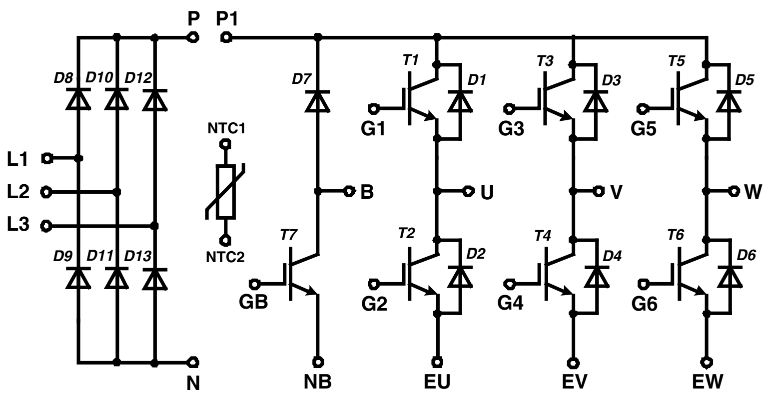
Converter - Brake - Inverter Module

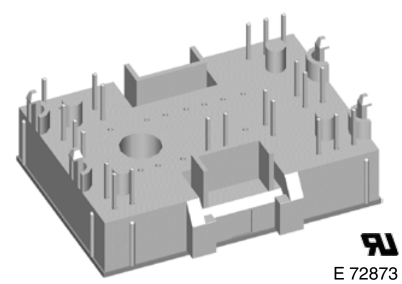
Standard Trench IGBT$_T$

Three Phase Rectifier	Brake Chopper	Three Phase Inverter
V_{RRM} = 1600 V	V_{CES} = 1200 V	V_{CES} = 1200 V
I_{DAVM25} = 90 A	I_{C25} = 17 A	I_{C25} = 17 A
I_{FSM} = 300 A	$V_{CE(sat)}$ = 1.9 V	$V_{CE(sat)}$ = 1.9 V

Part name (Marking on product)

MITA10WB1200TMH





E 72873

Pin configuration see outlines.

Features:

- High level of integration - only one power semiconductor module required for the whole drive
- Inverter with standard trench IGBTs
  - very low saturation voltage
  - positive temperature coefficient
  - 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

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

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Ouput Inverter T1 - T6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
V_{CES}	*collector emitter voltage*		T_{VJ} = 150°C			1200	V
V_{GES} V_{GEM}	*max. DC gate voltage* *max. transient collector gate voltage*	continuous transient				±20 ±30	V V
I_{C25} I_{C80}	*collector current*		T_C = 25°C T_C = 80°C			17 12	A A
P_{tot}	*total power dissipation*		T_C = 25°C			70	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 10 A; V_{GE} = 15 V	T_{VJ} = 25°C T_{VJ} = 125°C		1.9 2.3	2.2	V V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 0.3 A; V_{GE} = V_{CE}	T_{VJ} = 25°C	5	5.5	6.5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C T_{VJ} = 125°C		 0.8	0.6	mA mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				150	nA
C_{ies}	*input capacitance*	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			600		pF
$Q_{G(on)}$	*total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 10 A			54		nC
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse*	inductive load V_{CE} = 600 V; I_C = 10 A V_{GE} = ±15 V; R_G = 100 Ω	T_{VJ} = 25°C		55 30 320 200 0.9 0.75		ns ns ns ns mJ mJ
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse*	inductive load V_{CE} = 600 V; I_C = 10 A V_{GE} = ±15 V; R_G = 100 Ω	T_{VJ} = 125°C		60 35 360 340 1.55 1.1		ns ns ns ns mJ mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 100 Ω; I_C = 20 A; T_{VJ} = 125°C		$V_{CEK} \leq V_{CES}$-L_S·d_I/dt			V
I_{SC} (SCSOA)	*short circuit safe operating area*	V_{CE} = 720 V; V_{GE} = ±15 V; R_G = 100 Ω; t_p = 10 µs; non-repetitive	T_{VJ} = 125°C		40		A
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per IGBT)			 0.65	1.9	K/W K/W

Output Inverter D1 - D6

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
V_{RRM}	*max. repetitve reverse voltage*		T_{VJ} = 150°C			1200	V
I_{F25} I_{F80}	*forward current*		T_C = 25°C T_C = 80°C			24 16	A A
V_F	*forward voltage*	I_F = 10 A; V_{GE} = 0 V	T_{VJ} = 25°C T_{VJ} = 125°C		2.0 1.6	2.4	V V
Q_{rr} I_{RM} t_{rr} E_{rec}	*reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *reverse recovery energy*	V_R = 600 V di_F/dt = -300 A/µs I_F = 10 A; V_{GE} = 0 V	T_{VJ} = 125°C		1.9 12.8 335 0.54		µC A ns mJ
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per diode)			 0.55	1.6	K/W K/W

T_C = 25°C unless otherwise stated

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Brake T7

Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
V_{CES}	*collector emitter voltage*		T_{VJ} = 150°C			1200	V
V_{GES} V_{GEM}	*max. DC gate voltage* *max. transient collector gate voltage*	continuous transient				±20 ±30	V V
I_{C25} I_{C80}	*collector current*		T_C = 25°C T_C = 80°C			17 12	A A
P_{tot}	*total power dissipation*		T_C = 25°C			70	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 10 A; V_{GE} = 15 V	T_{VJ} = 25°C T_{VJ} = 125°C		1.9 2.3	2.2	V V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 0.3 A; V_{GE} = V_{CE}	T_{VJ} = 25°C	5	5.5	6.5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C T_{VJ} = 125°C		 0.8	0.6	mA mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				150	nA
C_{ies}	*input capacitance*	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz			600		pF
$Q_{G(on)}$	*total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 10 A			54		nC
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse*	inductive load V_{CE} = 600 V; I_C = 10 A V_{GE} = ±15 V; R_G = 100 Ω	T_{VJ} = 25°C		55 30 320 200 0.9 0.75		ns ns ns ns mJ mJ
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	*turn-on delay time* *current rise time* *turn-off delay time* *current fall time* *turn-on energy per pulse* *turn-off energy per pulse*	inductive load V_{CE} = 600 V; I_C = 10 A V_{GE} = ±15 V; R_G = 100 Ω	T_{VJ} = 125°C		60 35 360 340 1.55 1.1		ns ns ns ns mJ mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 100 Ω; I_C = 20 A; T_{VJ} = 125°C		$V_{CEK} \leq V_{CES}$-L_S·d_I/dt			V
I_{SC} (SCSOA)	*short circuit safe operating area*	V_{CE} = 720 V; V_{GE} = ±15 V; R_G = 100 Ω; t_p = 10 µs; non-repetitive	T_{VJ} = 125°C		40		A
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per IGBT)			 0.65	1.9	K/W K/W

Brake Chopper D7

Symbol	Definitions	Conditions		min.	Ratings typ.	max.	Unit
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 150°C			1200	V
I_{F25} I_{F80}	*forward current*		T_C = 25°C T_C = 80°C			15 10	A A
V_F	*forward voltage*	I_F = 10 A; V_{GE} = 0 V	T_{VJ} = 25°C T_{VJ} = 125°C		2.5 2.0	3.1	V V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C T_{VJ} = 125°C		 0.2	0.1	mA mA
Q_{rr} I_{RM} t_{rr} E_{rec}	*reverse recovery charge* *max. reverse recovery current* *reverse recovery time* *reverse recovery energy*	V_R = 600 V di_F/dt = tbd A/µs I_F = 10 A; V_{GE} = 0 V	T_{VJ} = 125°C		tbd tbd tbd tbd		µC A ns µJ
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per diode)			 0.85	2.5	K/W K/W

T_C = 25°C unless otherwise stated

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Input Rectifier Bridge D8 - D11

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
					Ratings		
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 25°C			1600	V
I_{FAV} I_{DAVM}	*average forward current* *max. average DC output current*	sine 180° rect.; d = $^1/_3$	T_C = 80°C T_C = 80°C			22 61	A A
I_{FSM}	*max. forward surge current*	t = 10 ms; sine 50 Hz	T_{VJ} = 25°C T_{VJ} = 125°C			300 tbd	A A
I^2t	*I^2t value for fusing*	t = 10 ms; sine 50 Hz	T_{VJ} = 25°C T_{VJ} = 125°C			450 tbd	A^2s A^2s
P_{tot}	*total power dissipation*		T_C = 25°C			50	W
V_F	*forward voltage*	I_F = 30 A	T_{VJ} = 25°C T_{VJ} = 125°C		1.35 1.35	1.6	V V
I_R	*reverse current*	$V_R = V_{RRM}$	T_{VJ} = 25°C T_{VJ} = 125°C		 0.3	0.01	mA mA
R_{thJC} R_{thCH}	*thermal resistance junction to case* *thermal resistance case to heatsink*	(per diode) (per diode)			 0.7	2.1	K/W K/W

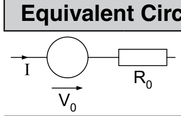
Temperature Sensor NTC

Symbol	Definitions	Conditions		min.	typ.	max.	Unit
					Ratings		
R_{25} $B_{25/50}$	*resistance*		T_C = 25°C	4.75	5.0 3375	5.25	kΩ K

Module

Symbol	Definitions	Conditions	min.	typ.	max.	Unit
				Ratings		
T_{VJ} T_{VJM} T_{stg}	*operating temperature* *max. virtual junction temperature* *storage temperature*		-40 -40		125 150 125	°C °C °C
V_{ISOL}	*isolation voltage*	$I_{ISOL} \le$ 1 mA; 50/60 Hz			2500	V~
CTI	*comparative tracking index*				-	
F_C	*mounting force*		40		80	N
d_S d_A	*creep distance on surface* *strike distance through air*		12.7 12			mm mm
Weight				35		g

Equivalent Circuits for Simulation



Symbol	Definitions	Conditions		min.	typ.	max.	Unit
					Ratings		
V_0 R_0	*rectifier diode*	D8 - D13	T_{VJ} = 125°C		0.9 16		V mΩ
V_0 R_0	*IGBT*	T1 - T6	T_{VJ} = 125°C		1.0 125		V mΩ
V_0 R_0	*free wheeling diode*	D1 - D6	T_{VJ} = 125°C		1.15 45		V mΩ
V_0 R_0	*IGBT*	T7	T_{VJ} = 125°C		1.0 125		V mΩ
V_0 R_0	*free wheeling diode*	D7	T_{VJ} = 125°C		1.4 60		V mΩ

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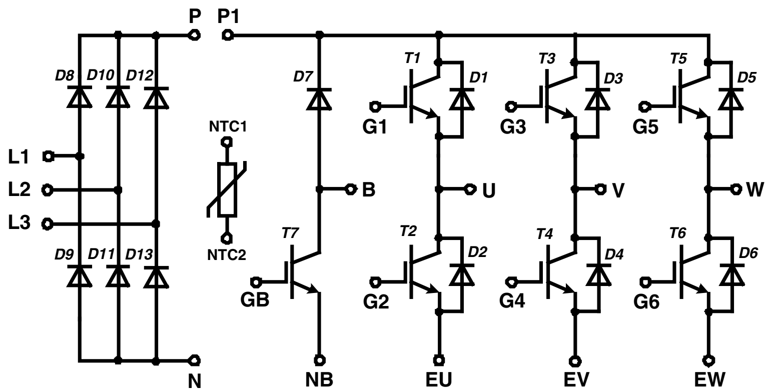
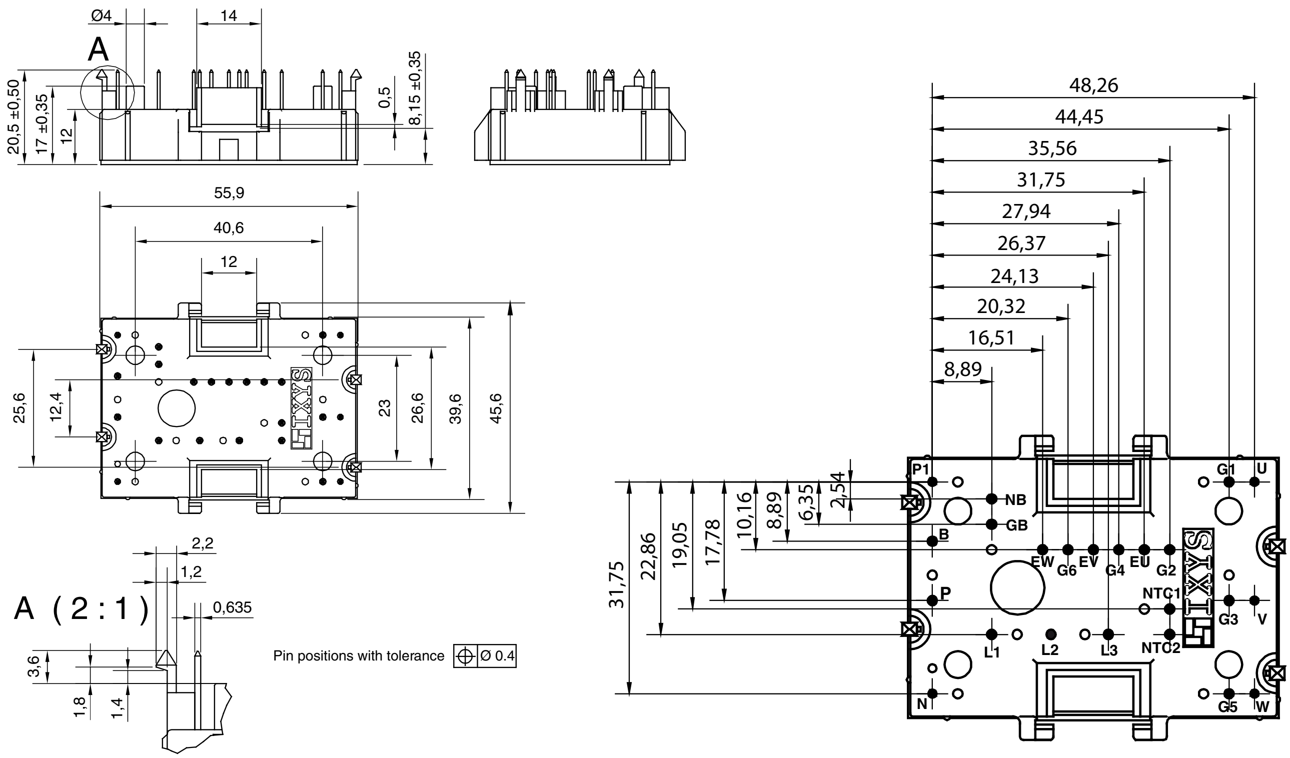
Circuit Diagram

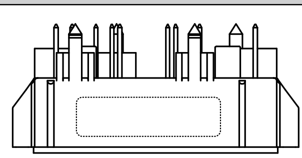


Outline Drawing

Dimensions in mm (1 mm = 0.0394“)



Product Marking



Part number

M = Module
I = IGBT
T = Standard trench
A = Gen 1 / std
10 = Current Rating [A]
WB = 6-Pack + 3~ Rectifier Bridge & Brake Unit
1200 = Reverse Voltage [V]
T = NTC
MH = MiniPack2

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	MITA 10 WB 1200 TMH	MITA10WB1200TMH	Box	20	502214

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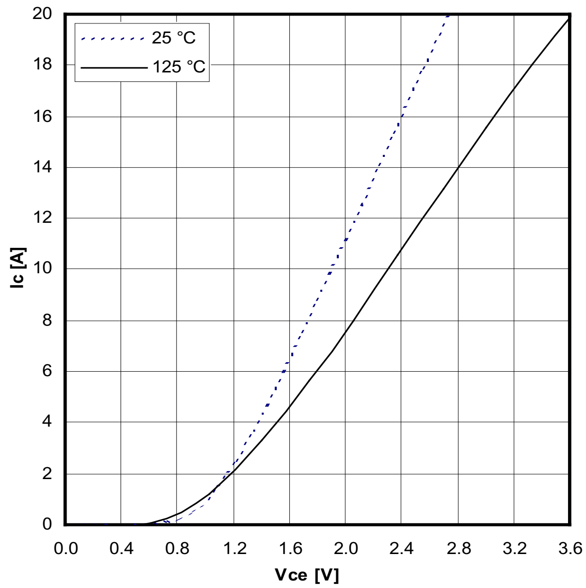
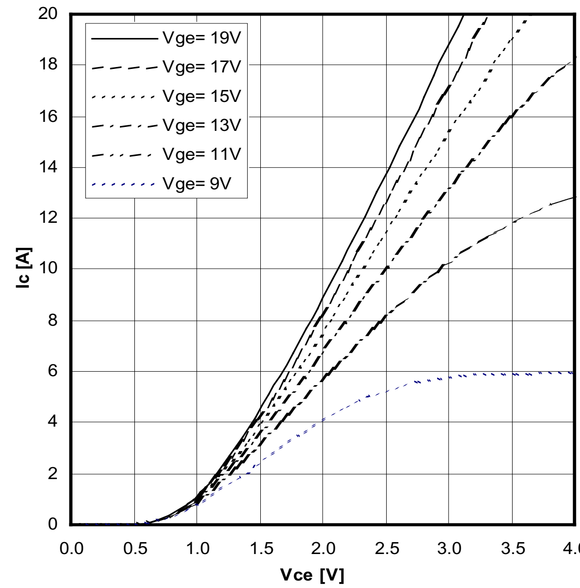
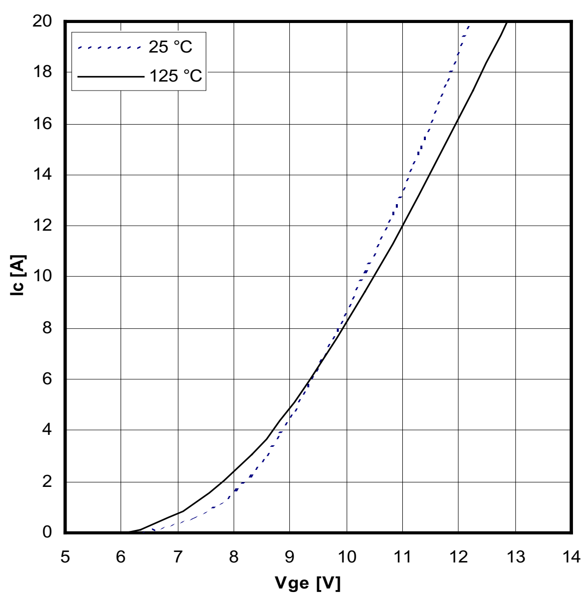


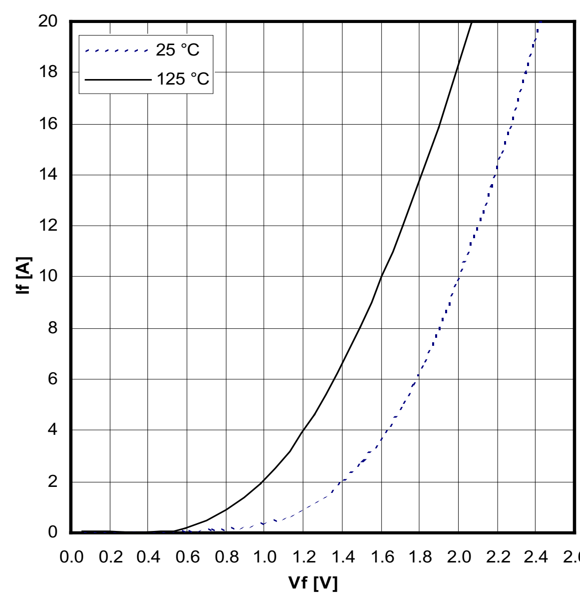
Typical output characteristics, V_{GE} = 15 V



Typical output characteristics (125°C)



Typical transfer characteristics



Typical forward characteristics of freewheeling diode

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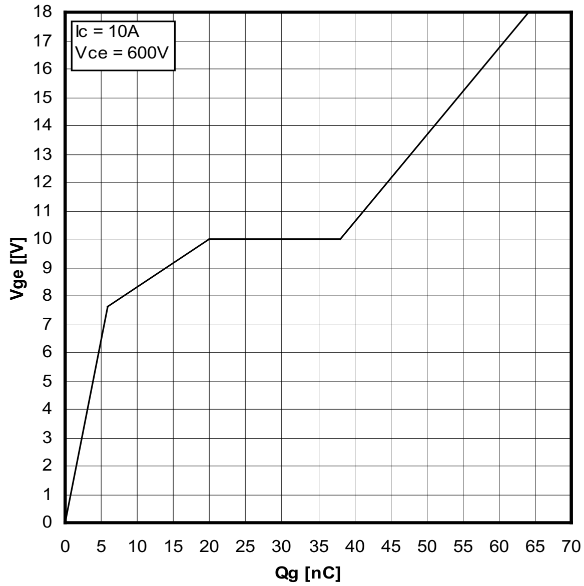
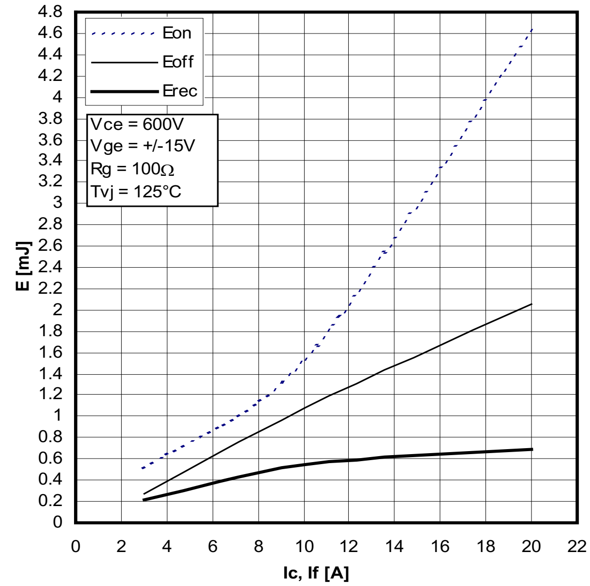
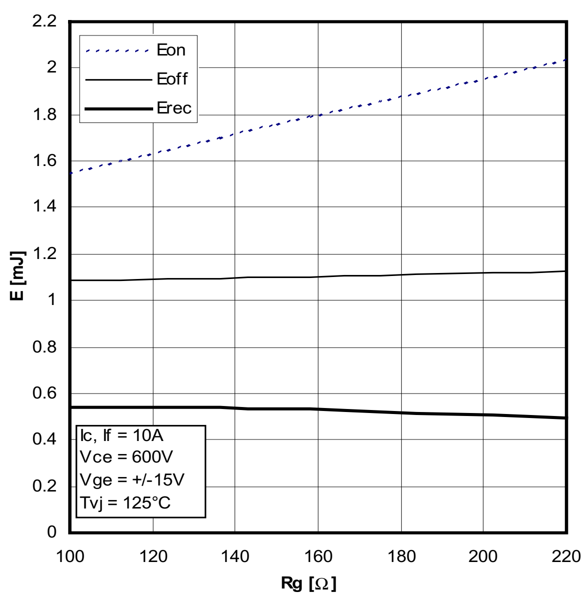


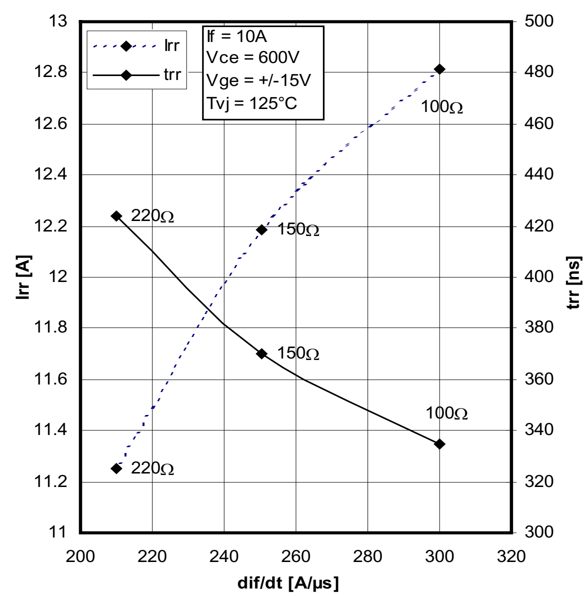
Typical turn on gate charge



Typical switching energy versus collector current



Typical switching energy versus gate resistance



Typical turn-off characteristics of free wheeling diode

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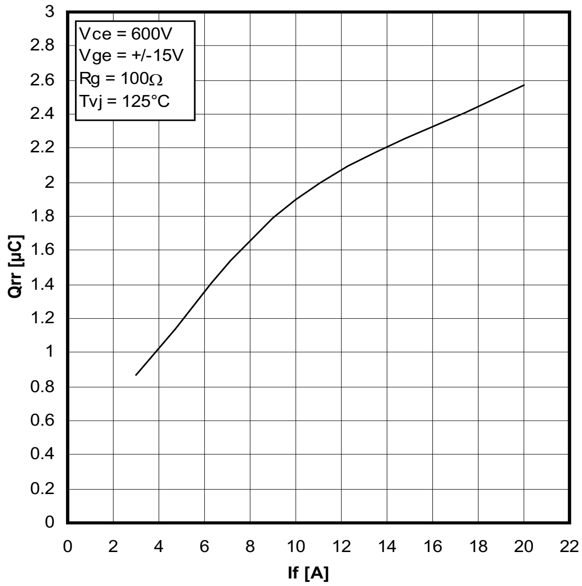
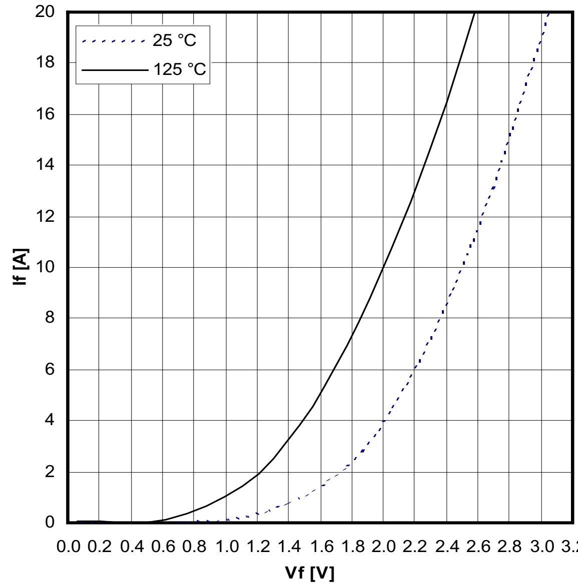
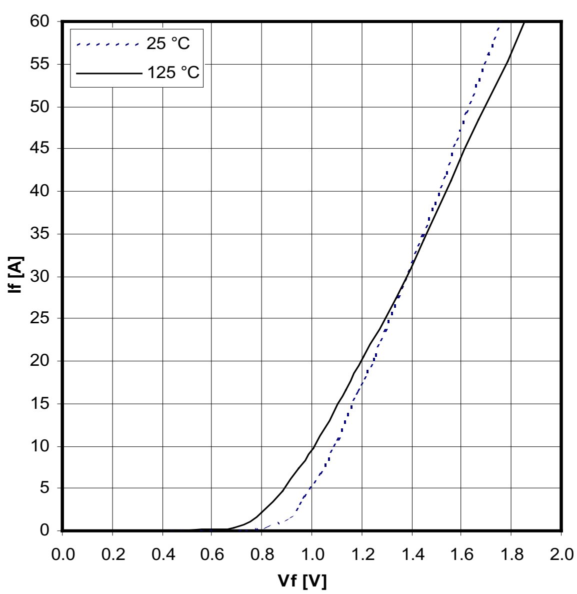


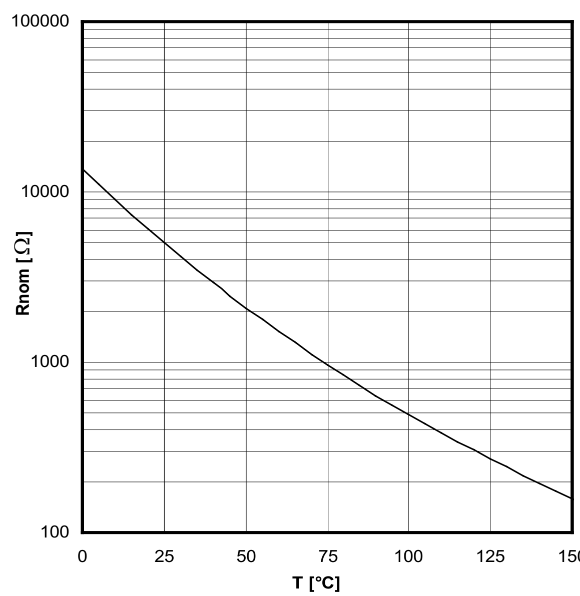
Typical turn-off characteristics of free wheeling diode



Typical forward characteristics of brake diode



Typical forward characteristics per rectifier



Typical thermistor resistance versus temperature

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