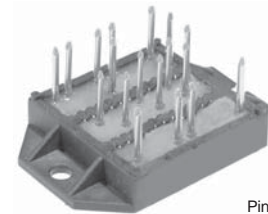
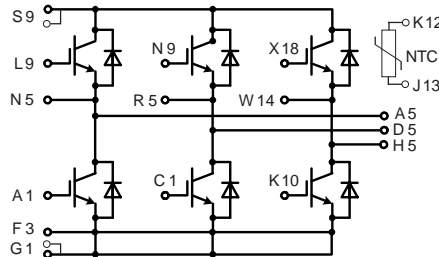


# IGBT Module

Sixpack in ECO-PAC 2

$I_{C25} = 19 \text{ A}$   
 $V_{CES} = 600 \text{ V}$   
 $V_{CE(sat) \text{ typ.}} = 1.9 \text{ V}$

Preliminary data



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
$I_{C25}$	$T_C = 25^{\circ}\text{C}$	19	A
$I_{C80}$	$T_C = 80^{\circ}\text{C}$	14	A
$I_{CM}$ $V_{CEK}$	$V_{GE} = \pm 15 \text{ V}; R_G = 82 \Omega; T_{VJ} = 125^{\circ}\text{C}$ RBSOA, Clamped inductive load; $L = 100 \mu\text{H}$	20	A
		$V_{CES}$	
$t_{SC}$ (SCSOA)	$V_{CE} = 720 \text{ V}; V_{GE} = \pm 15 \text{ V}; R_G = 82 \Omega; T_{VJ} = 125^{\circ}\text{C}$ non-repetitive	10	$\mu\text{s}$
$P_{tot}$	$T_C = 25^{\circ}\text{C}$	73	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.
$V_{CE(sat)}$	$I_C = 10 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.9 2.2	V V
$V_{GE(th)}$	$I_C = 0.35 \text{ mA}; V_{GE} = V_{CE}$	4.5		6.5 V
$I_{CES}$	$V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		2.7	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, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 300 \text{ V}; I_C = 10 \text{ A}$ $V_{GE} = \pm 15 \text{ V}; R_G = 82 \Omega$		35	ns
$E_{on}$			35	ns
$E_{off}$			230	ns
			30	ns
			0.4	mJ
$C_{ies}$	$V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$		600	pF
$Q_{Gon}$	$V_{CE} = 300 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 10 \text{ A}$		39	nC
$R_{thJC}$ $R_{thJH}$	(per IGBT) with heatsink compound ( $0.42 \text{ K/m.K}; 50 \mu\text{m}$ )		3.4	1.7 KW KW

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**Diodes**

Symbol	Conditions	Maximum Ratings	
$I_{F25}$	$T_C = 25^\circ\text{C}$	21	A
$I_{F80}$	$T_C = 80^\circ\text{C}$	14	A

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F$	$I_F = 10\text{ A}; T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$	1.9	2.1	V
$I_{RM}$ $t_{rr}$	$I_F = 10\text{ A}; di_F/dt = -400\text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$ $V_R = 300\text{ V}; V_{GE} = 0\text{ V}$	11		A
		80		ns
$R_{thJC}$ $R_{thJH}$	with heatsink compound (0.42 K/m.K; 50 $\mu\text{m}$ )	7.0		3.5 K/W K/W

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

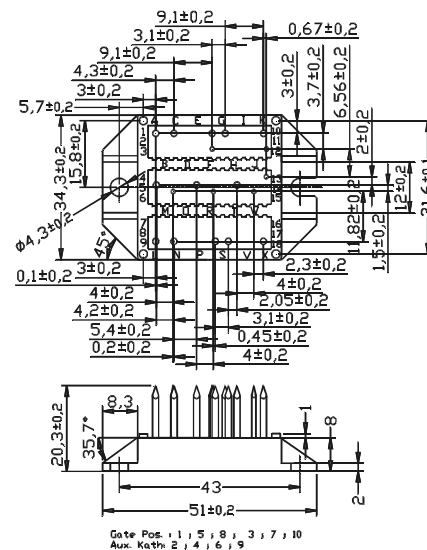
**Temperature Sensor NTC**

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$R_{25}$	$T = 25^\circ\text{C}$	4.75	5.0	5.25 k $\Omega$
$B_{25/50}$			3375	K

**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 14 - 18 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
<b>Weight</b>		24		g

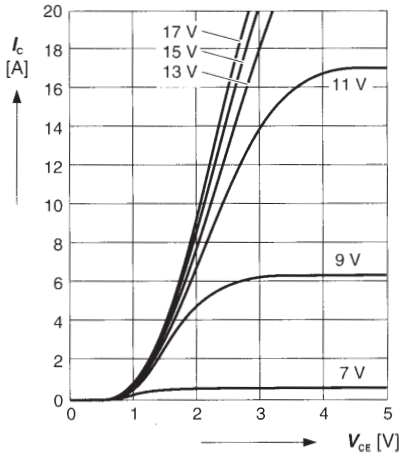
**Dimensions in mm (1 mm = 0.0394")**


**IGBT**

**Typ. output characteristics**

$I_C = f(V_{CE})$

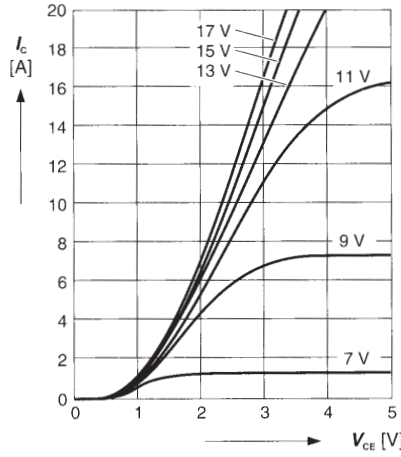
parameter:  $t_b = 250 \mu s; T_j = 25^\circ C$



**Typ. output characteristics**

$I_C = f(V_{CE})$

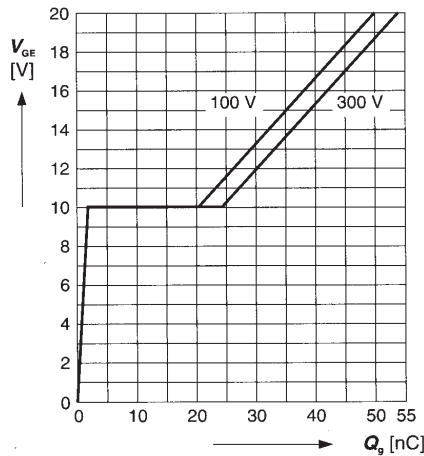
parameter:  $t_b = 250 \mu s; T_j = 125^\circ C$



**Typ. gate charge**

$V_{GE} = f(Q_g)$

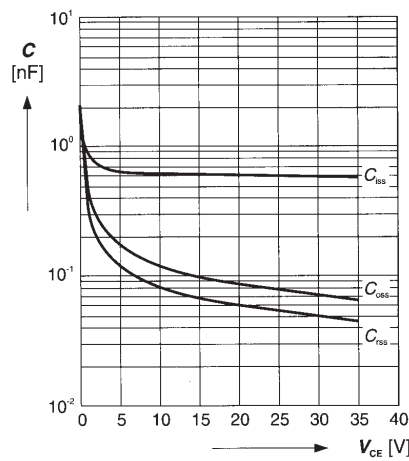
parameter:  $I_{C\ puls} = 10\ A$



**Typ. capacitances**

$C = f(V_{CE})$

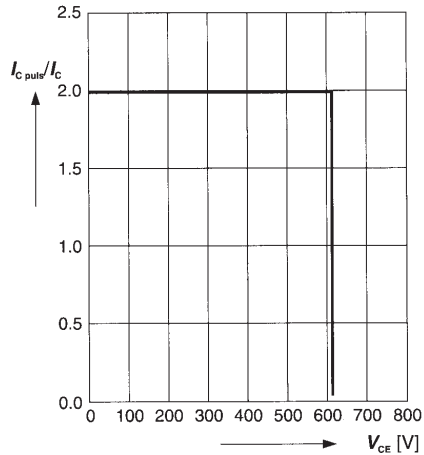
parameter:  $V_{GE} = 0\ V; f = 1\ MHz$



**Reverse biased safe operating area**

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

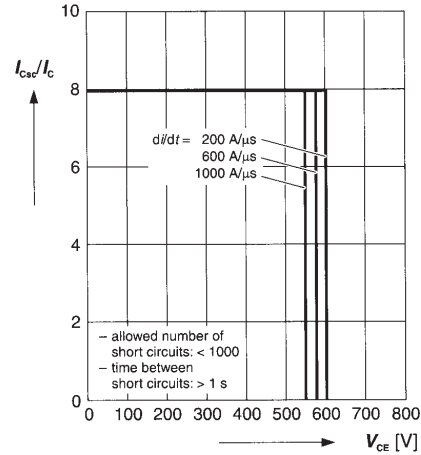
parameter:  $V_{GE} = 15\ V$



**Short circuit safe operating area**

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

parameter:  $V_{GE} = \pm 15\ V; t_{sc} \le 10\ \mu s; L < 60\ nH$

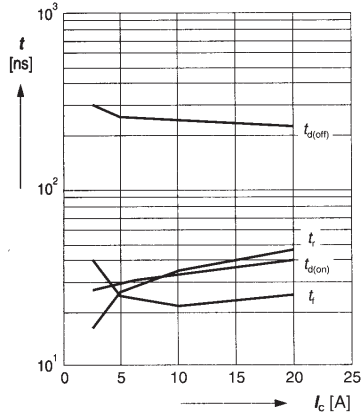


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## IGBT

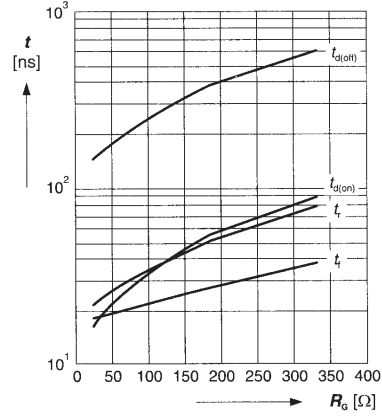
**Typ. switching time**

$t = f(I_c)$ , inductive load,  $T_j = 125\text{ }^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 100\ \Omega$



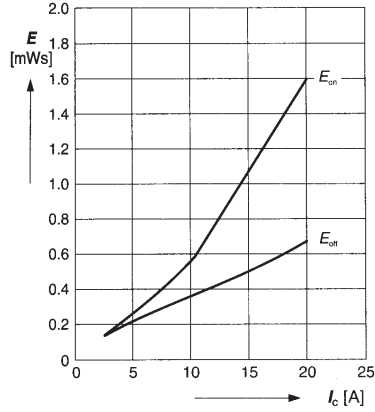
**Typ. switching time**

$t = f(R_G)$ , inductive load,  $T_j = 125\text{ }^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $I_C = 10\text{ A}$



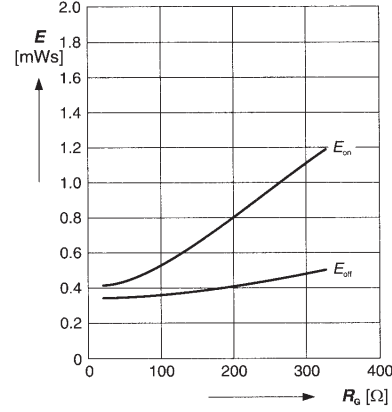
**Typ. switching losses**

$E = f(I_c)$ , inductive load,  $T_j = 125\text{ }^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $R_G = 100\ \Omega$

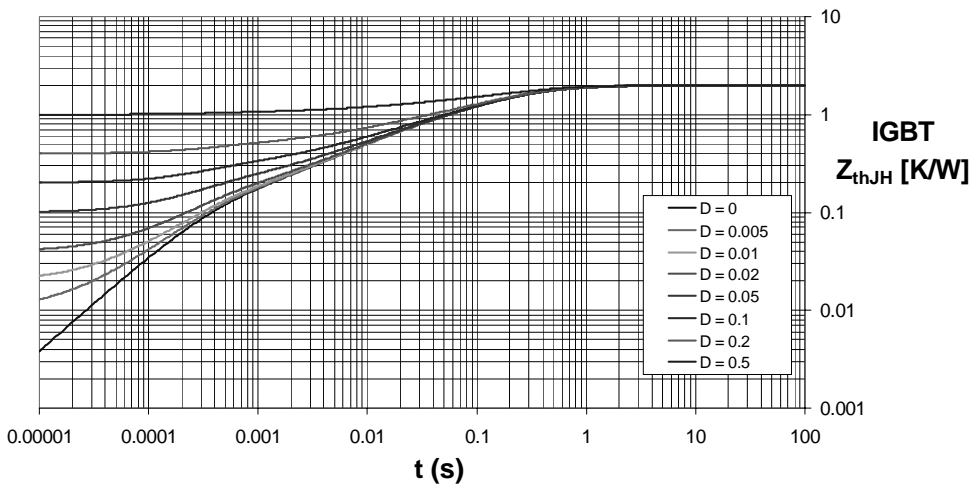


**Typ. switching losses**

$E = f(R_G)$ , inductive load,  $T_j = 125\text{ }^\circ\text{C}$   
 parameter:  $V_{CE} = 300\text{ V}$ ;  $V_{GE} = \pm 15\text{ V}$ ;  $I_C = 10\text{ A}$

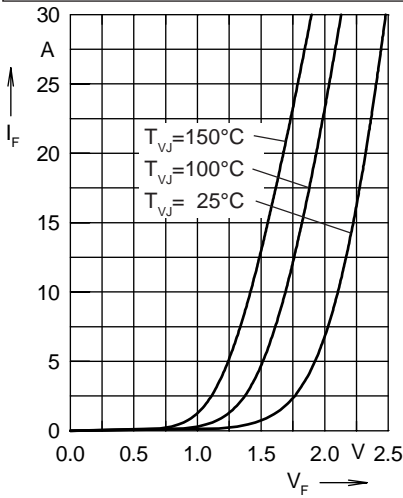


Transient thermal resistance junction to heatsink

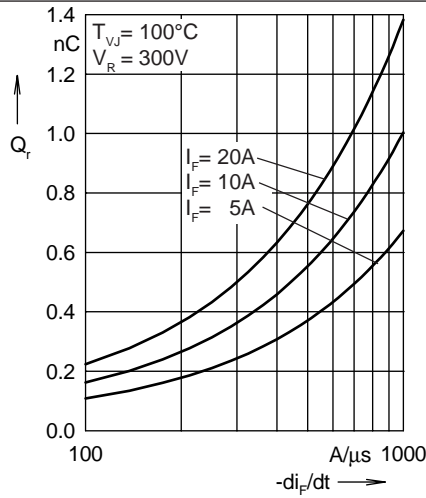


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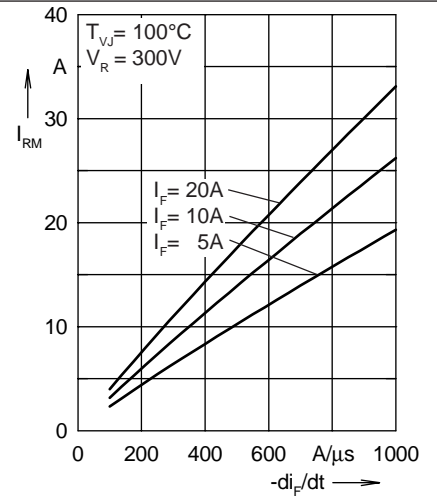
## Diode



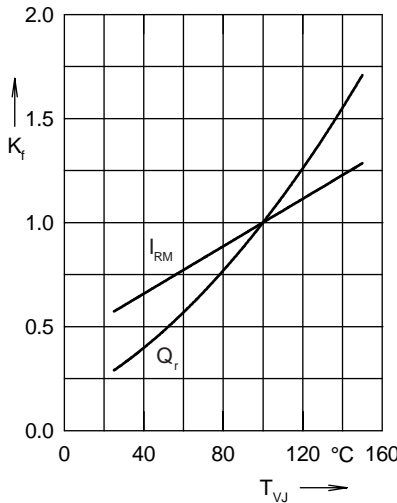
Forward current  $I_F$  versus  $V_F$



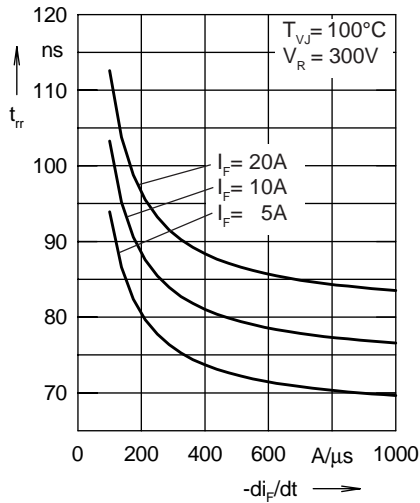
Reverse recovery charge  $Q_r$  versus  $-di_F/dt$



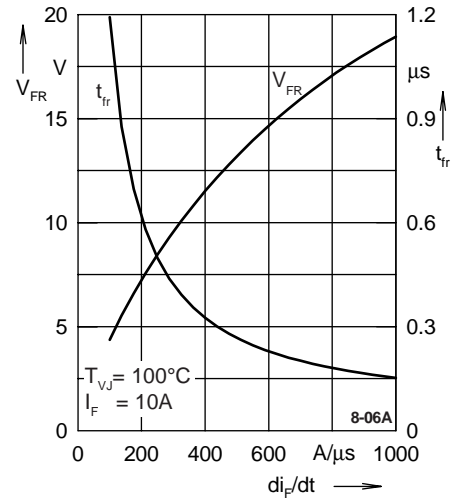
Peak reverse current  $I_{RM}$  versus  $-di_F/dt$



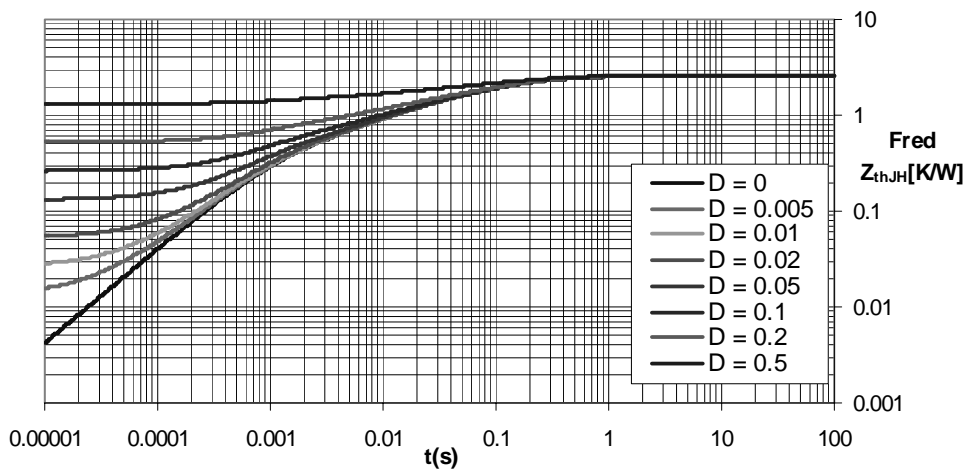
Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$



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



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



Transient thermal resistance junction to heatsink

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