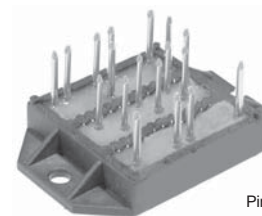
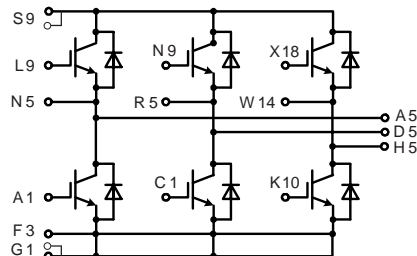


# IGBT Module

Sixpack in ECO-PAC 2

$I_{C25} = 31 \text{ A}$   
 $V_{CES} = 600 \text{ V}$   
 $V_{CE(sat)typ.} = 1.9 \text{ V}$



Pin arrangement see outlines

## IGBTs

Symbol	Conditions	Maximum Ratings	
$V_{CES}$	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$	600	V
$V_{GES}$		$\pm 20$	V
$I_{C25}$	$T_C = 25^{\circ}\text{C}$	31	A
$I_{C80}$	$T_C = 80^{\circ}\text{C}$	21	A
$I_{CM}$ $V_{CEK}$	$V_{GE} = \pm 15 \text{ V}; R_G = 47 \Omega; T_{VJ} = 125^{\circ}\text{C}$ RBSOA, Clamped inductive load; $L = 100 \mu\text{H}$	40	A
$t_{SC}$ (SCSOA)		$V_{CE} = 600 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 47 \Omega; T_{VJ} = 125^{\circ}\text{C}$ non-repetitive	10
$P_{tot}$	$T_C = 25^{\circ}\text{C}$	100	W

## Features

- NPT IGBT's
  - positive temperature coefficient of saturation voltage
  - fast switching
- FRED diodes
  - fast reverse recovery
  - low forward voltage
- Industry Standard Package
  - solderable pins for PCB mounting
  - isolated DCB ceramic base plate

## Typical Applications

- AC drives
- power supplies with power factor correction

Symbol	Conditions	Characteristic Values ( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{CE(sat)}$	$I_C = 20 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.9	2.2	V
$V_{GE(th)}$	$I_C = 0.5 \text{ mA}; V_{GE} = V_{CE}$	4.5		6.5 V
$I_{CES}$	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	0.7		0.6 mA mA
$I_{GES}$	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$			100 nA
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 300 \text{ V}; I_C = 10 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 82 \Omega$	50		ns
$E_{on}$		55		ns
$E_{off}$		300		ns
		30		ns
		0.9		mJ
$C_{ies}$	$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$	1100		pF
$Q_{Gon}$	$V_{CE} = 300 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 20 \text{ A}$	65		nC
$R_{thJC}$ $R_{thJH}$	(per IGBT) with heatsink compound (0.42 K/m.K; 50 $\mu\text{m}$ )	2.5		1.3 KW KW

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**Diodes**

Symbol	Conditions	Maximum Ratings	
$I_{F25}$	$T_C = 25^\circ\text{C}$	35	A
$I_{F80}$	$T_C = 80^\circ\text{C}$	22	A

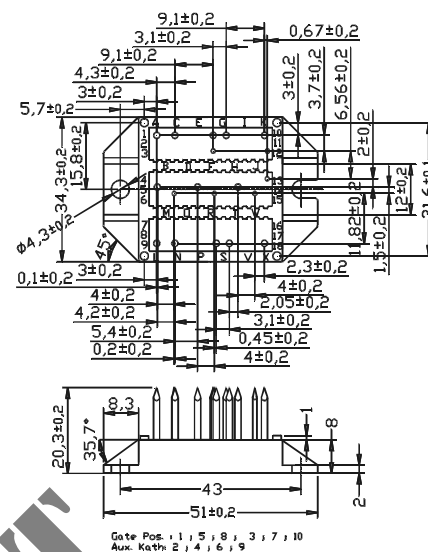
Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F$	$I_F = 20\text{ A}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$	1.9	2.1	V
$I_{RM}$ $t_{rr}$	} $I_F = 15\text{ A}; di_F/dt = -400\text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$ $V_R = 300\text{ V}; V_{GE} = 0\text{ V}$	13		A
		90		ns
$R_{thJC}$ $R_{thJH}$	with heatsink compound (0.42 K/m.K; 50 $\mu\text{m}$ )	4.6		2.3 K/W K/W

Data according to IEC 60747 and refer to a single diode unless otherwise stated.

**Component**

Symbol	Conditions	Maximum Ratings	
$T_{VJ}$		-40...+150	$^\circ\text{C}$
$T_{stg}$		-40...+125	$^\circ\text{C}$
$V_{ISOL}$	$I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz}; t = 1\text{ s}$	3600	V~
$M_d$	mounting torque (M4)	1.5 - 2.0	Nm lb.in.
$a$	Max. allowable acceleration	50	$\text{m/s}^2$

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$d_s$	Creepage distance on surface (Pin to heatsink)	11.2		mm
$d_A$	Strike distance in air (Pin to heatsink)	11.2		mm
Weight		24		g

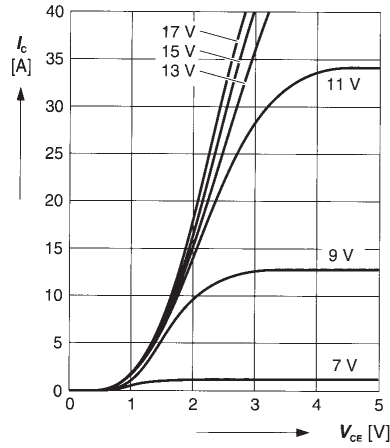
**Dimensions in mm (1 mm = 0.0394")**


## IGBT

### Typ. output characteristics

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

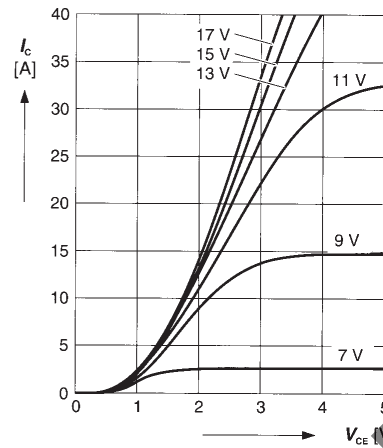
parameter:  $t_p = 250 \mu s$ ;  $T_j = 25^\circ C$



### Typ. output characteristics

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

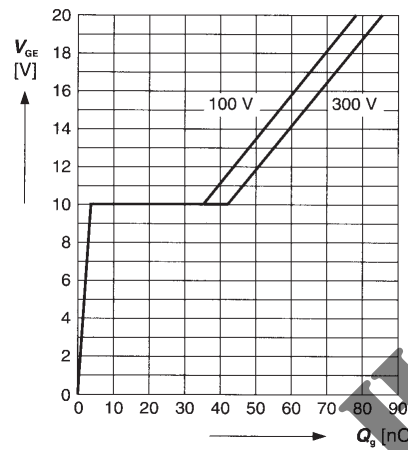
parameter:  $t_p = 250 \mu s$ ;  $T_j = 125^\circ C$



### Typ. gate charge

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

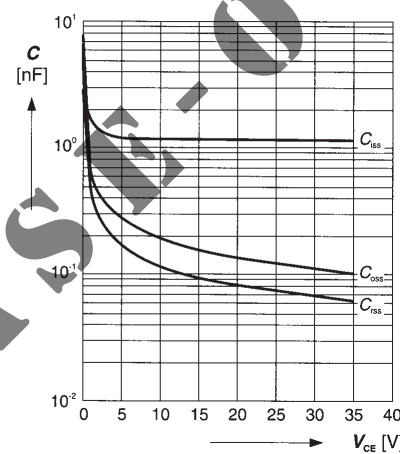
parameter:  $I_{C,puls} = 20 A$



### Typ. capacitances

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

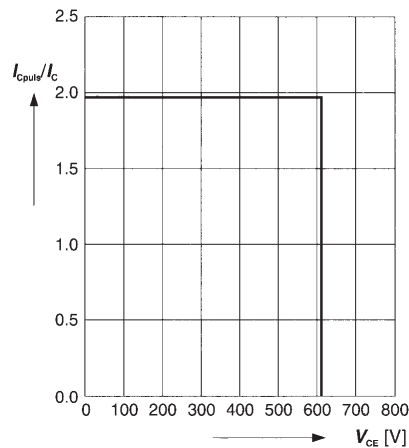
parameter:  $V_{GE} = 0 V$ ;  $f = 1 MHz$



### Reverse biased safe operating area

$$I_{C,puls} = f(V_{CE}), T_j = 150^\circ C$$

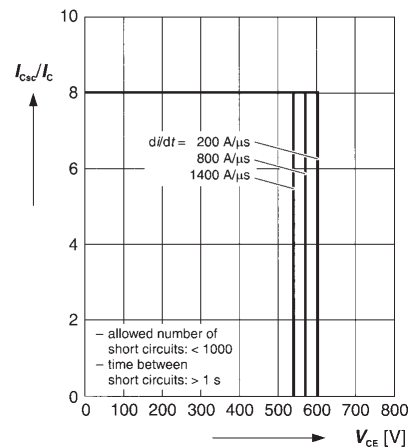
parameter:  $V_{GE} = 15 V$



### Short circuit safe operating area

$$I_{C,sc} = f(V_{CE}), T_j = 150^\circ C$$

parameter:  $V_{GE} = \pm 15 V$ ;  $t_{sc} \le 10 \mu s$ ;  $L < 50 nH$

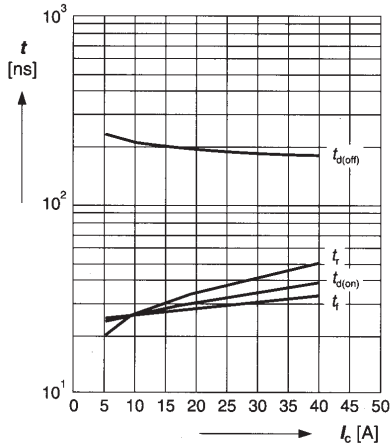


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## IGBT

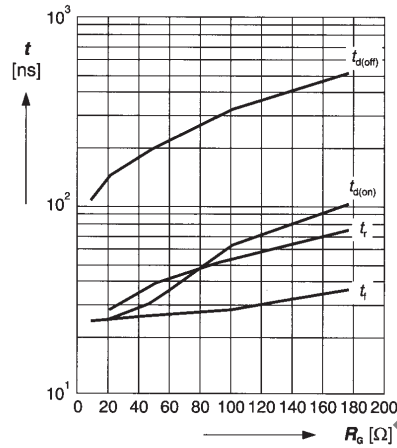
### Typ. switching time

$t = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 47\ \Omega$



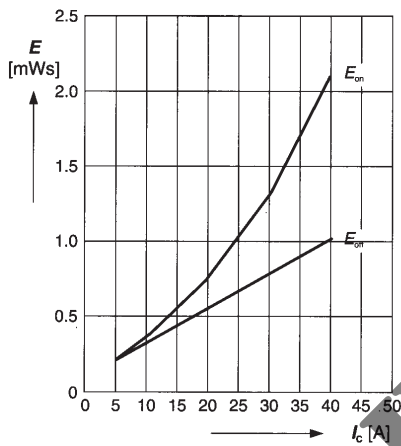
### Typ. switching time

$t = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $I_C = 20\text{ A}$



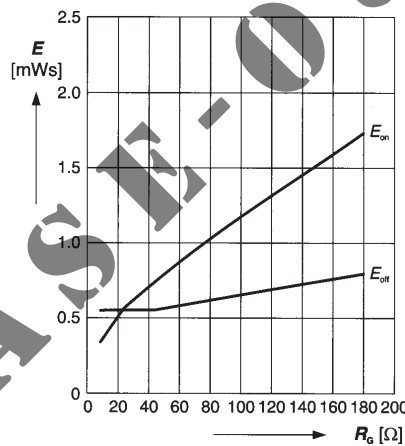
### Typ. switching losses

$E = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 47\ \Omega$

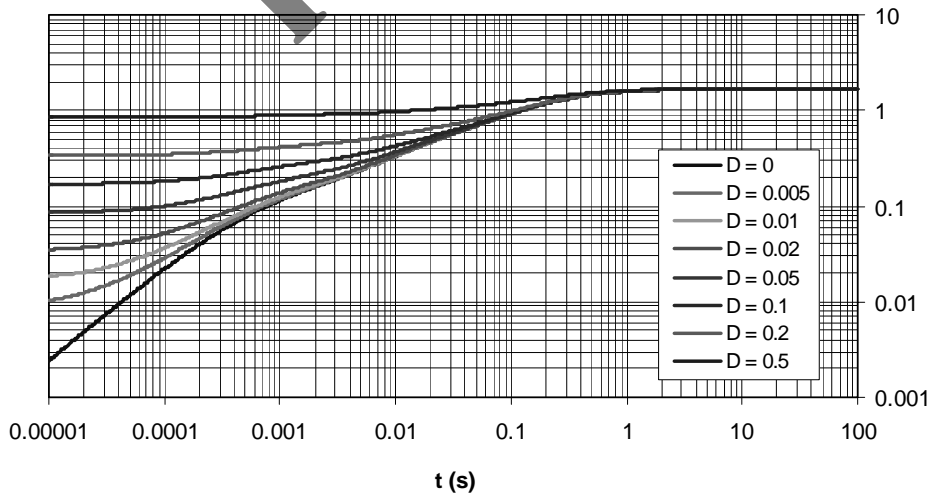


### Typ. switching losses

$E = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $I_C = 20\text{ A}$

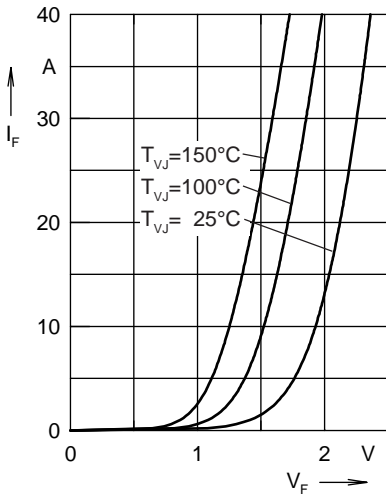


### Transient thermal resistance junction to heatsink

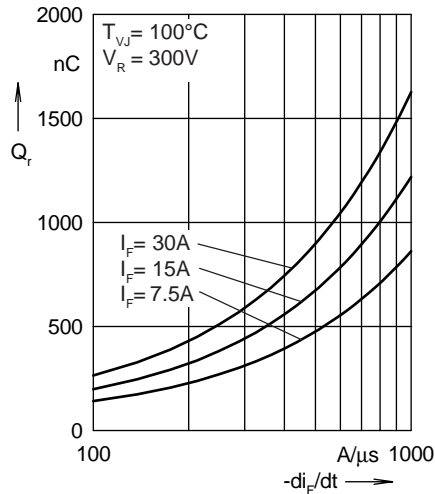


IGBT  
 $Z_{thjH} [K/W]$

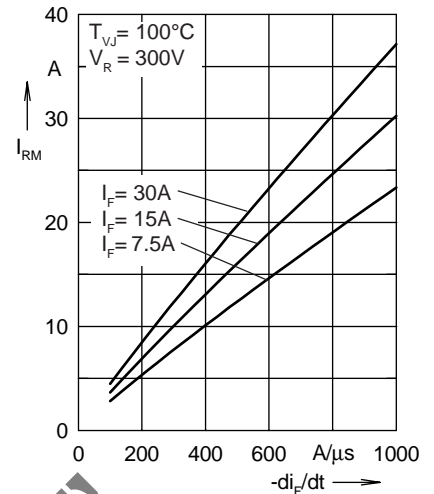
**Diode**



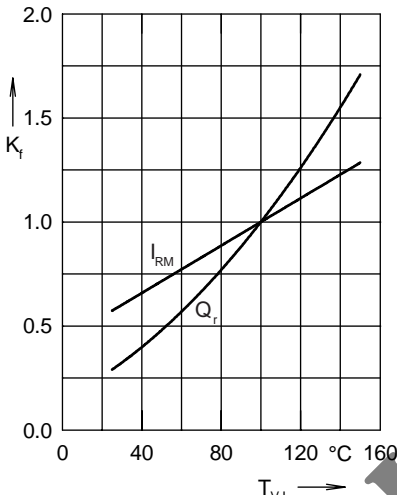
Forward current  $I_F$  versus  $V_F$



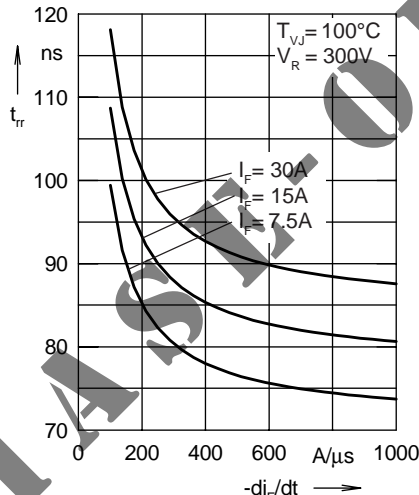
Reverse recovery charge  $Q_r$  versus  $-di_F/dt$



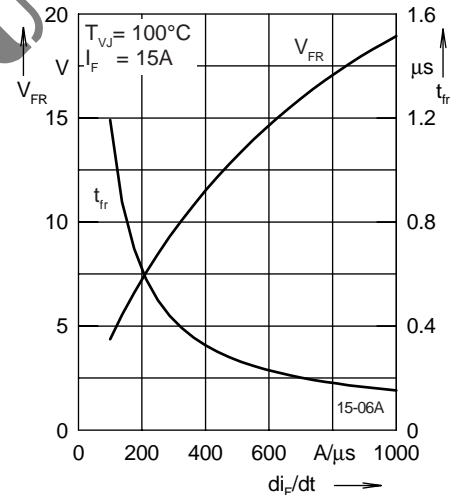
Peak reverse current  $I_{RM}$  versus  $-di_F/dt$



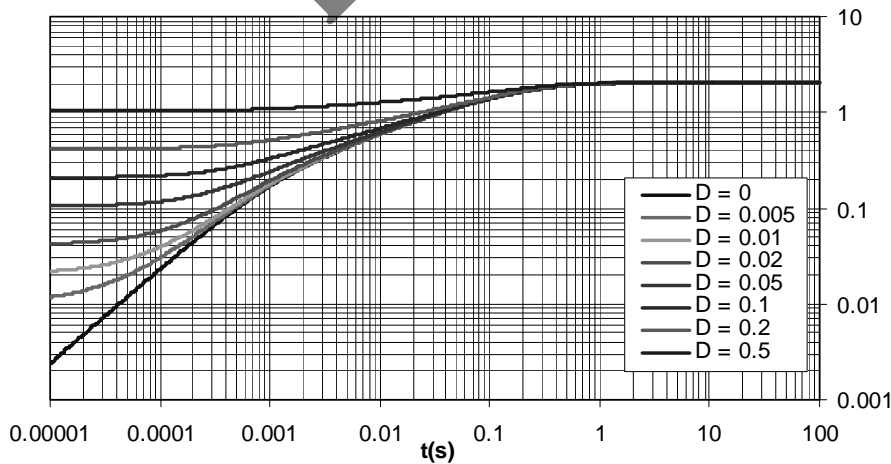
Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$



Recovery time  $t_{rr}$  versus  $-di_F/dt$



Peak forward voltage  $V_{FR}$  and  $t_{rr}$  versus  $di_F/dt$



Transient thermal resistance junction to heatsink

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