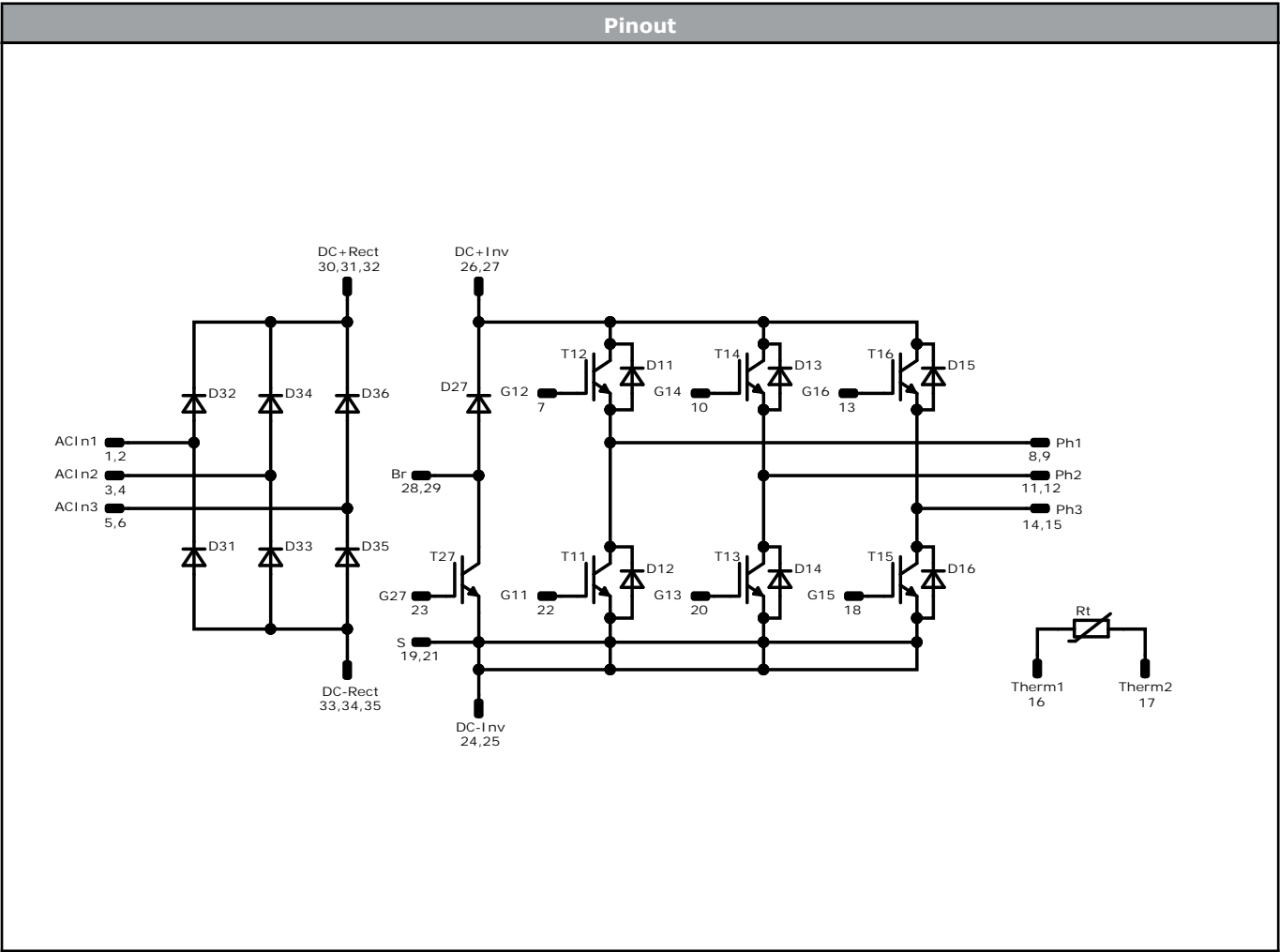
Outline			
Pin table [mm]			
Pin	X	Y	Function
1	19,05	0	ACIn1
2	22,86	0	ACIn1
3	34,29	0	ACIn2
4	38,1	0	ACIn2
5	49,53	0	ACIn3
6	53,34	0	ACIn3
7	64,77	0	G12
8	68,58	0	Ph1
9	72,36	0	Ph1
10	83,82	0	G14
11	87,56	0	Ph2
12	91,45	0	Ph2
13	118,11	15,865	G16
14	118,11	19,675	Ph3
15	118,11	23,485	Ph3
16	118,11	34,915	Therm1
17	118,11	38,725	Therm2
18	100,965	58,4	G15
19	97,155	58,4	S
20	93,305	58,4	G13
21	70,505	58,4	S
22	66,655	58,4	G11
23	62,855	58,4	G27
24	51,395	58,4	DC-Inv
25	47,585	58,4	DC-Inv
26	36,195	58,4	DC+Inv
27	32,385	58,4	DC+Inv
28	20,975	58,4	Br
29	17,175	58,4	Br
30	0	42,535	DC+Rect
31	0	38,725	DC+Rect
32	0	34,915	DC+Rect
33	0	23,485	DC+Rect
34	0	19,675	DC+Rect
35	0	15,865	DC+Rect





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A0-VP12PMA075RA-LF16A80T  
datasheet



Identification					
ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	75 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	75 A	Inverter Diode	
T27	IGBT	1200 V	50 A	Brake Switch	
D27	FWD	1200 V	25 A	Brake Diode	
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	50 A	Rectifier Diode	
Rt	Thermistor			Thermistor	





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**A0-VP12PMA075RA-LF16A80T**  
datasheet

Packaging instruction				
Standard packaging quantity (SPQ) 24	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for VINco E3s packages see vincotech.com website.

Package data
Package data for VINco E3s packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number
Certification pending. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
A0-VP12PMA075RA-LF16A80T-D1-14	26 Mar. 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.