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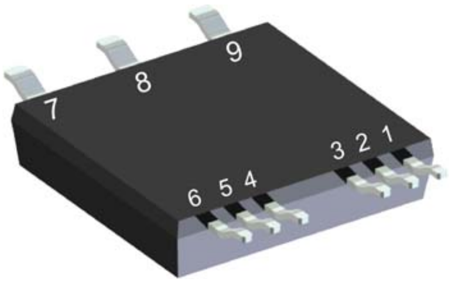
# XPT IGBT

$V_{CES}$ = 2x 1200 V
$I_{C25}$ = 28 A
$V_{CE(sat)}$ = 1.8 V

## ISOPLUS™
## Surface Mount Power Device
## Phase leg SCR / IGBT

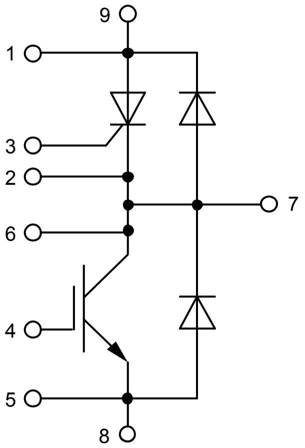
**Part number**

IXA20PT1200LB



Backside: isolated

E326641



**Features / Advantages:**

- XPT IGBT
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance in resonant circuits
- Sonic™ diode
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
  - low temperature dependency of reverse recovery
- Thyristor

**Applications:**

- Phaseleg
  - buck-boost chopper
- Full bridge
  - power supplies
  - induction heating
  - four quadrant DC drives
  - controlled rectifier
- Three phase bridge
  - AC drives
  - controlled rectifier

**Package:** SMPD

- Isolation Voltage: 3000 V~
- Industry convenient outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Backside: DCB ceramic
- Reduced weight
- Advanced power cycling

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## IGBT

| Symbol | Definition | Conditions | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| | | | | min. | typ. | max. | Unit |
| $V_{CES}$ | *collector emitter voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $V_{GES}$ | *max. DC gate voltage* | | | | | ±20 | V |
| $V_{GEM}$ | *max. transient gate emitter voltage* | | | | | tbd | V |
| $I_{C25}$ | *collector current* | | $T_C$ = 25°C | | | 28 | A |
| $I_{C80}$ | | | $T_C$ = 80°C | | | 20 | A |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 100 | W |
| $V_{CE(sat)}$ | *collector emitter saturation voltage* | $I_C$ = 15A; $V_{GE}$ = 15 V | $T_{VJ}$ = 25°C | | 1.8 | 2.1 | V |
| | | | $T_{VJ}$ = 125°C | | 2 | | V |
| $V_{GE(th)}$ | *gate emitter threshold voltage* | $I_C$ = 0.6 mA; $V_{GE}$ = $V_{CE}$ | $T_{VJ}$ = 25°C | 5.4 | 5.9 | 6.5 | V |
| $I_{CES}$ | *collector emitter leakage current* | $V_{CE}$ = $V_{CES}$; $V_{GE}$ = 0 V | $T_{VJ}$ = 25°C | | | 0.1 | mA |
| | | | $T_{VJ}$ = 125°C | | 0.1 | | mA |
| $I_{GES}$ | *gate emitter leakage current* | $V_{GE}$ = ±20 V | | | | 500 | nA |
| $Q_{G(on)}$ | *total gate charge* | $V_{CE}$ = 600 V; $V_{GE}$ = 15 V; $I_C$ = 15 A | | | 48 | | nC |
| $t_{d(on)}$ | *turn-on delay time* | inductive load<br>$V_{CE}$ = 600 V; $I_C$ = 15 A<br>$V_{GE}$ = ±15 V; $R_G$ = 56 Ω | $T_{VJ}$ = 125°C | | 70 | | ns |
| $t_r$ | *current rise time* | | | | 40 | | ns |
| $t_{d(off)}$ | *turn-off delay time* | | | | 250 | | ns |
| $t_f$ | *current fall time* | | | | 100 | | ns |
| $E_{on}$ | *turn-on energy per pulse* | | | | 1.55 | | mJ |
| $E_{off}$ | *turn-off energy per pulse* | | | | 1.7 | | mJ |
| RBSOA | *reverse bias safe operating area* | $V_{GE}$ = ±15 V; $R_G$ = 56 Ω<br>$V_{CEmax}$ = 1200 V | $T_{VJ}$ = 125°C | | | | |
| $I_{CM}$ | | | | | | 45 | A |
| SCSOA | *short circuit safe operating area* | $V_{CEmax}$ = 1200 V<br>$V_{CE}$ = 900 V; $V_{GE}$ = ±15 V<br>$R_G$ = 56 Ω; non-repetitive | $T_{VJ}$ = 125°C | | | | |
| $t_{SC}$ | *short circuit duration* | | | | | 10 | µs |
| $I_{SC}$ | *short circuit current* | | | | 60 | | A |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 1.25 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.40 | | K/W |

## Diode

| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | *max. repetitive reverse voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $I_{F25}$ | *forward current* | | $T_C$ = 25°C | | | 32 | A |
| $I_{F80}$ | | | $T_C$ = 80°C | | | 22 | A |
| $V_F$ | *forward voltage* | $I_F$ = 20A | $T_{VJ}$ = 25°C | | | 2.24 | V |
| | | | $T_{VJ}$ = 125°C | | 1.90 | | V |
| $I_R$ | *reverse current* | $V_R$ = $V_{RRM}$ | $T_{VJ}$ = 25°C | | | 0.03 | mA |
| | | | $T_{VJ}$ = 125°C | | 0.12 | | mA |
| $Q_{rr}$ | *reverse recovery charge* | $V_R$ = 600 V<br>-$di_F$/dt = 400 A/µs<br>$I_F$ = 20 A; $V_{GE}$ = 0 V | $T_{VJ}$ = 125°C | | 3 | | µC |
| $I_{RM}$ | *max. reverse recovery current* | | | | 20 | | A |
| $t_{rr}$ | *reverse recovery time* | | | | 350 | | ns |
| $E_{rec}$ | *reverse recovery energy* | | | | 0.7 | | mJ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 1.5 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.5 | | K/W |

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## Thyristor

| | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| $V_{RSM/DSM}$ | *max. non-repetitive reverse/forward blocking voltage* | | $T_{VJ}$ = 25°C | | | 1300 | V |
| $V_{RRM/DRM}$ | *max. repetitive reverse/forward blocking voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $I_{R/D}$ | *reverse current, drain current* | $V_{R/D}$ = 1200 V | $T_{VJ}$ = 25°C | | | 50 | µA |
| | | $V_{R/D}$ = 1200 V | $T_{VJ}$ = 125°C | | | 5 | mA |
| $V_T$ | *forward voltage drop* | $I_T$ = 15 A | $T_{VJ}$ = 25°C | | | 1.42 | V |
| | | $I_T$ = 30 A | | | | 1.77 | V |
| | | $I_T$ = 15 A | $T_{VJ}$ = 125°C | | | 1.37 | V |
| | | $I_T$ = 30 A | | | | 1.86 | V |
| $I_{TAV}$ | *average forward current* | $T_C$ = 80°C | $T_{VJ}$ = 150°C | | | 18 | A |
| $I_{T(RMS)}$ | *RMS forward current* | 180 sine | | | | 28 | A |
| $V_{T0}$ | *threshold voltage* | *for power loss calculation only* | $T_{VJ}$ = 150°C | | | 0.87 | V |
| $r_T$ | *slope resistance* | | | | | 32.9 | mΩ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 1.7 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.57 | | K/W |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 74 | W |
| $I_{TSM}$ | *max. forward surge current* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 200 | A |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 215 | A |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 170 | A |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 185 | A |
| I²t | *value for fusing* | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 45°C | | | 200 | A²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 190 | A²s |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ}$ = 150°C | | | 145 | A²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R$ = 0 V | | | 140 | A²s |
| $C_J$ | *junction capacitance* | $V_R$ = 0 V f = 1 MHz | $T_{VJ}$ = 25°C | | 0 | | pF |
| $P_{GM}$ | *max. gate power dissipation* | $t_P$ = 30 µs | $T_C$ = 150°C | | | 10 | W |
| | | $t_P$ = 300 µs | | | | 5 | W |
| $P_{GAV}$ | *average gate power dissipation* | | | | | 0.5 | W |
| $(di/dt)_{cr}$ | *critical rate of rise of current* | $T_{VJ}$ = 125°C; f = 50 Hz | repetitive, $I_T$ = 20 A | | | 100 | A/µs |
| | | $t_P$ = 200 µs; $di_G/dt$ = 0.3 A/µs; | | | | | |
| | | $I_G$ = 0.3 A; $V_D = \frac{2}{3} V_{DRM}$ | non-repet., $I_T$ = 20 A | | | 500 | A/µs |
| $(dv/dt)_{cr}$ | *critical rate of rise of voltage* | $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ}$ = 125°C | | | 500 | V/µs |
| | | $R_{GK} = \infty$; method 1 (linear voltage rise) | | | | | |
| $V_{GT}$ | *gate trigger voltage* | $V_D$ = 6 V | $T_{VJ}$ = 25°C | | | 1.5 | V |
| | | | $T_{VJ}$ = -40°C | | | 2.5 | V |
| $I_{GT}$ | *gate trigger current* | $V_D$ = 6 V | $T_{VJ}$ = 25°C | | | 25 | mA |
| | | | $T_{VJ}$ = -40°C | | | 50 | mA |
| $V_{GD}$ | *gate non-trigger voltage* | $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ}$ = 125°C | | | 0.2 | V |
| $I_{GD}$ | *gate non-trigger current* | | | | | 4 | mA |
| $I_L$ | *latching current* | $t_p$ = 10 µs | $T_{VJ}$ = 25°C | | | 75 | mA |
| | | $I_G$ = 0.3 A; $di_G/dt$ = 0.3 A/µs | | | | | |
| $I_H$ | *holding current* | $V_D$ = 6 V $R_{GK} = \infty$ | $T_{VJ}$ = 25°C | | | 50 | mA |
| $t_{gd}$ | *gate controlled delay time* | $V_D = \frac{1}{2} V_{DRM}$ | $T_{VJ}$ = 25°C | | | 2 | µs |
| | | $I_G$ = 0.3 A; $di_G/dt$ = 0.3 A/µs | | | | | |
| $t_q$ | *turn-off time* | $V_R$ = 100 V; $I_T$ = 20 A; $V_D = \frac{2}{3} V_{DRM}$ | $T_{VJ}$ = 150°C | | 40 | | µs |
| | | di/dt = 10 A/µs; dv/dt = 20 V/µs; $t_p$ = 200 µs | | | | | |

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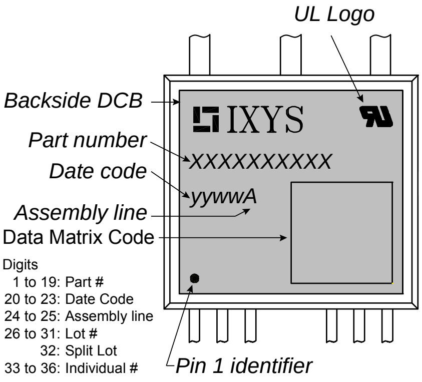
## Package SMPD

| Symbol | Definition | Conditions | | Ratings min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_{RMS}$ | *RMS current* | per terminal | | | | 100 | A |
| $T_{stg}$ | *storage temperature* | | | -55 | | 150 | °C |
| $T_{VJ}$ | *virtual junction temperature* | | | -55 | | 150 | °C |
| Weight | | | | | 8.5 | | g |
| $F_C$ | *mounting force with clip* | | | 40 | | 130 | N |
| $d_{Spp/App}$ | *creepage distance on surface \| striking distance through air* | | *terminal to terminal* | 1.6 | | | mm |
| $d_{Spb/Apb}$ | | | *terminal to backside* | 4.0 | | | mm |
| $V_{ISOL}$ | *isolation voltage* | t = 1 second | 50/60 Hz, RMS; $I_{ISOL} \le 1$ mA | 3000 | | | V |
| | | t = 1 minute | | 2500 | | | V |



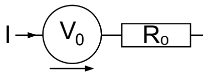
### Part number

I = IGBT
X = XPT IGBT
A = Gen 1 / std
20 = Current Rating [A]
PT = Phase leg SCR / IGBT
1200 = Reverse Voltage [V]
LB = SMPD-B

| Ordering | Part Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | IXA20PT1200LB | IXA20PT1200LB | Blister | 45 | |
| | | | Tape & Reel | 200 | |

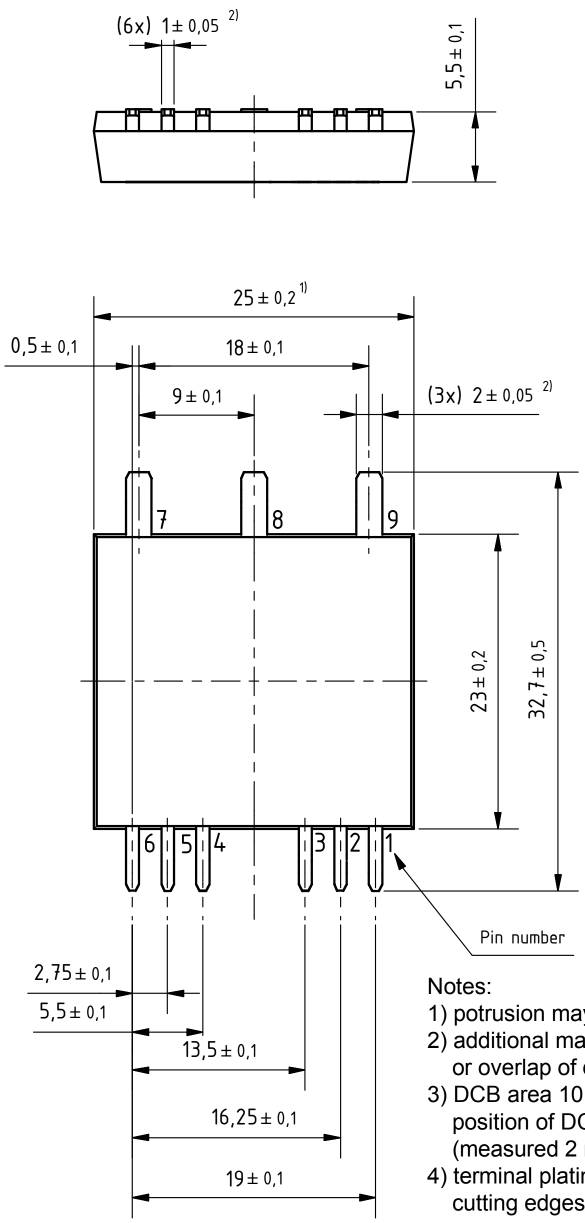
## Equivalent Circuits for Simulation

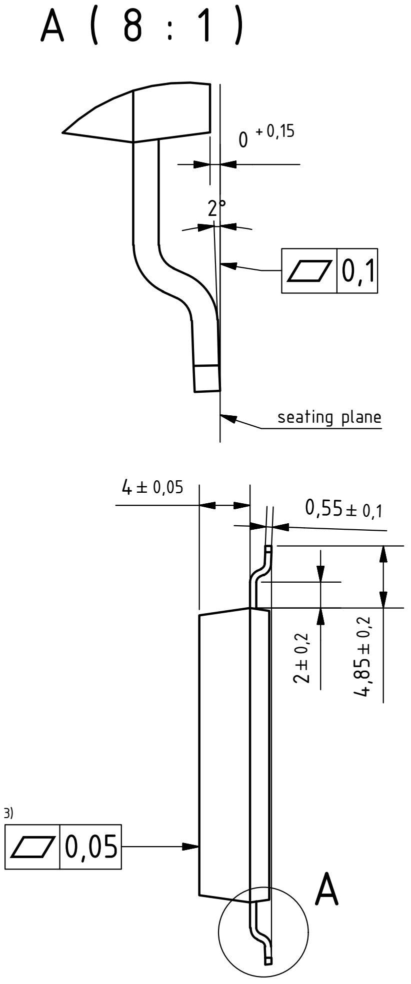
* on die level $T_{VJ} = 150°C$



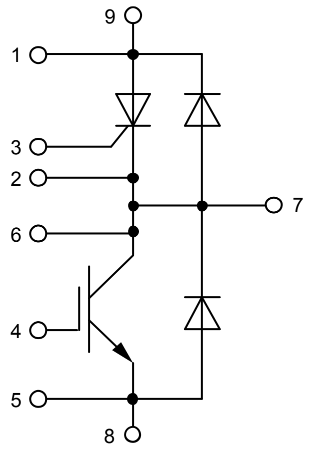
| | | Thyristor | IGBT | Diode | |
|---|---|---|---|---|---|
| $V_{0\,max}$ | *threshold voltage* | 0.87 | 1.1 | 1.2 | V |
| $R_{0\,max}$ | *slope resistance ** | 32.9 | 90 | 45 | mΩ |

## Outlines SMPD





Notes:
1) potrusion may add 0.2 mm max. on each side
2) additional max. 0.05 mm per side by punching misalignement
   or overlap of dam bar or bending compression
3) DCB area 10 to 50 µm convex;
   position of DCB area in relation to plastic rim: ±25 µm
   (measured 2 mm from Cu rim)
4) terminal plating: 0.2 - 1 µm Ni + 10 - 25 µm Sn (gal v.)
   cutting edges may be partially free of plating



IXYS

A Littelfuse Technology