

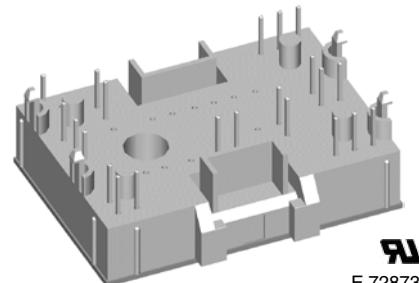
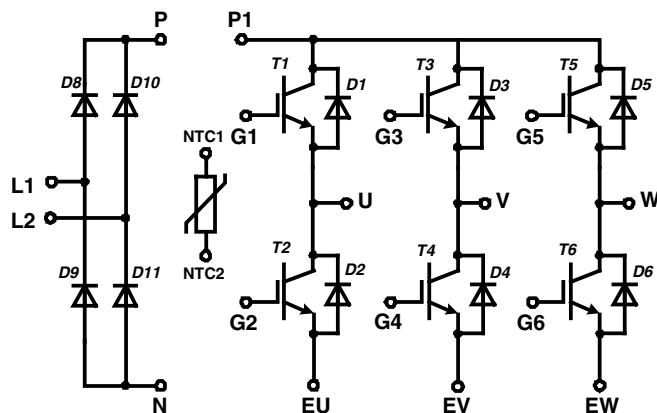
# Converter - Inverter Module

## NPT IGBT

Single Phase Rectifier	Three Phase Inverter
$V_{RRM} = 1600 \text{ V}$	$V_{CES} = 600 \text{ V}$
$I_{DAVM25} = 65 \text{ A}$	$I_{C25} = 29 \text{ A}$
$I_{FSM} = 550 \text{ A}$	$V_{CE(sat)} = 2.1 \text{ V}$

**Part name** (Marking on product)

MIAA20WD600TMH



Pin configuration see outlines.

### Features:

- High level of integration - only one power semiconductor module required for the whole drive
- Inverter with NPT IGBTs
  - low saturation voltage
  - positive temperature coefficient
  - fast switching
  - short tail current
- Epitaxial free wheeling diodes with hiperfast soft reverse recovery
- Temperature sense included

### Application:

- AC motor drives
- Pumps, Fans
- Washing machines
- Air-conditioning system
- Inverter and power supplies

### Package:

- "Mini" package
- Assembly height is 17 mm
- Insulated base plate
- Pins suitable for wave soldering and PCB mounting
- Assembly clips available
  - IXKU 5-505 screw clamp
  - IXRB 5-506 click clamp
- UL registered E72873

## Output Inverter T1 - T6

## Ratings

Symbol	Definitions	Conditions	min.	typ.	max.	Unit
$V_{CES}$	collector emitter voltage	$T_{VJ} = 150^\circ\text{C}$			600	V
$V_{GES}$	max. DC gate voltage	continuous			$\pm 20$	V
$V_{GEM}$	max. transient collector gate voltage	transient			$\pm 30$	V
$I_{C25}$	collector current	$T_C = 25^\circ\text{C}$			29	A
$I_{C80}$		$T_C = 80^\circ\text{C}$			20	A
$P_{tot}$	total power dissipation	$T_C = 25^\circ\text{C}$			100	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 20 \text{ A}; V_{GE} = 15 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$	2.1	2.7	V
			$T_{VJ} = 125^\circ\text{C}$	2.4		V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 0.5 \text{ A}; V_{GE} = V_{CE}$	$T_{VJ} = 25^\circ\text{C}$	4.5	5.5	V
$I_{CES}$	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$		1.1	mA
			$T_{VJ} = 125^\circ\text{C}$		1.3	mA
$I_{GES}$	gate emitter leakage current	$V_{GE} = \pm 20 \text{ V}$			150	nA
$C_{ies}$	input capacitance	$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$			900	pF
$Q_{G(on)}$	total gate charge	$V_{CE} = 300 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 20 \text{ A}$			76	nC
$t_{d(on)}$	turn-on delay time	$T_{VJ} = 25^\circ\text{C}$ $V_{CE} = 300 \text{ V}; I_C = 20 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 47 \Omega$			35	ns
$t_r$	current rise time				45	ns
$t_{d(off)}$	turn-off delay time				155	ns
$t_f$	current fall time				75	ns
$E_{on}$	turn-on energy per pulse				0.39	mJ
$E_{off}$	turn-off energy per pulse				0.4	mJ
$t_{d(on)}$	turn-on delay time	$T_{VJ} = 125^\circ\text{C}$ $V_{CE} = 300 \text{ V}; I_C = 20 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 47 \Omega$			35	ns
$t_r$	current rise time				45	ns
$t_{d(off)}$	turn-off delay time				165	ns
$t_f$	current fall time				150	ns
$E_{on}$	turn-on energy per pulse				0.6	mJ
$E_{off}$	turn-off energy per pulse				0.54	mJ
<b>RBSOA</b>	reverse bias safe operating area	$V_{GE} = \pm 15 \text{ V}; R_G = 47 \Omega; I_C = 40 \text{ A}$	$T_{VJ} = 125^\circ\text{C}$	$V_{CEK} \leq V_{CES} \cdot L_S \cdot d_I/dt$		V
<b>I<sub>sc</sub> (SCSOA)</b>	short circuit safe operating area	$V_{CE} = 360 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 47 \Omega; t_p = 10 \mu\text{s}$	$T_{VJ} = 125^\circ\text{C}$	90		A
$R_{thJC}$	thermal resistance junction to case	(per IGBT)			1.3	K/W
$R_{thCH}$	thermal resistance case to heatsink				0.45	K/W

## Output Inverter D1 - D6

## Ratings

Symbol	Definitions	Conditions	min.	typ.	max.	Unit
$V_{RRM}$	max. repetitive reverse voltage	$T_{VJ} = 150^\circ\text{C}$			600	V
$I_{F25}$	forward current	$T_C = 25^\circ\text{C}$			37	A
$I_{F80}$		$T_C = 80^\circ\text{C}$			24	A
$V_F$	forward voltage	$I_F = 20 \text{ A}; V_{GE} = 0 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$	1.95	2.2	V
			$T_{VJ} = 125^\circ\text{C}$	1.65		V
$Q_{rr}$	reverse recovery charge	$T_{VJ} = 125^\circ\text{C}$ $V_R = 300 \text{ V}$ $di_F/dt = -370 \text{ A}/\mu\text{s}$ $I_F = 20 \text{ A}; V_{GE} = 0 \text{ V}$			0.58	$\mu\text{C}$
$I_{RM}$	max. reverse recovery current				10.7	A
$t_{rr}$	reverse recovery time				110	ns
$E_{rec}$	reverse recovery energy				60	$\mu\text{J}$
$R_{thJC}$	thermal resistance junction to case	(per diode)			1.6	K/W
$R_{thCH}$	thermal resistance case to heatsink				0.55	K/W

 $T_C = 25^\circ\text{C}$  unless otherwise stated

IXYS reserves the right to change limits, test conditions and dimensions.

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**Input Rectifier Bridge D8 - D11****Ratings**

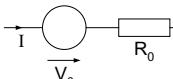
<b>Symbol</b>	<b>Definitions</b>	<b>Conditions</b>	<b>min.</b>	<b>typ.</b>	<b>max.</b>	<b>Unit</b>
<b>V<sub>RRM</sub></b>	max. repetitive reverse voltage		T <sub>VJ</sub> = 25°C		1600	V
<b>I<sub>FAV</sub></b>	average forward current	sine 180°	T <sub>C</sub> = 80°C		39	A
<b>I<sub>DAVM</sub></b>	max. average DC output current	rect.; d = 1/2	T <sub>C</sub> = 80°C		42	A
<b>I<sub>FSM</sub></b>	max. forward surge current	t = 10 ms; sine 50 Hz	T <sub>VJ</sub> = 25°C T <sub>VJ</sub> = 125°C		550 tbd	A A
<b>I<sup>2</sup>t</b>	I <sup>2</sup> t value for fusing	t = 10 ms; sine 50 Hz	T <sub>VJ</sub> = 25°C T <sub>VJ</sub> = 125°C		1270 tbd	A <sup>2</sup> s A <sup>2</sup> s
<b>P<sub>tot</sub></b>	total power dissipation		T <sub>C</sub> = 25°C		100	W
<b>V<sub>F</sub></b>	forward voltage	I <sub>F</sub> = 30 A	T <sub>VJ</sub> = 25°C T <sub>VJ</sub> = 125°C	1.2 1.3	1.5	V V
<b>I<sub>R</sub></b>	reverse current	V <sub>R</sub> = V <sub>RRM</sub>	T <sub>VJ</sub> = 25°C T <sub>VJ</sub> = 125°C	0.03 0.3	0.03	mA mA
<b>R<sub>thJC</sub></b>	thermal resistance junction to case	(per diode)			1.2	K/W
<b>R<sub>thCH</sub></b>	thermal resistance case to heatsink	(per diode)			0.4	K/W

**Temperature Sensor NTC****Ratings**

<b>Symbol</b>	<b>Definitions</b>	<b>Conditions</b>	<b>min.</b>	<b>typ.</b>	<b>max.</b>	<b>Unit</b>
<b>R<sub>25</sub></b>	resistance		T <sub>C</sub> = 25°C	4.75	5.0 3375	kΩ K
<b>B<sub>25/50</sub></b>						

**Module****Ratings**

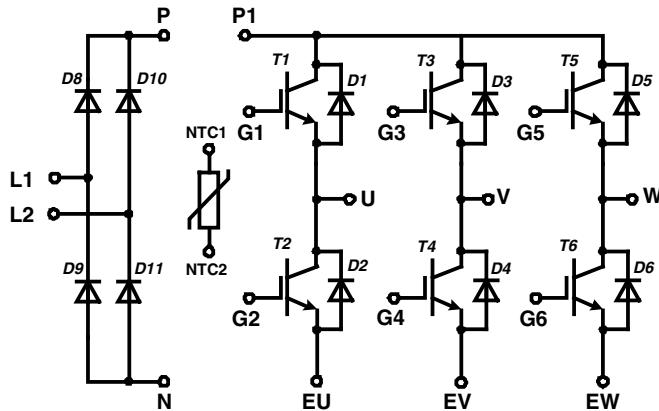
<b>Symbol</b>	<b>Definitions</b>	<b>Conditions</b>	<b>min.</b>	<b>typ.</b>	<b>max.</b>	<b>Unit</b>
<b>T<sub>VJ</sub></b>	operating temperature		-40		125	°C
<b>T<sub>VJM</sub></b>	max. virtual junction temperature				150	°C
<b>T<sub>stg</sub></b>	storage temperature		-40		125	°C
<b>V<sub>ISOL</sub></b>	isolation voltage	I <sub>ISOL</sub> ≤ 1 mA; 50/60 Hz			2500	V~
<b>CTI</b>	comparative tracking index			-		
<b>F<sub>c</sub></b>	mounting force		40		80	N
<b>d<sub>s</sub></b>	creep distance on surface		12.7			mm
<b>d<sub>A</sub></b>	strike distance through air		12			mm
<b>Weight</b>				35		g

**Equivalent Circuits for Simulation****Ratings**

<b>Symbol</b>	<b>Definitions</b>	<b>Conditions</b>	<b>min.</b>	<b>typ.</b>	<b>max.</b>	<b>Unit</b>
<b>V<sub>0</sub></b>	rectifier diode	D8 - D11	T <sub>VJ</sub> = 125°C	0.9 6		V mΩ
<b>R<sub>0</sub></b>						
<b>V<sub>0</sub></b>	IGBT	T1 - T6	T <sub>VJ</sub> = 125°C	1.7 40		V mΩ
<b>R<sub>0</sub></b>						
<b>V<sub>0</sub></b>	free wheeling diode	D1 - D6	T <sub>VJ</sub> = 125°C	1.25 12		V mΩ
<b>R<sub>0</sub></b>						

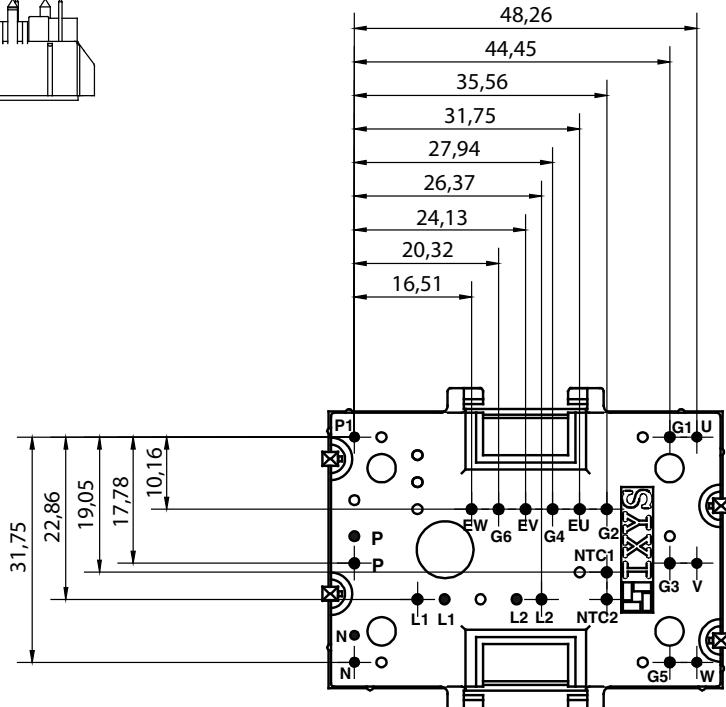
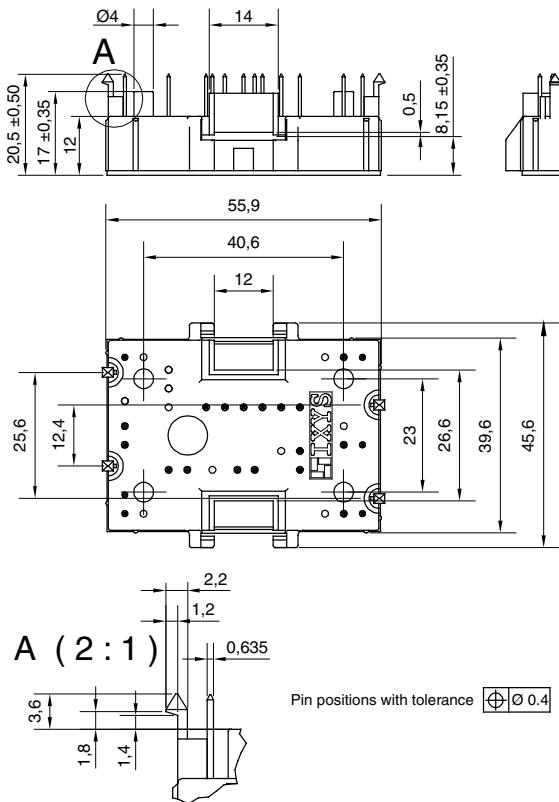
T<sub>C</sub> = 25°C unless otherwise stated

## Circuit Diagram

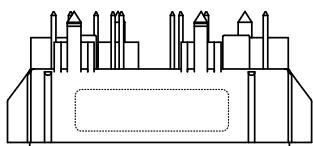


## Outline Drawing

Dimensions in mm (1 mm = 0.0394")



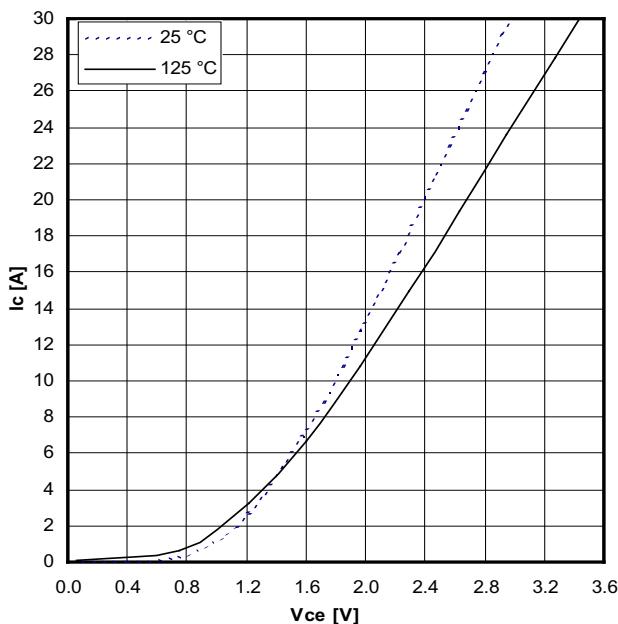
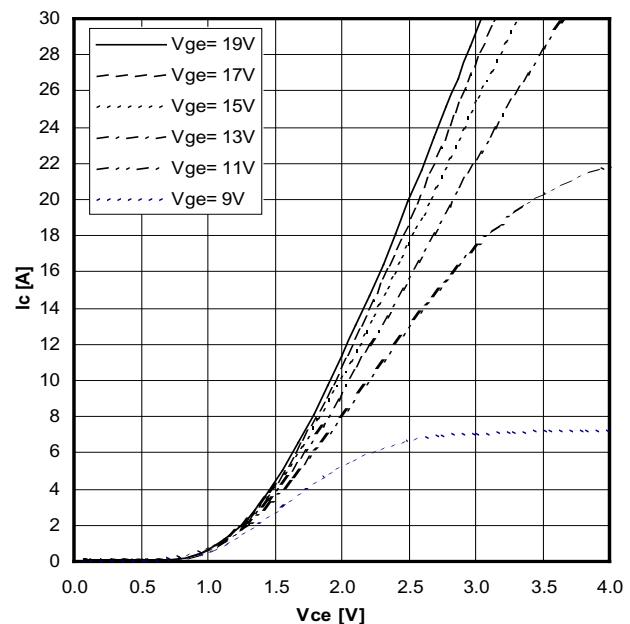
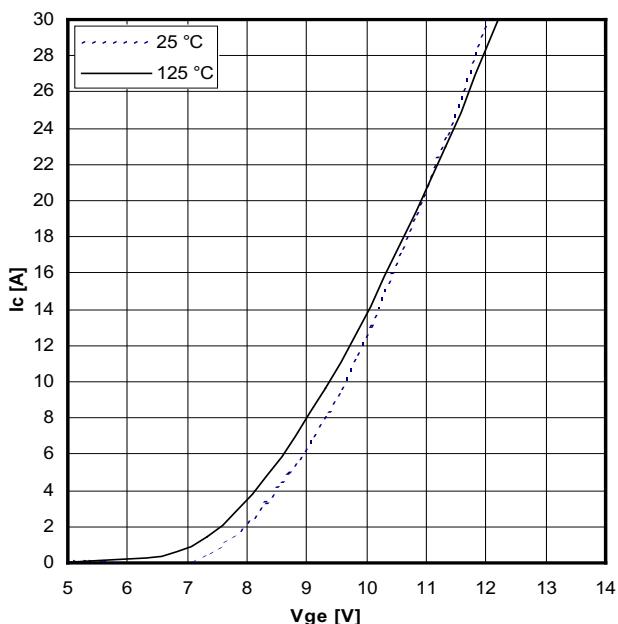
## Product Marking



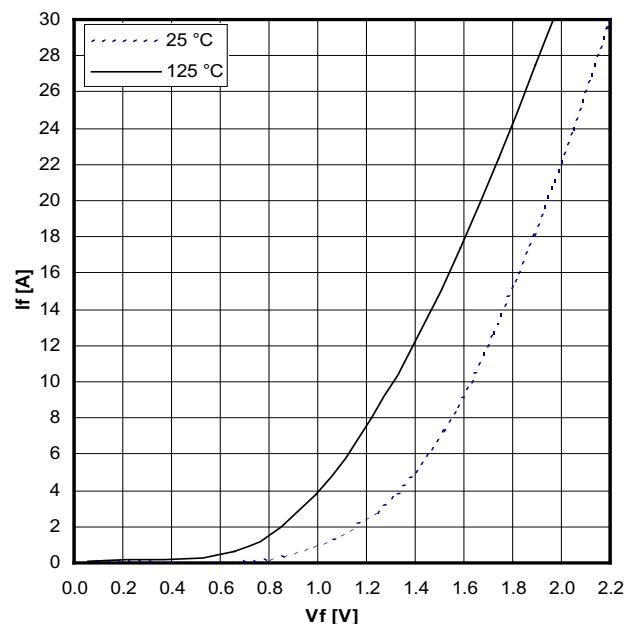
## Part number

M = Module  
 I = IGBT  
 A = IGBT (NPT)  
 A = Gen 1 / std  
 20 = Current Rating [A]  
 WD = 6-Pack + 1~ Rectifier Bridge  
 600 = Reverse Voltage [V]  
 T = NTC  
 MH = MiniPack2

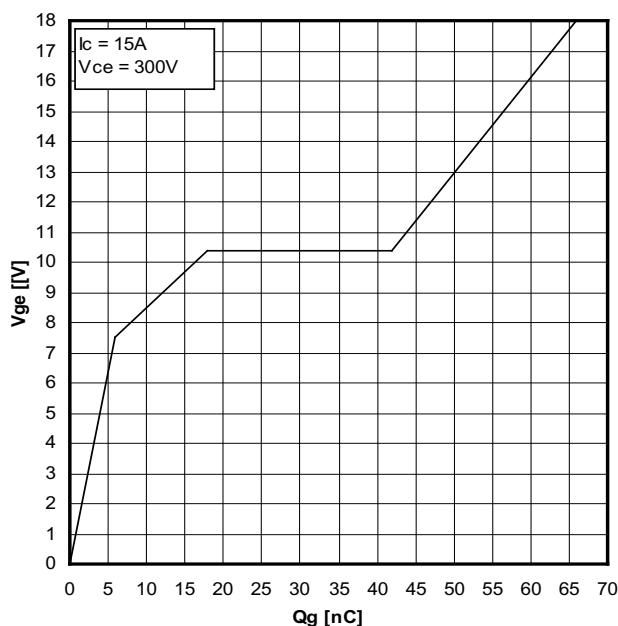
Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MIAA 20 WD 600 TMH	MIAA20WD600TMH	Box	20	504975

Typical output characteristics,  $V_{GE} = 15$  VTypical output characteristics ( $125^\circ\text{C}$ )

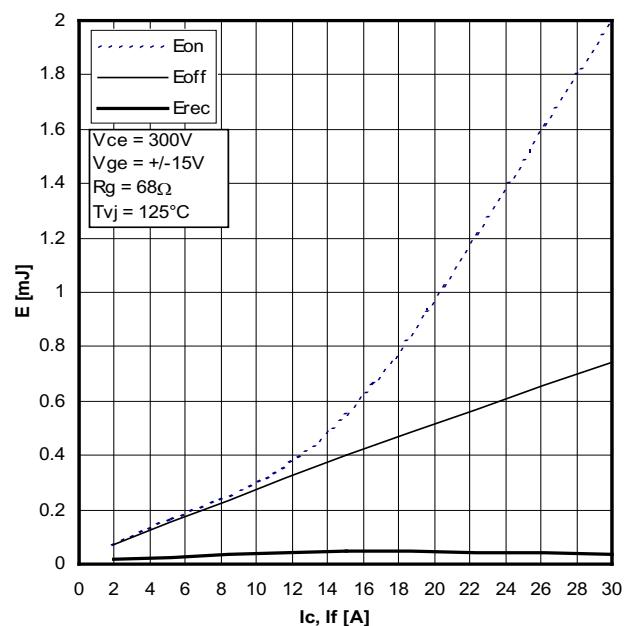
Typical transfer characteristics



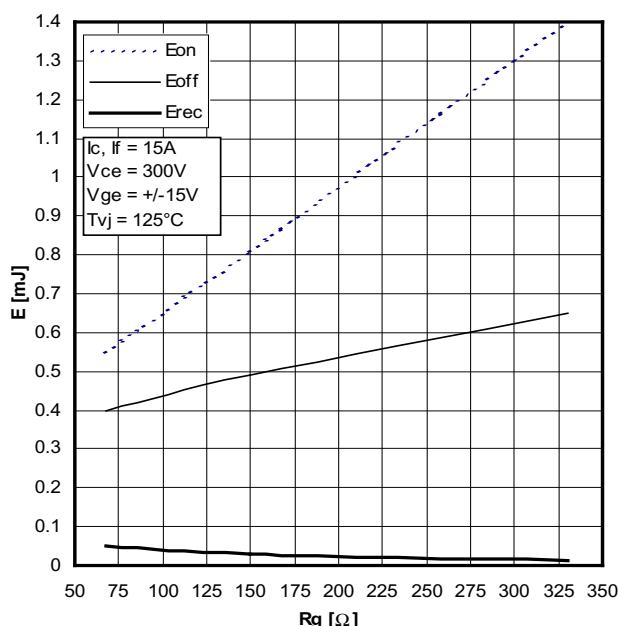
Typical forward characteristics of freewheeling diode



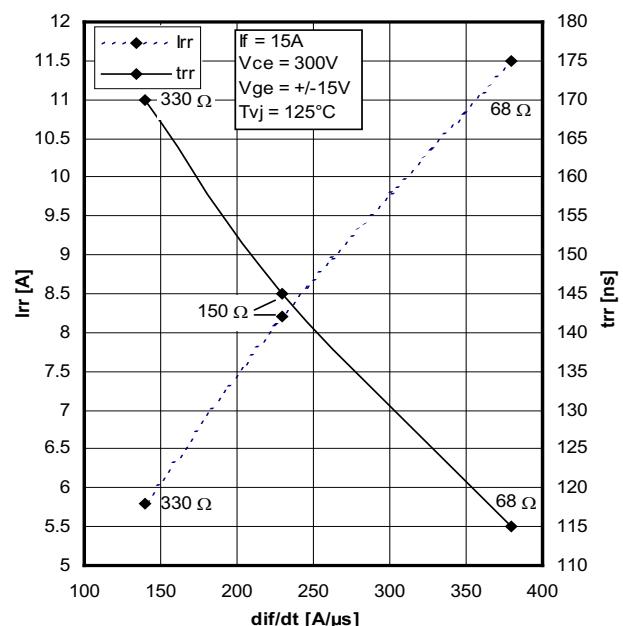
Typical turn on gate charge



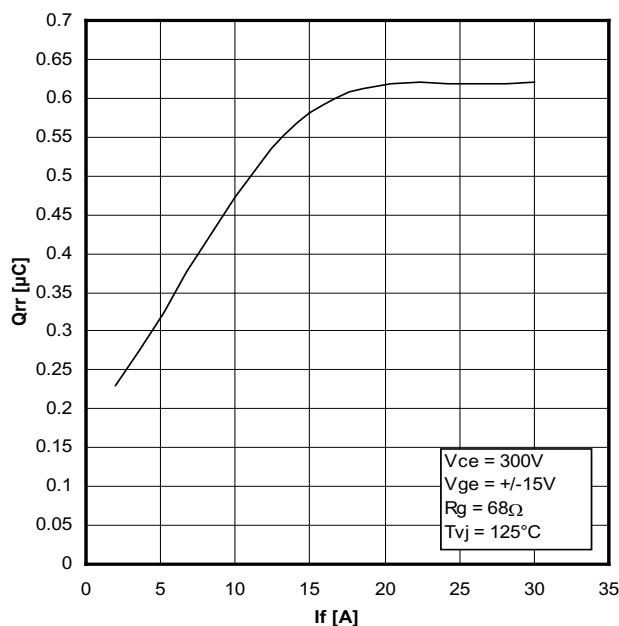
Typical switching energy versus collector current



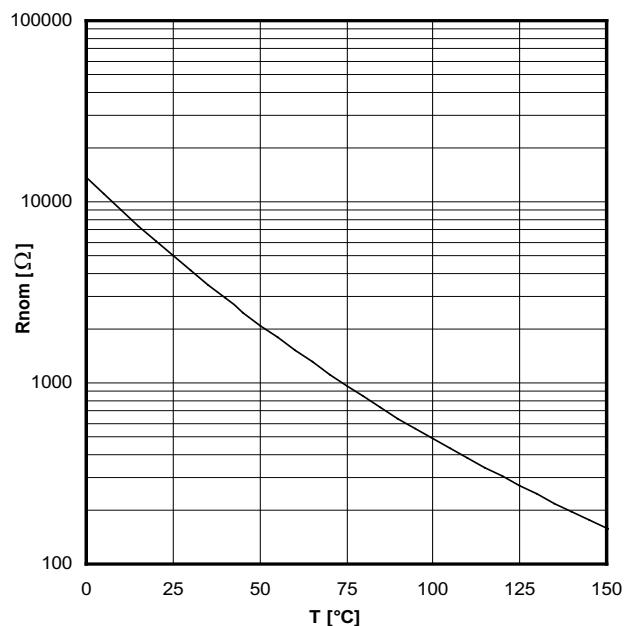
Typical switching energy versus gate resistance



Typical turn-off characteristics of free wheeling diode



Typical turn-off characteristics of free wheeling diode



Typical thermistor resistance versus temperature



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- Поставка более 17-ти миллионов наименований электронных компонентов;
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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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