

## Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_c(100^{\circ}C)$
1200V	1.7V@15V	25A

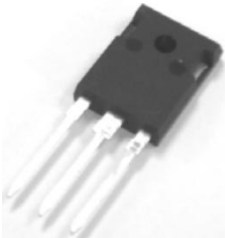
## Feature

- Trench and field-stop technology
- High speed switching
- Low collector to emitter saturation voltage
- Easy parallel switching capability
- Short circuit withstands time 10 $\mu$ s
- High ruggedness performance

## Application

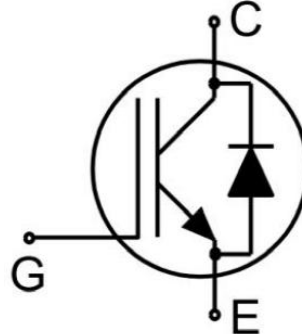
- Motor drives
- General inverter

## Package

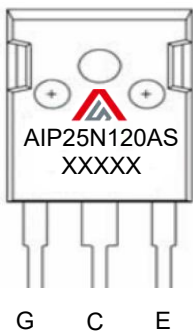


TO-247AB

## Circuit diagram



## Marking



### Absolute maximum ratings (Tc=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CES</sub>	1200	V
Continuous Gate- Emitter Voltage	V <sub>GES</sub>	±20	V
Collector Current	I <sub>C</sub>	50	A
Collector Current(T <sub>C</sub> =100°C)	I <sub>C</sub> (100°C)	25	A
Pulsed Collector Current, tp limited by T <sub>jmax</sub>	I <sub>CM</sub>	100	A
Diode Continuous Forward Current(T <sub>C</sub> =100°C)	I <sub>F</sub> (100°C)	25	A
Diode Forward Pulsed Current,tp limited by T <sub>jmax</sub>	I <sub>Fpuls</sub>	100	A
Power Dissipation	P <sub>D</sub>	428	W
Thermal Resistance, Junction to case for Diode	R <sub>θJC</sub>	0.9	°C/W
Thermal Resistance, Junction to case for IGBT	R <sub>θJC</sub>	0.35	°C/W
Short circuit withstand time	t <sub>sc</sub>	10	us
Junction Temperature Range	T <sub>J</sub>	-40 ~ +175	°C
Storage Temperature Range	T <sub>STG</sub>	-55 ~ +150	°C

### Electrical characteristics of the IGBT (T<sub>J</sub>=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
<b>Static Characteristics</b>							
Collector-Emitter Breakdown Voltage	V <sub>(BR)CES</sub>	V <sub>GE</sub> = 0V, I <sub>CE</sub> =250uA	1200			V	
Collector-Emitter Leakage Current	I <sub>CES</sub>	V <sub>GE</sub> = 0V,V <sub>CE</sub> =1200V			100	uA	
Gate to Emitter Leakage Current	I <sub>GES</sub>	V <sub>GE</sub> =±20V, V <sub>CE</sub> = 0V			±100	nA	
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	V <sub>GE</sub> =15V,I <sub>C</sub> =25A		1.7		V	
		V <sub>GE</sub> =15V,I <sub>C</sub> =25A,T <sub>J</sub> =175°C		2.3			
Gate Threshold Voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> =V <sub>GE</sub> ,I <sub>C</sub> =1mA	5.8	6.1	6.3	V	
<b>Dynamic characteristics</b>							
Input Capacitance	C <sub>ies</sub>	V <sub>CE</sub> =30V,V <sub>GE</sub> =0V, f =1MHz		2080		pF	
Output Capacitance	C <sub>oes</sub>			105			
Reverse Transfer Capacitance	C <sub>res</sub>			20			
Total Gate Charge	Q <sub>g</sub>	V <sub>CC</sub> =960V,V <sub>GE</sub> =15V,I <sub>C</sub> =25A		133		nC	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>CC</sub> =600V,V <sub>GE</sub> = 0V/15V, I <sub>C</sub> =25A,R <sub>G</sub> =10Ω, Inductive load		31		nS	
Turn-on rise time	t <sub>r</sub>			62			
Turn-off delay time	t <sub>d(off)</sub>			184			
Turn-off fall time	t <sub>f</sub>			59			
Turn-on Switching Energy	E <sub>on</sub>		V <sub>CC</sub> =600V,V <sub>GE</sub> = 0V/15V, I <sub>C</sub> =25A,R <sub>G</sub> =10Ω, Inductive load,T <sub>J</sub> =175°C		2.0		mJ
Turn-off Switching Energy	E <sub>off</sub>				0.9		
Total Switching Energy	E <sub>ts</sub>				2.9		
Turn-on delay time	t <sub>d(on)</sub>				33		nS
Turn-on rise time	t <sub>r</sub>		67				
Turn-off delay time	t <sub>d(off)</sub>		206				
Turn-off fall time	t <sub>f</sub>		87				
Turn-on Switching Energy	E <sub>on</sub>	Inductive load,T <sub>J</sub> =175°C		3.1		mJ	
Turn-off Switching Energy	E <sub>off</sub>			1.3			
Total Switching Energy	E <sub>ts</sub>			4.4			

### Electrical characteristics of the Diode (T<sub>J</sub>=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Diode Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =25A		2.0		V	
		I <sub>F</sub> =25A,T <sub>J</sub> =175°C		1.6			
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =25A,V <sub>R</sub> =600V, di/dt=-250A/us		309		nS	
Reverse Recovery Current	I <sub>rr</sub>			7		A	
Reverse Recovery Charge	Q <sub>rr</sub>			1038		nC	
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =25A,V <sub>R</sub> =600V, di/dt=-250A/us,T <sub>J</sub> =175°C		480		nS	
Reverse Recovery Current	I <sub>rr</sub>			11		A	
Reverse Recovery Charge	Q <sub>rr</sub>				3000		nC

**Typical Characteristics**

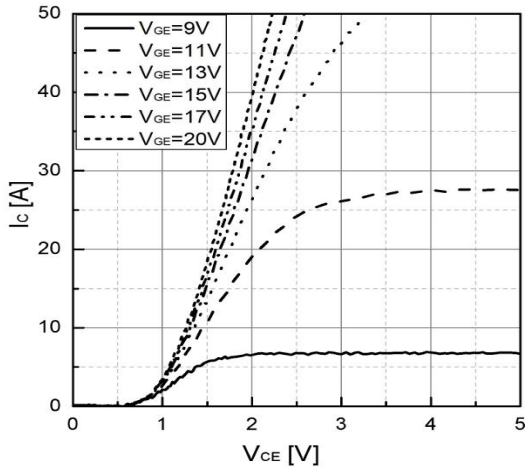


Fig 1. Typical output characteristic ( $T_{vj}=25^{\circ}\text{C}$ )

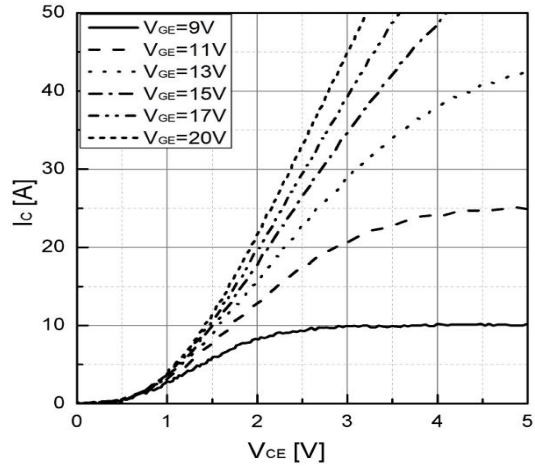


Fig 2. Typical output characteristic ( $T_{vj}=175^{\circ}\text{C}$ )

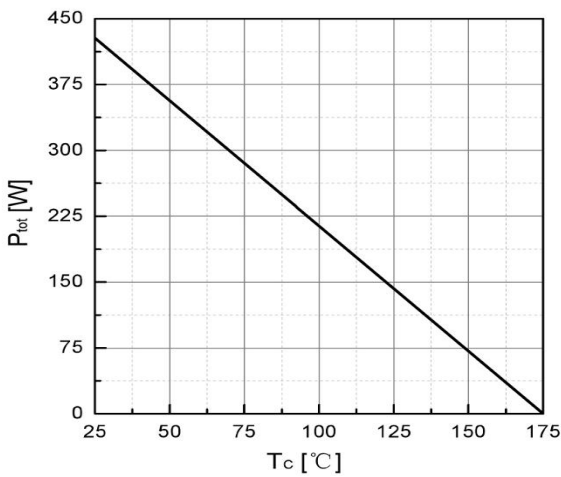


Fig 3. Power dissipation as a function of  $T_c$

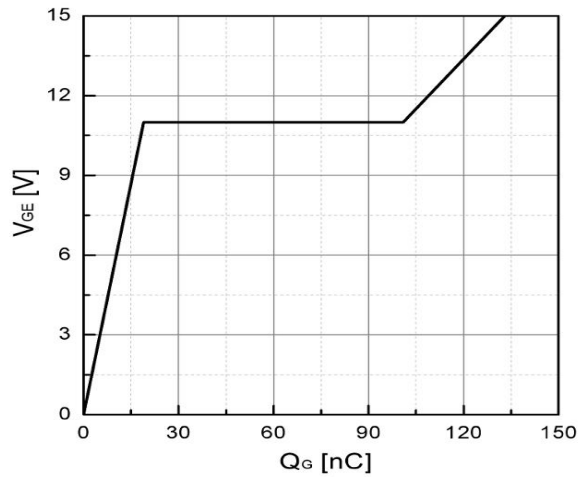


Fig 4. Typical Gate charge

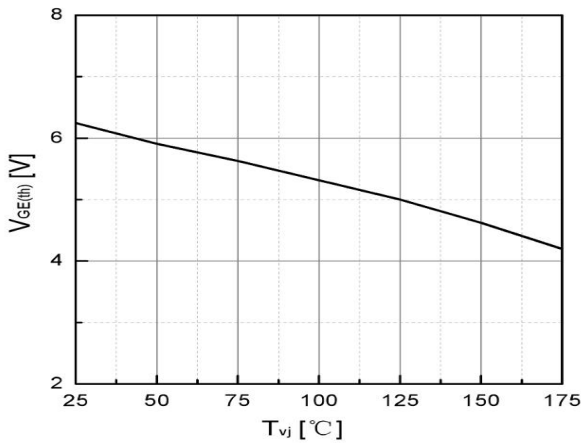


Fig 5. Typical  $V_{GE(th)}$  as a function of  $T_{vj}$  ( $I_c=1\text{mA}$ )

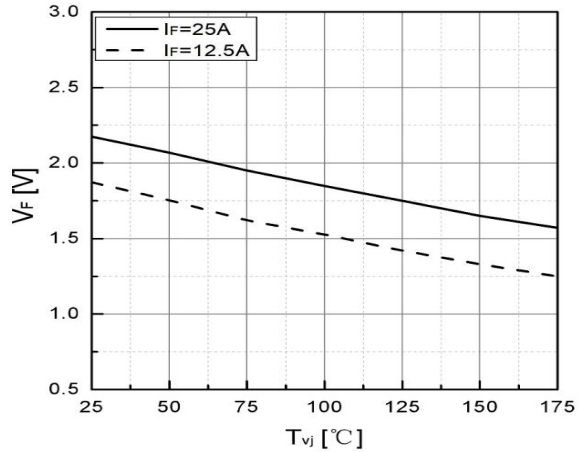


Fig 6. Typical  $V_F$  as a function of  $T_{vj}$

**Typical Characteristics**

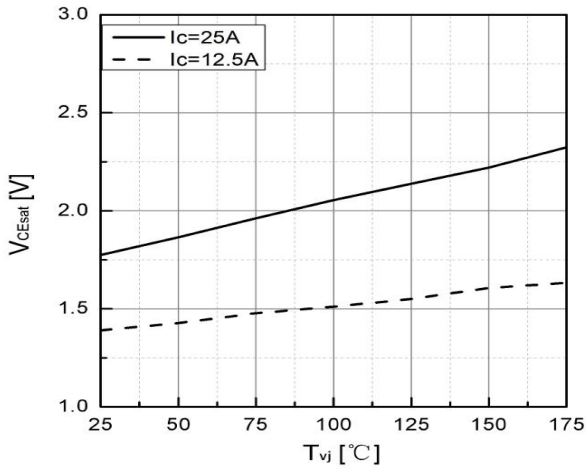


Fig 7. Typical  $V_{CEsat}$  as a function of  $T_{vj}$

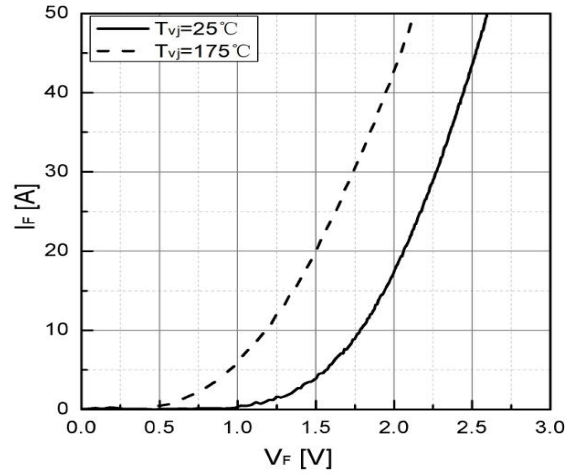


Fig 8. Typical  $I_F$  as a function of  $V_F$

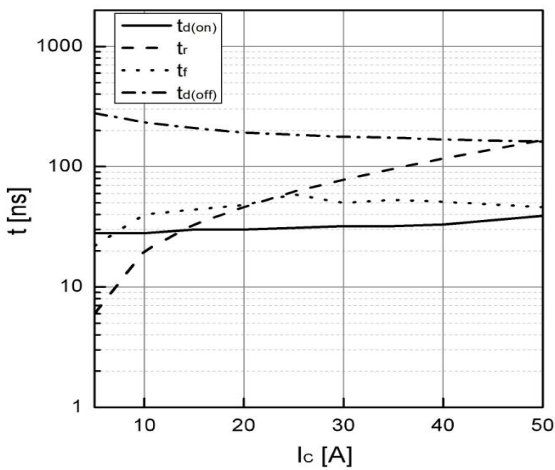


Fig 9. Typical switching time as a function of  $I_c$

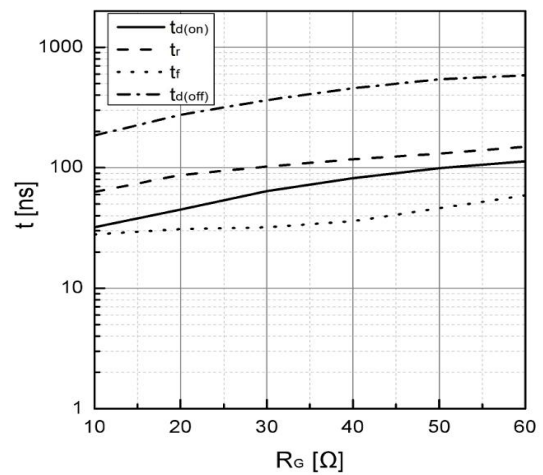


Fig 10. Typical switching times as a function of  $R_G$

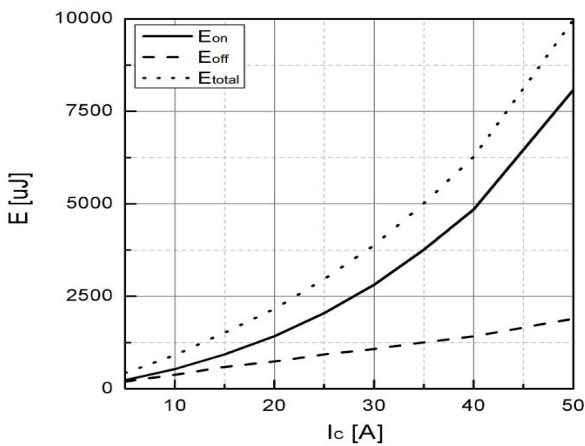


Fig 11. Typical switching energy losses as a function of  $I_c$

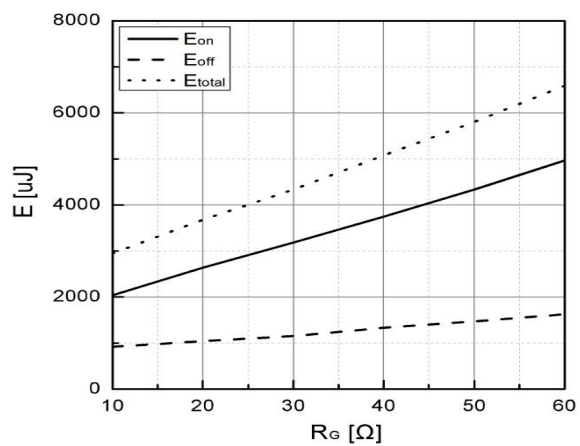


Fig 12. Typical switching energy losses as a function of  $R_G$

**Typical Characteristics**

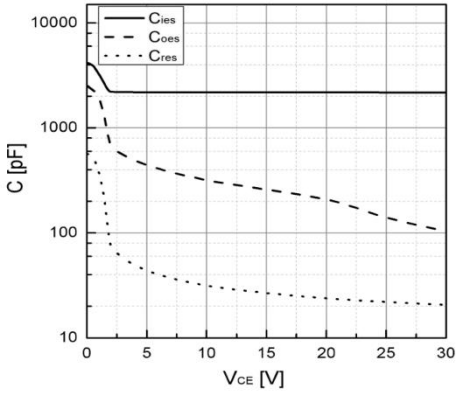


Fig 13. Typical capacitance as a function of  $V_{CE}$   
( $f=1\text{MHz}$ ,  $V_{GE}=0\text{V}$ )

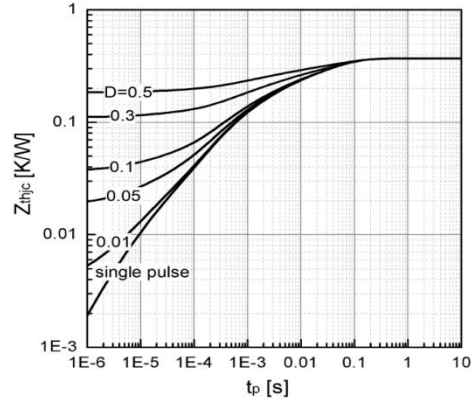
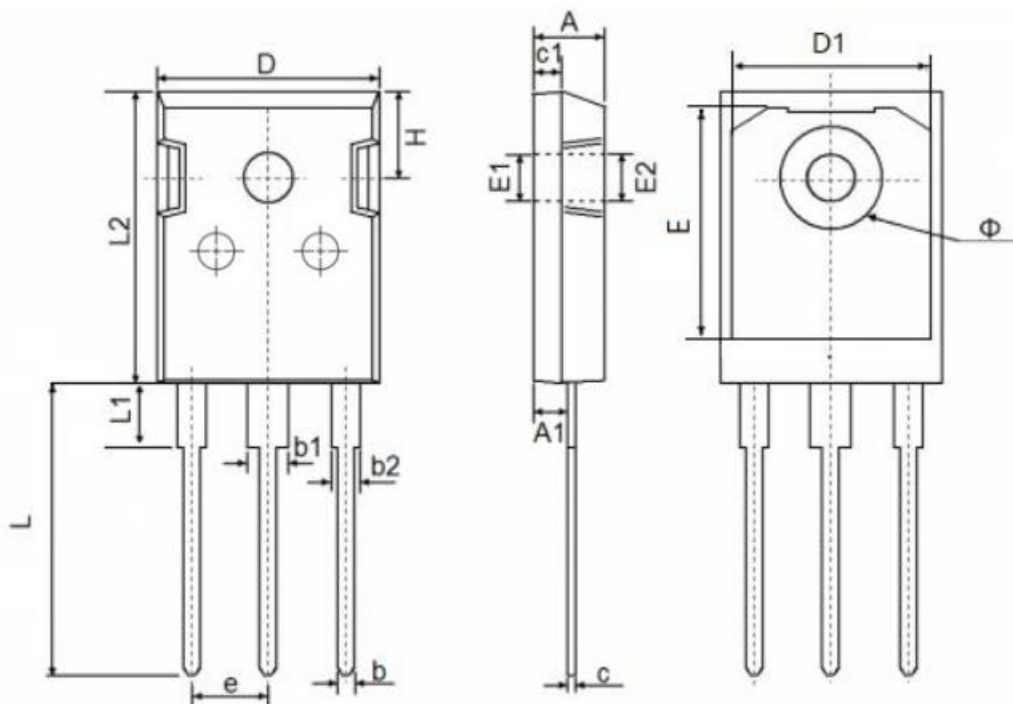


Fig 14. Transient thermal impedance of IGBT

## TO-247AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.800	5.250	0.189	0.207
A1	2.100	2.600	0.083	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.400	0.110	0.134
b2	1.800	2.420	0.071	0.095
c	0.410	0.790	0.016	0.031
c1	1.500	2.500	0.059	0.098
D	15.500	16.200	0.610	0.638
D1	13.000	14.200	0.512	0.559
E	16.250	17.650	0.640	0.695
E1	3.650	5.500	0.144	0.220
E2	3.650	5.500	0.144	0.220
L	19.400	20.400	0.764	0.803
L1	3.900	4.500	0.154	0.177
L2	20.800	21.300	0.819	0.836
φ	7.190 REF.		0.283 REF.	
e	5.440 BSC		0.214 BSC	
H	5.300	6.300	0.209	0.248