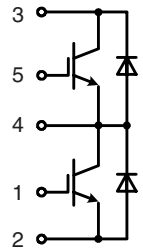
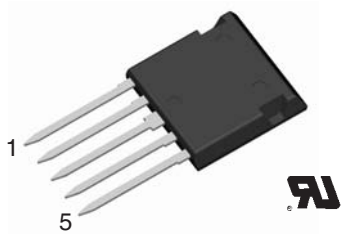
NPT³ IGBT

Phaseleg Topology in ISOPLUS i4-PAC™

I_{C25} = 33 A
V_{CES} = 1200 V
$V_{CE(sat)\,typ}$ = 2.4 V





IGBTs

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1200	V
V_{GES}		± 20	V
I_{C25}	T_C = 25°C	33	A
I_{C90}	T_C = 90°C	20	A
I_{CM}	V_{GE} = ±15 V; R_G = 68 Ω; T_{VJ} = 125°C	40	A
V_{CEK}	RBSOA, Clamped inductive load; L = 100 µH	V_{CES}	
t_{SC} (SCSOA)	V_{CE} = 900V; V_{GE} = ±15 V; R_G = 68 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	150	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 20 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.4	2.9	V
	T_{VJ} = 125°C		2.8		V
$V_{GE(th)}$	I_C = 0.6 mA; V_{GE} = V_{CE}	4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.2	mA
	T_{VJ} = 125°C		0.2		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C		205		ns
t_r	V_{CE} = 600 V; I_C = 20 A		105		ns
$t_{d(off)}$	V_{GE} = ±15 V; R_G = 68 Ω		320		ns
t_f			175		ns
E_{on}			4.1		mJ
E_{off}			1.5		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		1.2		nF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 20 A		100		nC
R_{thJC}				0.8	K/W
R_{thJH}	with heat transfer paste		1.2		K/W

Features

- NPT³ IGBT
  - positive temperature coefficient of saturation voltage for easy paralleling
  - fast switching
  - short tail current for optimized performance in resonant circuits
- HiPerFRED™ diode
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- ISOPLUS i4-PAC™ package
  - isolated back surface
  - low coupling capacity between pins and heatsink
  - enlarged creepage towards heatsink
  - application friendly pinout
  - low inductive current path
  - high reliability
  - industry standard outline
  - UL registered, E 72873

Applications

- single phaseleg
  - buck-boost chopper
- H bridge
  - power supplies
  - induction heating
  - four quadrant DC drives
  - controlled rectifier
- three phase bridge
  - AC drives
  - controlled rectifier

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

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Diodes

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	25	A
I_{F90}	T_C = 90°C	15	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 20 A; T_{VJ} = 25°C		2.5	3.0	V
	T_{VJ} = 125°C		1.9		V
I_{RM}	I_F = 15 A; di_F/dt = -400 A/µs; T_{VJ} = 125°C		16		A
t_{rr}	V_R = 600 V; V_{GE} = 0 V		130		ns
R_{thJC}	(per diode)			2.3	K/W
R_{thCH}	with heat transfer paste		3.6		K/W

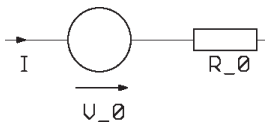
Component

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-55...+150	°C
T_{stg}		-55...+125	°C
V_{ISOL}	$I_{ISOL} \leq$ 1 mA; 50/60 Hz	2500	V~
F_C	mounting force with clip	20...120	N

Symbol	Conditions	Characteristic Values min.	typ.	max.	
C_p	coupling capacity between shorted pins and mounting tab in the case		40		pF
d_S,d_A	pin - pin	1.7			mm
d_S,d_A	pin - backside metal	5.5			mm
Weight			9		g

Equivalent Circuits for Simulation

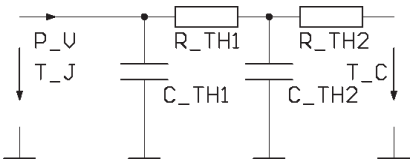
Conduction



IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 1.09 V; R_0 = 85 mΩ

Free Wheeling Diode (typ. at T_J = 125°C)
V_0 = 1.3 V; R_0 = 32 mΩ

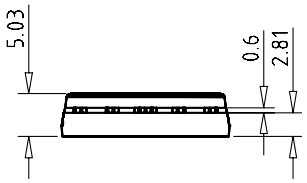
Thermal Response

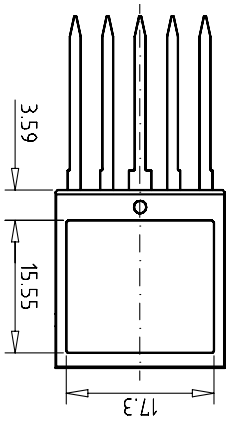


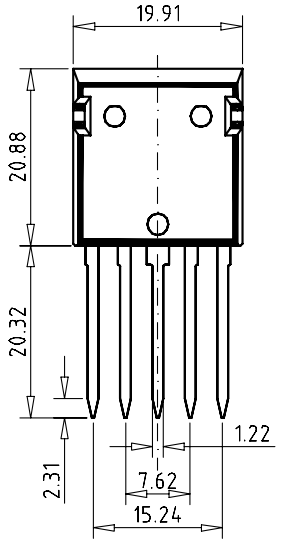
IGBT (typ.)
C_{th1} = 0.049 J/K; R_{th1} = 0.15 K/W
C_{th2} = 0.133 J/K; R_{th2} = 0.65 K/W

Free Wheeling Diode (typ.)
C_{th1} = 0.021 J/K; R_{th1} = 0.63 K/W
C_{th2} = 0.052 J/K; R_{th2} = 1.67 K/W

Dimensions in mm (1 mm = 0.0394")







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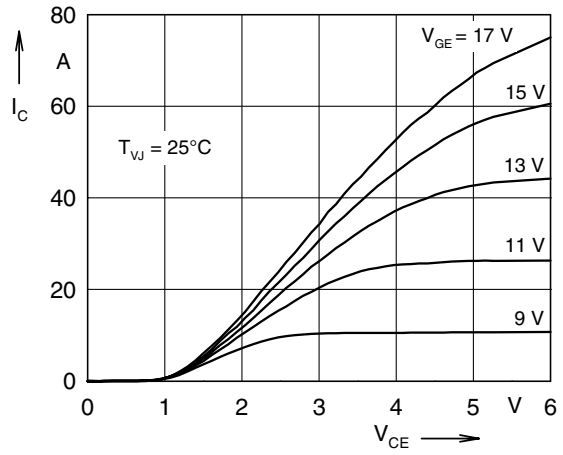

Fig. 1 Typ. output characteristics

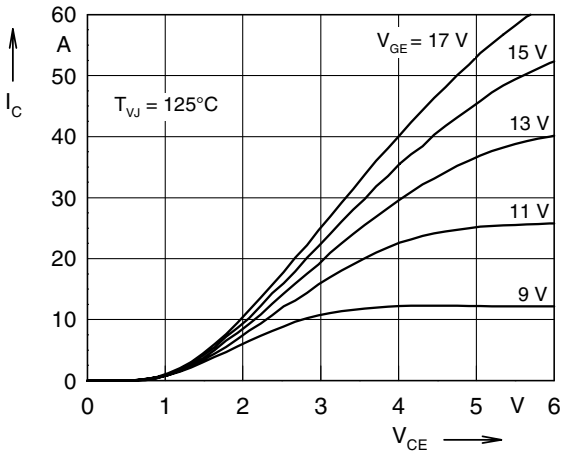

Fig. 2 Typ. output characteristics

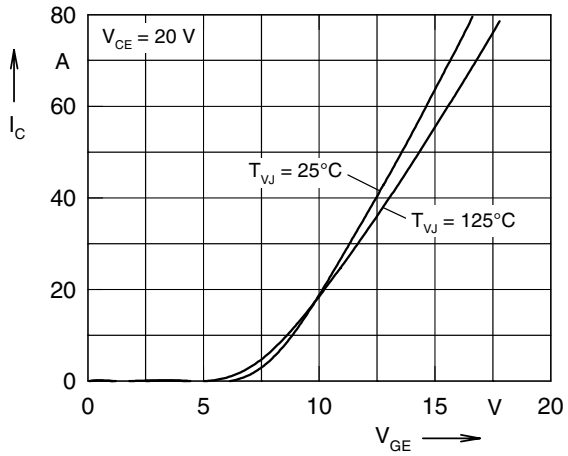

Fig. 3 Typ. transfer characteristics

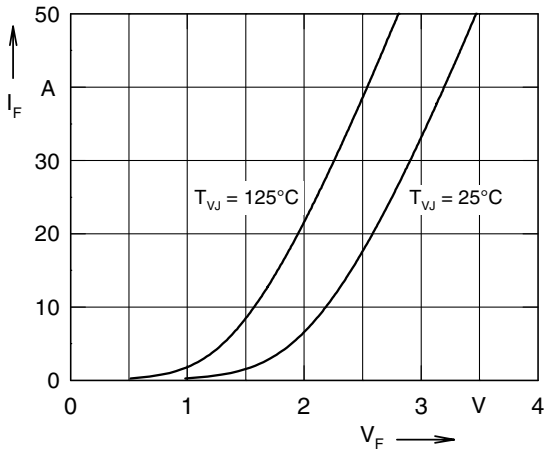

Fig. 4 Typ. forward characteristics of free wheeling diode

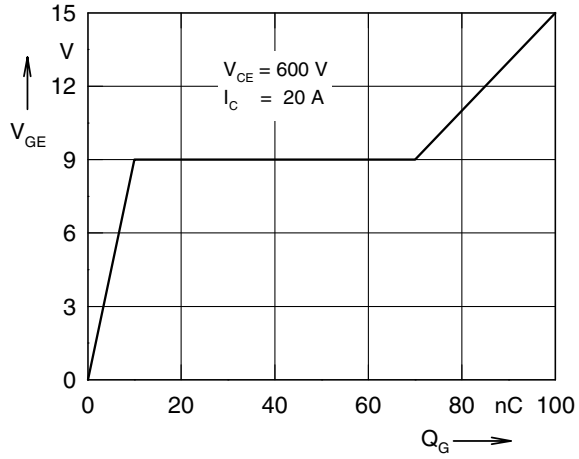

Fig. 5 Typ. turn on gate charge

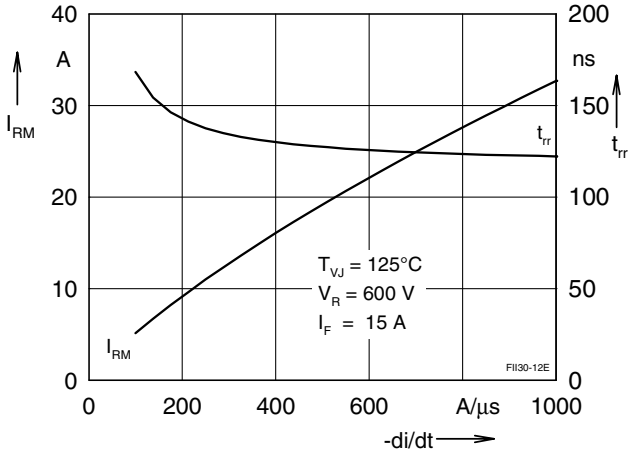

Fig. 6 Typ. turn off characteristics of free wheeling diode

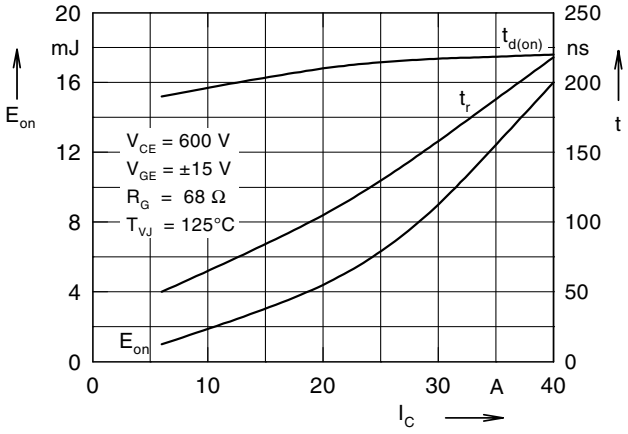

Fig. 7 Typ. turn on energy and switching times versus collector current

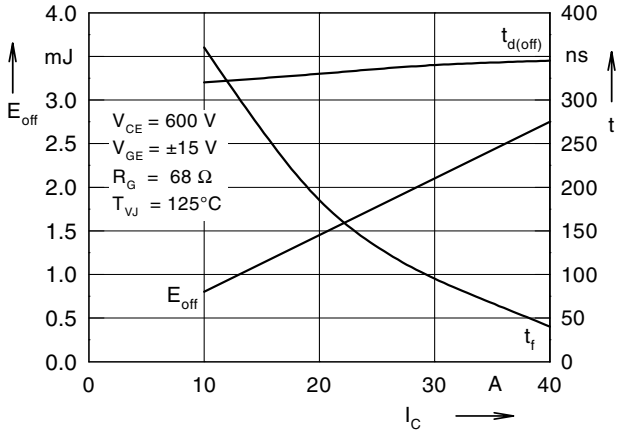

Fig. 8 Typ. turn off energy and switching times versus collector current

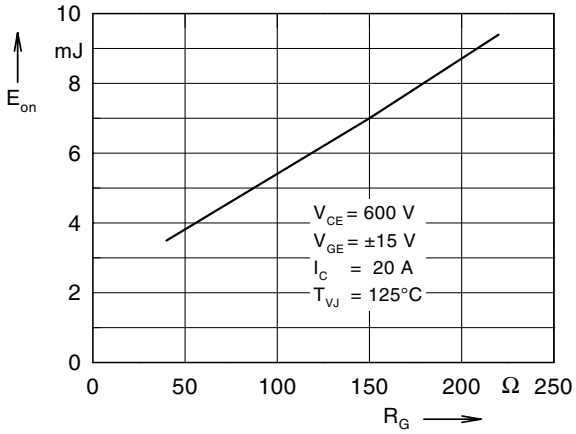

Fig. 9 Typ. turn on energy vs gate resistor

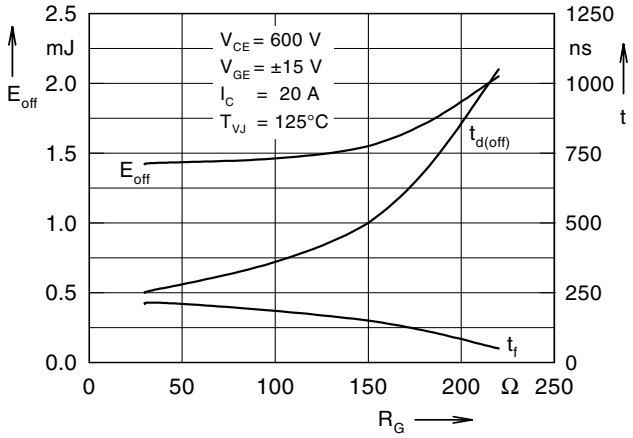

Fig.10 Typ. turn off energy and switching times versus gate resistor

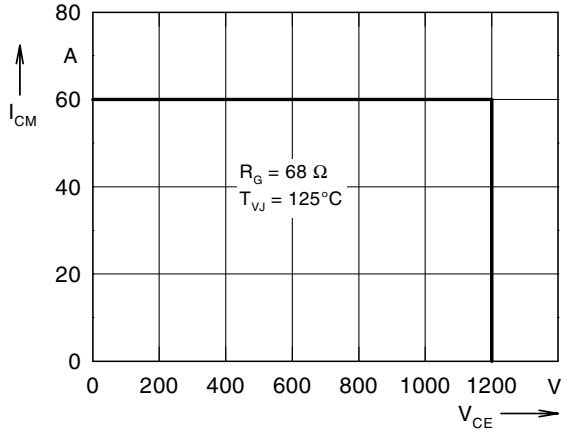

Fig. 11 Reverse biased safe operating area RBSOA

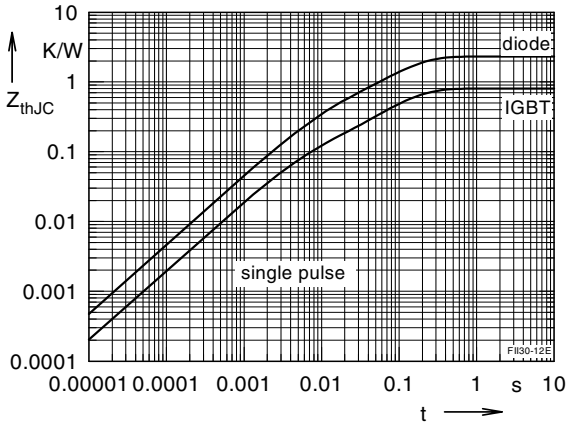

Fig. 12 Typ. transient thermal impedance