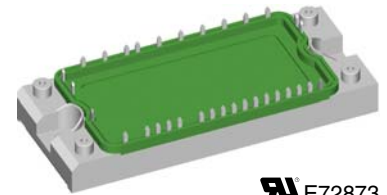
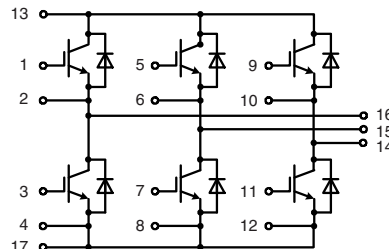


# IGBT Module

## Sixpack

Short Circuit SOA Capability  
Square RBSOA

$I_{C25} = 52 \text{ A}$   
 $V_{CES} = 1200 \text{ V}$   
 $V_{CE(sat) \text{ typ.}} = 1.9 \text{ V}$



**IXYS** E72873

See outline drawing for pin arrangement

### IGBTs

Symbol	Conditions	Maximum Ratings	
$V_{CES}$	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$	1200	V
$V_{GES}$		$\pm 20$	V
$I_{C25}$	$T_C = 25^{\circ}\text{C}$	52	A
$I_{C80}$	$T_C = 80^{\circ}\text{C}$	36	A
$I_{CM}$	$V_{GE} = \pm 15 \text{ V}; R_G = 39 \Omega; T_{VJ} = 125^{\circ}\text{C}$	70	A
$V_{CEK}$	RBSOA; clamped inductive load; $L = 100 \mu\text{H}$	$V_{CES}$	
$t_{SC}$	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 39 \Omega; T_{VJ} = 125^{\circ}\text{C}$ SCSOA; non-repetitive	10	$\mu\text{s}$
$P_{tot}$	$T_C = 25^{\circ}\text{C}$	225	W

### Features

- NPT<sup>3</sup> IGBTs
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance also in resonant circuits
- HiPerFRED<sup>TM</sup> diode:
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- Industry Standard Package
  - solderable pins for PCB mounting
  - isolated copper base plate

Symbol	Conditions	Characteristic Values ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{CE(sat)}$	$I_C = 25 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.9	2.4	V
		2.1		V
$V_{GE(th)}$	$I_C = 1 \text{ mA}; V_{GE} = V_{CE}$	4.5		6.5 V
$I_{CES}$	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	0.4		0.4 mA
$I_{GES}$	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$			200 nA
$t_{d(on)}$	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 600 \text{ V}; I_C = 25 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 39 \Omega$		80	ns
$t_r$			50	ns
$t_{d(off)}$			440	ns
$t_f$			50	ns
$E_{on}$			3.8	mJ
$E_{off}$		2.0	mJ	
$C_{ies}$	$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$		2	nF
$Q_{Gon}$	$V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 35 \text{ A}$		150	nC
$R_{thJC}$	(per IGBT)			0.55 K/W

### Typical Applications

- AC drives
- power supplies with power factor correction

## Maximum Ratings

Symbol	Conditions	Maximum Ratings	
$I_{F25}$	$T_C = 25^\circ\text{C}$	50	A
$I_{F80}$	$T_C = 80^\circ\text{C}$	33	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F$	$I_F = 25\text{ A}; V_{GE} = 0\text{ V}; T_{VJ} = 25^\circ\text{C}$	2.3	2.7	V
		1.7		V
$I_{RM}$ $t_{rr}$ $E_{rec(off)}$	$I_F = 30\text{ A}; di_F/dt = -1100\text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$ $V_R = 600\text{ V}; V_{GE} = 0\text{ V}$	51		A
		180		ns
		1.8		mJ
$R_{thJC}$	(per diode)			1.19 K/W

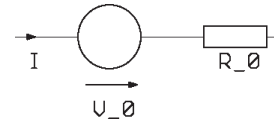
## Module

Symbol	Conditions	Maximum Ratings	
$T_{VJ}$		-40...+150	$^\circ\text{C}$
$T_{stg}$		-40...+125	$^\circ\text{C}$
$V_{ISOL}$	$I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}$	2500	V~
$M_d$	Mounting torque (M5)	2.7 - 3.3	Nm

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$R_{pin-chip}$			5	m $\Omega$
$d_s$	Creepage distance on surface	6		mm
$d_A$	Strike distance in air	6		mm
$R_{thCH}$	with heatsink compound		0.02	K/W
Weight			180	g

## Equivalent Circuits for Simulation

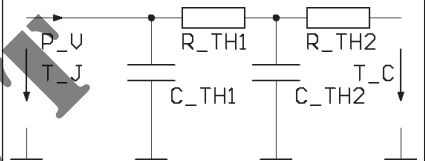
### Conduction



IGBT (typ. at  $V_{GE} = 15\text{ V}; T_J = 125^\circ\text{C}$ )  
 $V_0 = 0.95\text{ V}; R_0 = 48\text{ m}\Omega$

Free Wheeling Diode (typ. at  $T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.3\text{ V}; R_0 = 16.0\text{ m}\Omega$

### Thermal Response

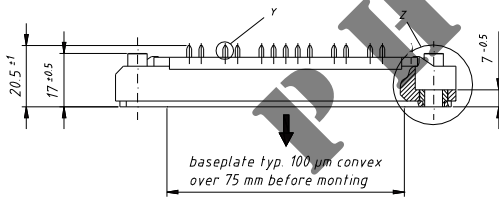


IGBT (typ.)

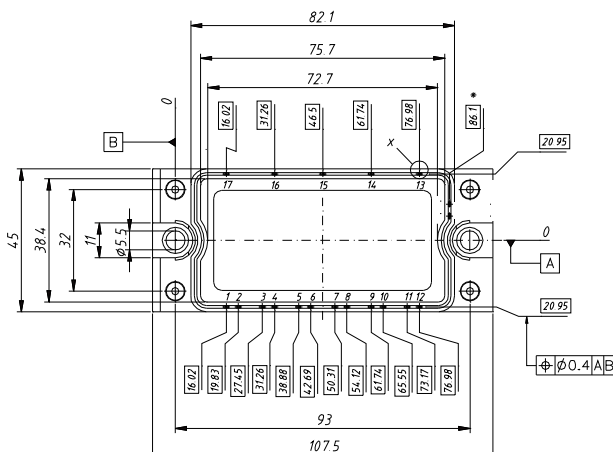
$C_{th1} = 0.129\text{ J/K}; R_{th1} = 0.415\text{ K/W}$   
 $C_{th2} = 1.279\text{ J/K}; R_{th2} = 0.135\text{ K/W}$

Free Wheeling Diode (typ.)

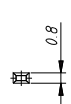
$C_{th1} = 0.069\text{ J/K}; R_{th1} = 0.956\text{ K/W}$   
 $C_{th2} = 0.847\text{ J/K}; R_{th2} = 0.234\text{ K/W}$



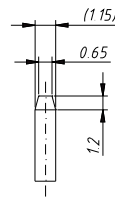
Dimensions in mm (1 mm = 0.0394")



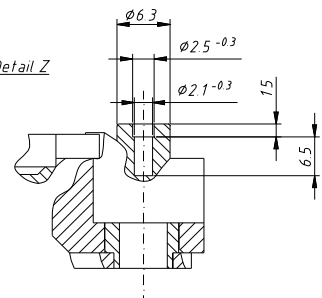
Detail X



Detail Y



Detail Z



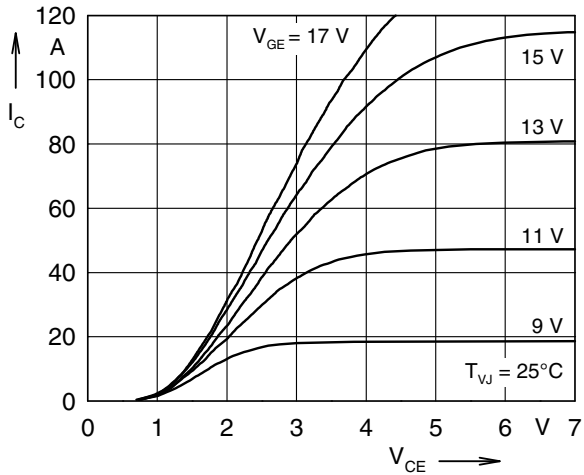


Fig. 1 Typ. output characteristics

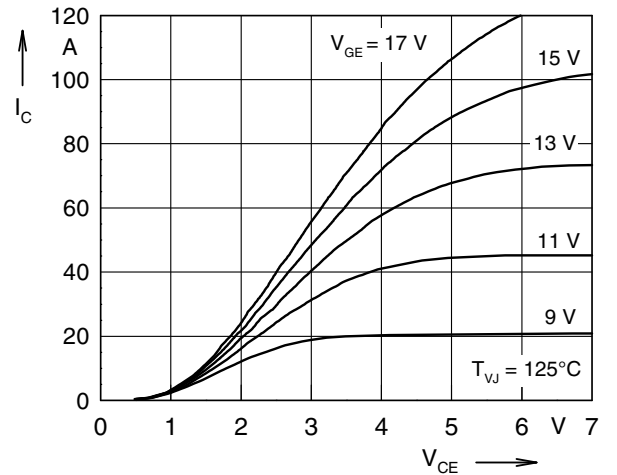


Fig. 2 Typ. output characteristics

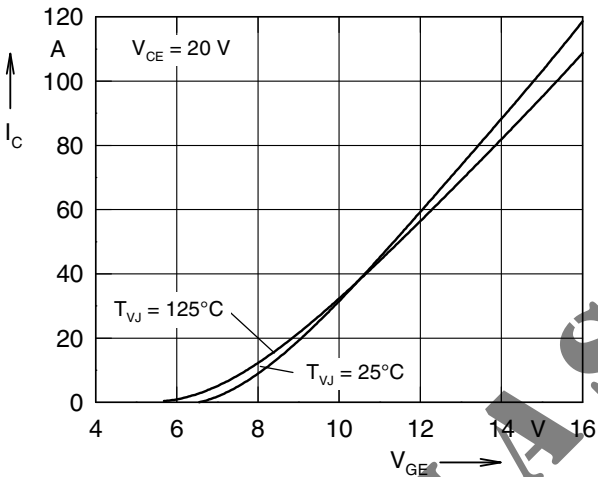


Fig. 3 Typ. transfer characteristics

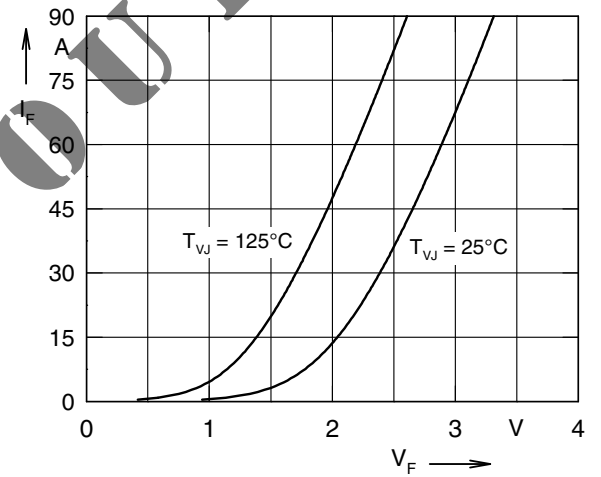


Fig. 4 Typ. forward characteristics of free wheeling diode

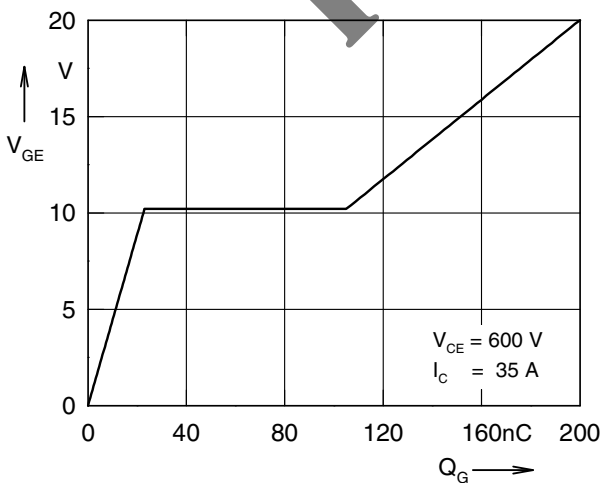


Fig. 5 Typ. turn on gate charge

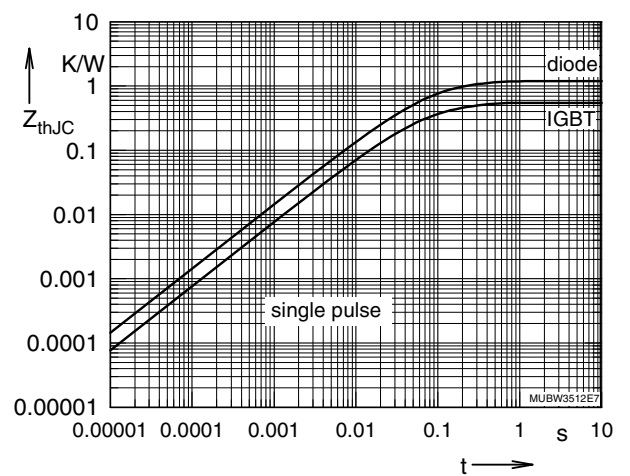


Fig. 6 Typ. transient thermal impedance

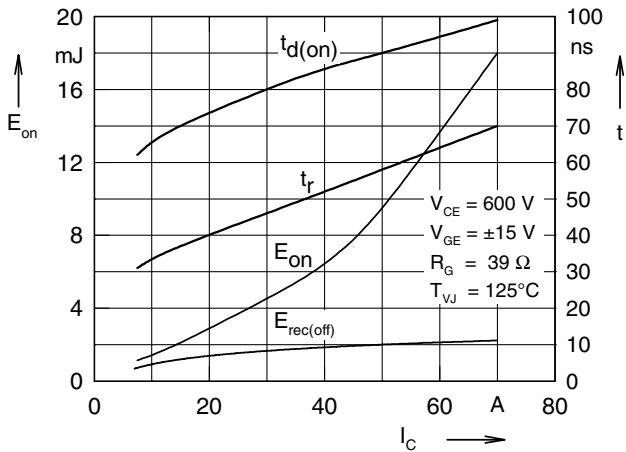


Fig. 7 Typ. turn on energy and switching times versus collector current

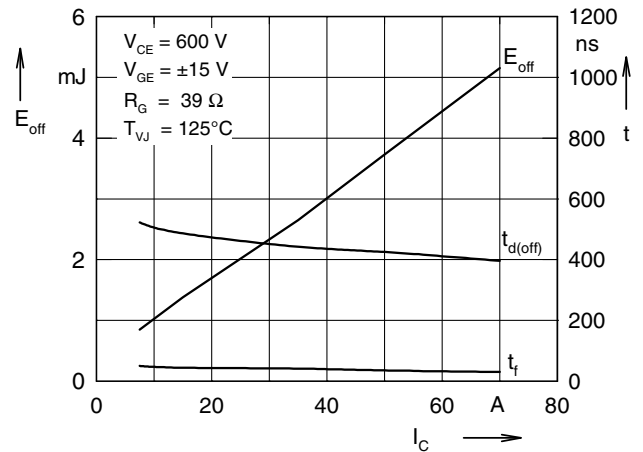


Fig. 8 Typ. turn off energy and switching times versus collector current

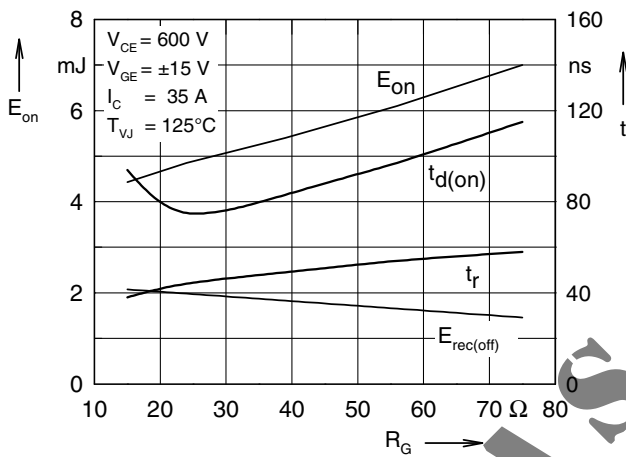


Fig. 9 Typ. turn on energy and switching times versus gate resistor

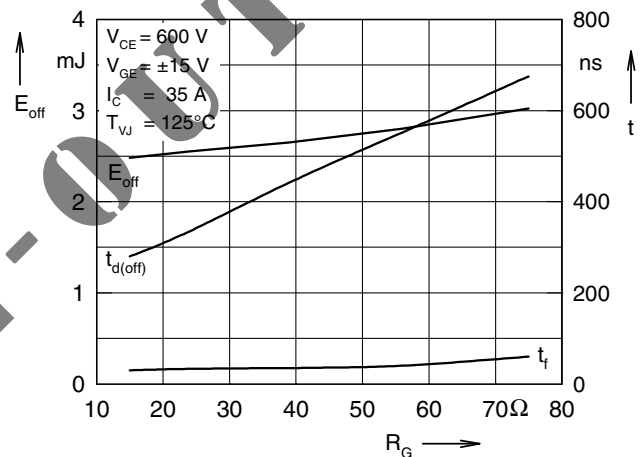


Fig. 10 Typ. turn off energy and switching times versus gate resistor

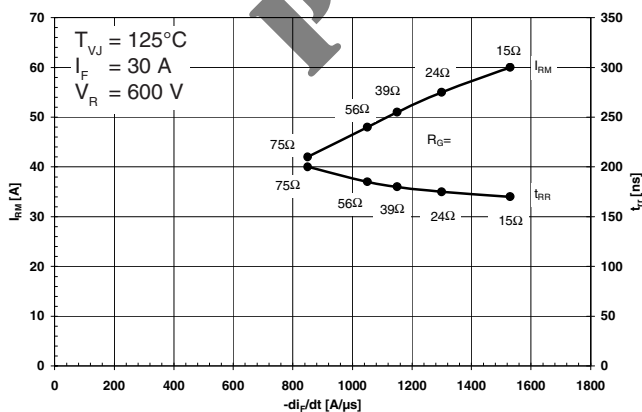


Fig. 11 Typ. turn off characteristics of free wheeling diode

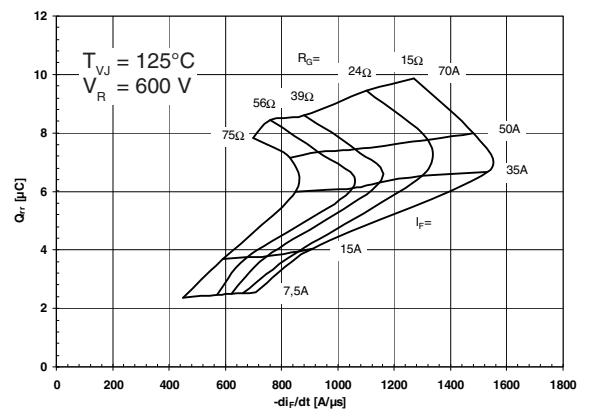


Fig. 12 Typ. turn off characteristics of free wheeling diode