

## Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)MAX}$	$I_c(100^{\circ}C)$
1200V	2.5V@15V	40A

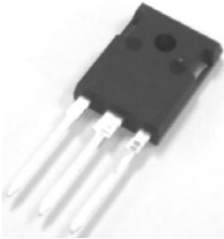
## Feature

- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- High short circuit capability

## Application

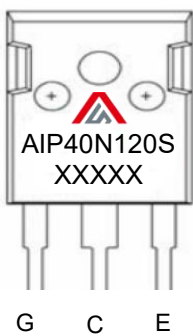
- High frequency switching application
- Resonant converters
- Uninterruptible power supply
- Welding converters

## Package

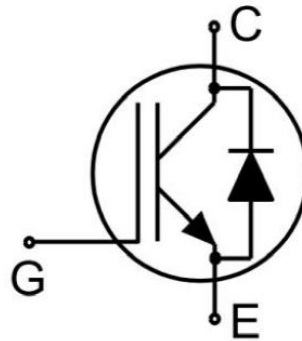


TO-247AB

## Marking



## Circuit diagram



### 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>	80	A
Collector Current(T <sub>C</sub> =100°C)	I <sub>C</sub> (100°C)	40	A
Pulsed Collector Current, tp limited by T <sub>Jmax</sub> ,V <sub>GE</sub> =15V	I <sub>CM</sub>	160	A
Diode Continuous Forward Current	I <sub>F</sub>	80	A
Diode Continuous Forward Current(T <sub>C</sub> =100°C)	I <sub>F</sub> (100°C)	40	A
Diode Forward Pulsed Current,tp limited by T <sub>Jmax</sub>	I <sub>Fpuls</sub>	160	A
Turn off Safe Operating Area V <sub>CE</sub> ≤1200V,T <sub>J</sub> ≤150°C	-	160	A
Power Dissipation(T <sub>J</sub> =175°C)	P <sub>D</sub>	428	W
Thermal Resistance, Junction to case for Diode	R <sub>θJC</sub>	0.65	°C/W
Thermal Resistance, Junction to case for IGBT	R <sub>θJC</sub>	0.35	°C/W
Short circuit withstand time V <sub>GE</sub> =15V, V <sub>CC</sub> =600V, V <sub>CEM</sub> ≤1200V	t <sub>sc</sub>	10	us
Maximum Temperature for Soldering,wave soldering 1.6mm (0.063in.) from case for 10s	T <sub>L</sub>	260	°C
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			0.25	mA	
		V <sub>GE</sub> = 0V, V <sub>CE</sub> =1200V, T <sub>J</sub> =150°C			4		
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> =40A		2.10	2.50	V	
		V <sub>GE</sub> =15V,I <sub>C</sub> =40A,T <sub>J</sub> =125°C		2.50			
		V <sub>GE</sub> =15V,I <sub>C</sub> =40A,T <sub>J</sub> =150°C		2.70			
Gate Threshold Voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> =V <sub>GE</sub> ,I <sub>C</sub> =1.4mA	5.2	5.8	6.5	V	
<b>Dynamic characteristics</b>							
Input Capacitance	C <sub>ies</sub>	V <sub>CE</sub> =25V,V <sub>GE</sub> =0V, f =1MHz		2.53		nF	
Reverse Transfer Capacitance	C <sub>res</sub>			0.09			
Total Gate Charge	Q <sub>g</sub>	V <sub>CC</sub> =600V,V <sub>GE</sub> =15V,I <sub>C</sub> =40A		0.16		uC	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>CC</sub> =600V,V <sub>GE</sub> = -5V~15V, I <sub>C</sub> =40A,R <sub>G</sub> =10Ω		21		nS	
Turn-on rise time	t <sub>r</sub>			24			
Turn-off delay time	t <sub>d(off)</sub>			124			
Turn-off fall time	t <sub>f</sub>			130			
Turn-on Switching Energy	E <sub>on</sub>			4.01			mJ
Turn-off Switching Energy	E <sub>off</sub>			1.38			
Turn-on delay time	t <sub>d(on)</sub>	V <sub>CC</sub> =600V,V <sub>GE</sub> = -5V~15V, I <sub>C</sub> =40A,R <sub>G</sub> =10Ω,T <sub>J</sub> =125°C		19		nS	
Turn-on rise time	t <sub>r</sub>			24			
Turn-off delay time	t <sub>d(off)</sub>			138			
Turn-off fall time	t <sub>f</sub>			185			
Turn-on Switching Energy	E <sub>on</sub>			4.12			mJ
Turn-off Switching Energy	E <sub>off</sub>			1.91			
Turn-on delay time	t <sub>d(on)</sub>	V <sub>CC</sub> =600V,V <sub>GE</sub> = -5V~15V, I <sub>C</sub> =40A,R <sub>G</sub> =10Ω,T <sub>J</sub> =150°C		19		nS	
Turn-on rise time	t <sub>r</sub>			25			
Turn-off delay time	t <sub>d(off)</sub>			140			
Turn-off fall time	t <sub>f</sub>			205			
Turn-on Switching Energy	E <sub>on</sub>			4.19			mJ
Turn-off Switching Energy	E <sub>off</sub>			2.09			

### Electrical characteristics of the Diode ( $T_j=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	$V_F$	$I_F=40\text{A}$		2.85	3.30	V
		$I_F=40\text{A}, T_j=125^\circ\text{C}$		2.60		
		$I_F=40\text{A}, T_j=150^\circ\text{C}$		2.50		
Reverse Recovery Current	$I_{rr}$	$I_F=40\text{A}, V_R=600\text{V}, -di/dt=510\text{A}/\mu\text{s}$		14		A
Reverse Recovery Charge	$Q_{rr}$			1.09		$\mu\text{C}$
Diode reverse recovery time	$t_{rr}$			305		ns
Reverse recovery energy	$E_{rec}$			0.43		mJ
Reverse Recovery Current	$I_{rr}$	$I_F=40\text{A}, V_R=600\text{V}, -di/dt=510\text{A}/\mu\text{s}, T_j=125^\circ\text{C}$		15		A
Reverse Recovery Charge	$Q_{rr}$			3.22		$\mu\text{C}$
Diode reverse recovery time	$t_r$			446		ns
Reverse recovery energy	$E_{rec}$			1.02		mJ
Reverse Recovery Current	$I_{rr}$	$I_F=40\text{A}, V_R=600\text{V}, -di/dt=510\text{A}/\mu\text{s}, T_j=150^\circ\text{C}$		15		A
Reverse Recovery Charge	$Q_{rr}$			3.78		$\mu\text{C}$
Diode reverse recovery time	$t_r$			541		ns
Reverse recovery energy	$E_{rec}$			1.38		mJ

## Typical Characteristics

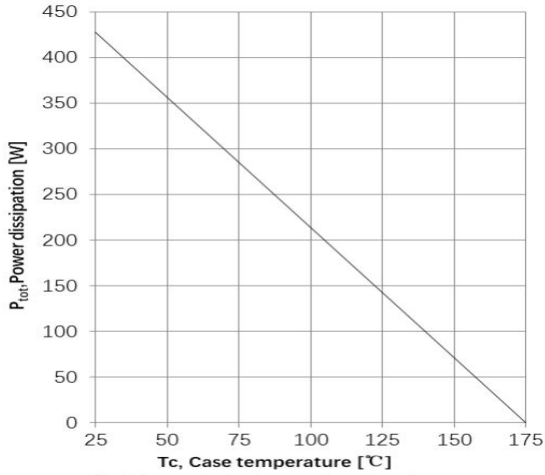


Fig1. Power dissipation as a function of case temperature ( $T_j < 175^\circ\text{C}$ )

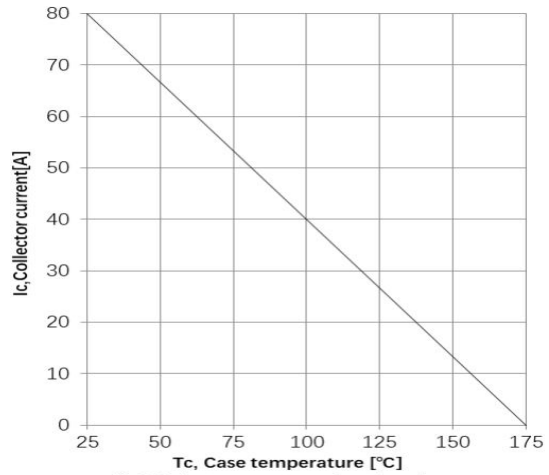


Fig2. Collector current as a function of case temperature ( $V_{ge} > 15\text{V}$ ,  $T_j < 175^\circ\text{C}$ )

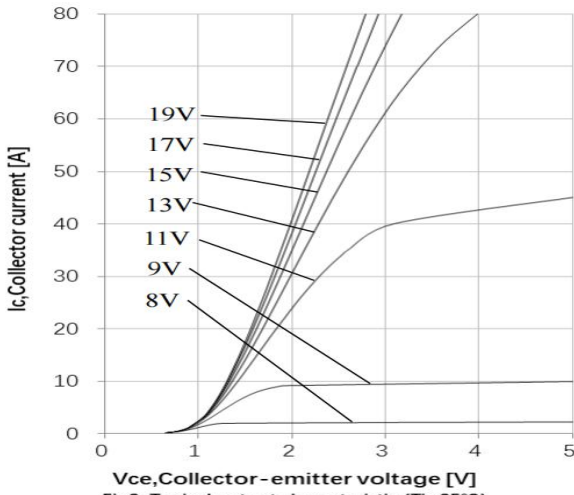


Fig3. Typical output characteristic ( $T_j = 25^\circ\text{C}$ )

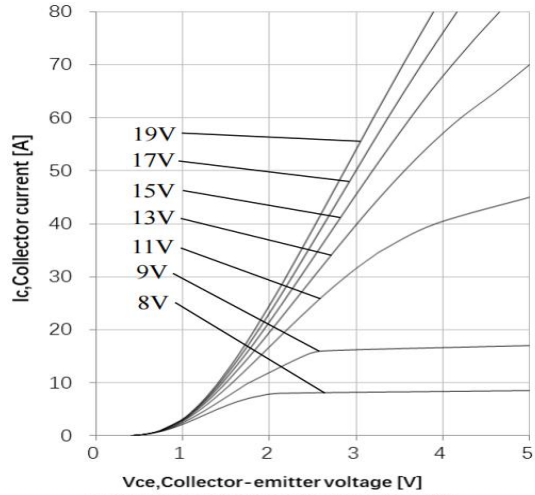


Fig4. Typical output characteristic ( $T_j = 150^\circ\text{C}$ )

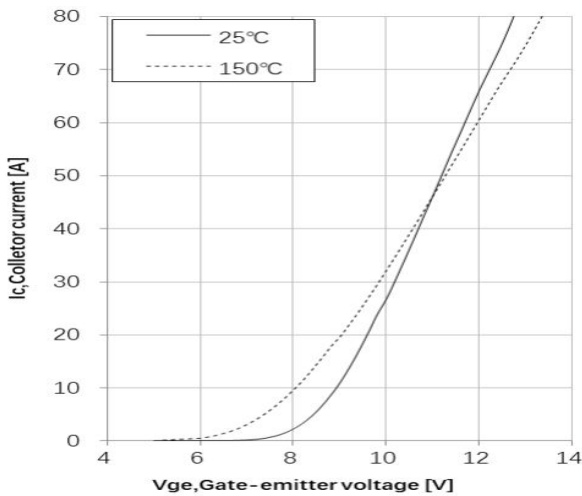


Fig5. Typical transfer characteristic ( $V_{ce} = 20\text{V}$ )

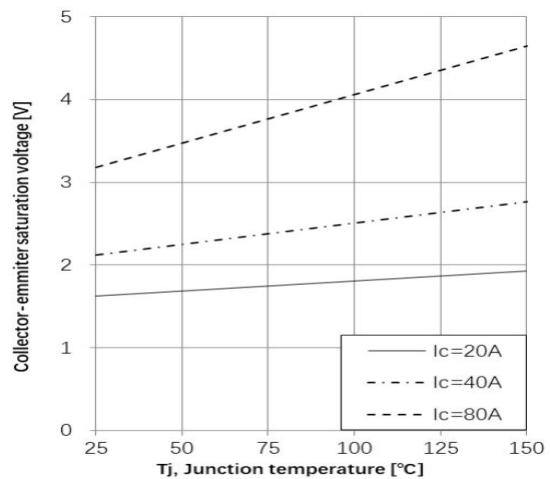


Fig6. Typical collector-emitter saturation voltage as a function of junction temperature ( $V_{ge} = 15\text{V}$ )

### Typical Characteristics

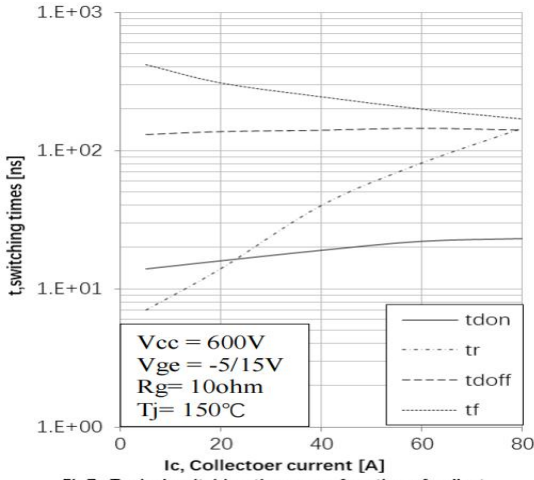


Fig7. Typical switching times as a function of collector current

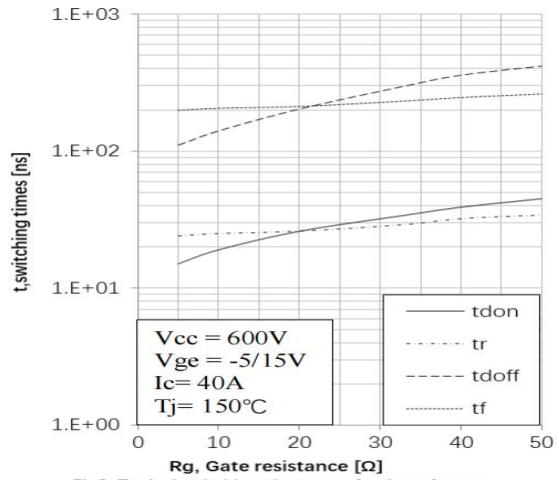


Fig8. Typical switching times as a function of gate resistance

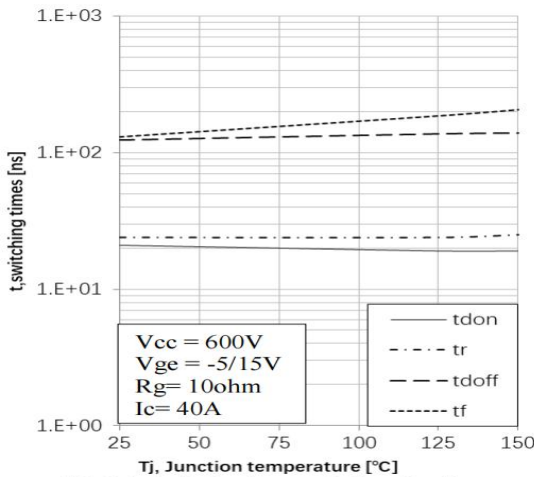


Fig9. Typical switching times as a function of junction temperature

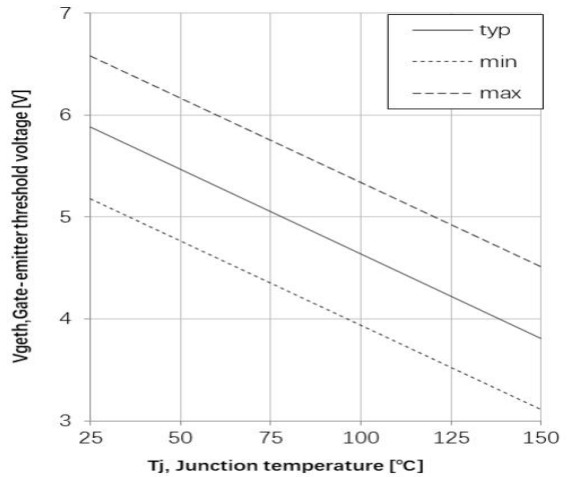


Fig10. Gate-emitter threshold voltage as a function of junction temperature

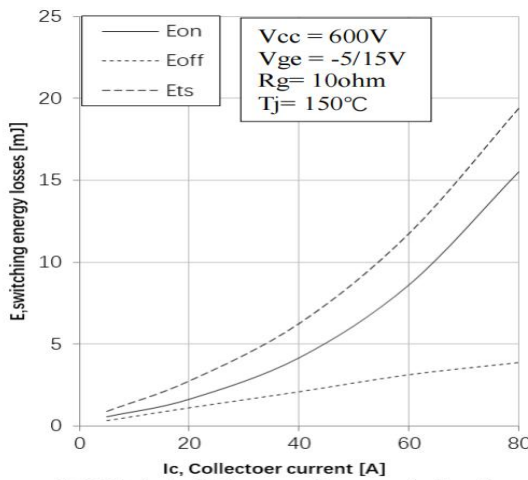


Fig11. Typical switching energy losses as a function of collector current

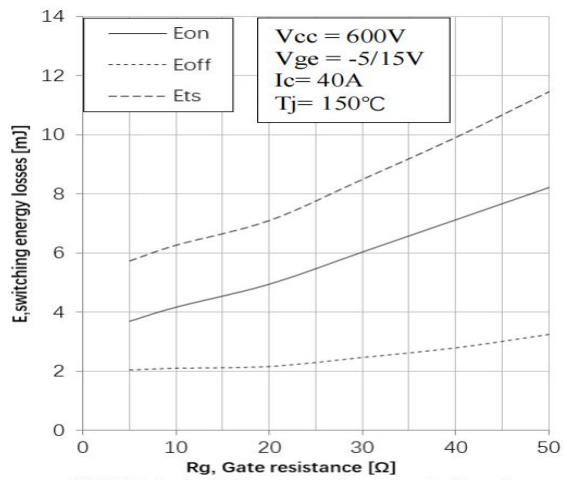


Fig12. Typical switching energy losses as a function of gate resistance

### Typical Characteristics

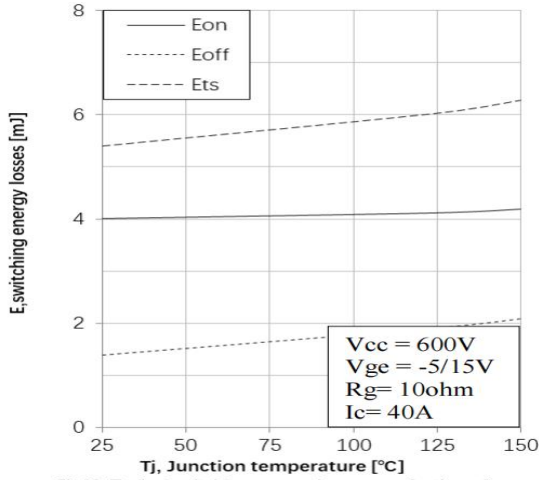


Fig13. Typical switching energy losses as a function of junction temperature

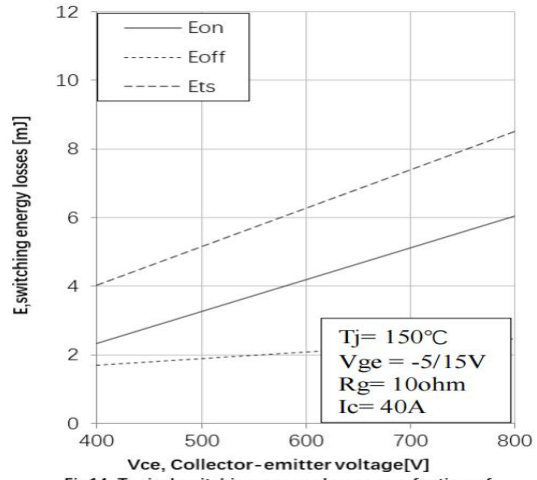


Fig14. Typical switching energy losses as a function of collector-emitter voltage

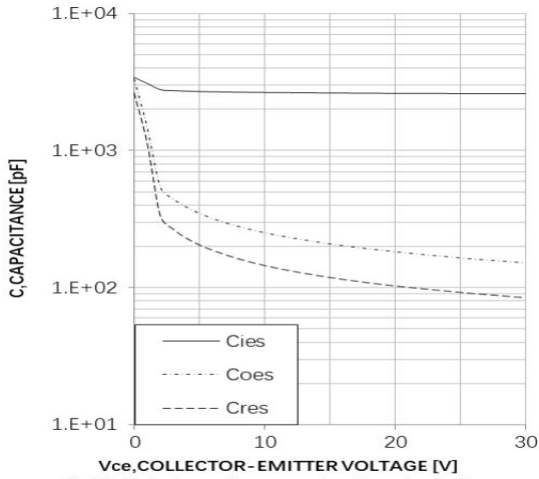


Fig15. Typical capacitance as a function of collector-emitter voltage

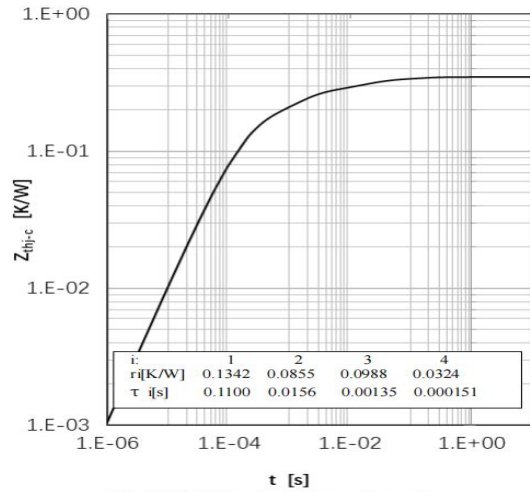


Fig 16. IGBT Transient Thermal Impedance

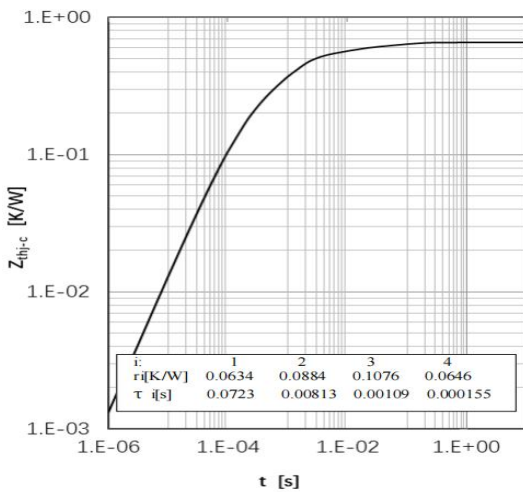


Fig 17. Diode Transient Thermal Impedance

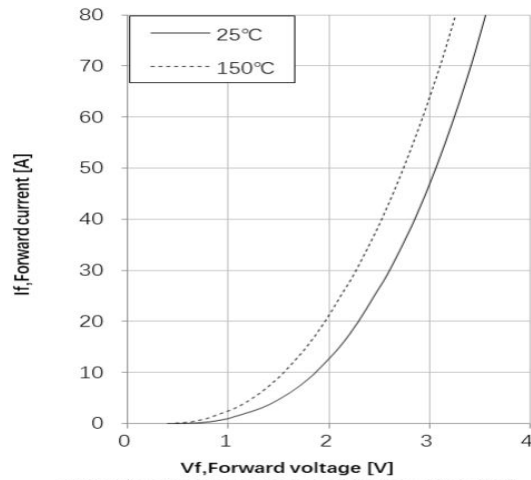


Fig18. Diode forward current as a function of forward voltage

## Typical Characteristics

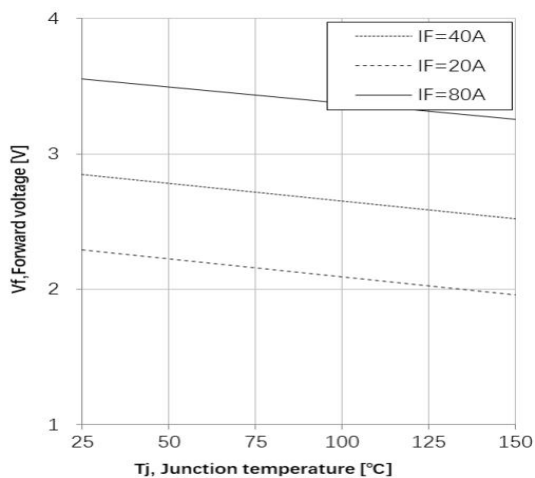
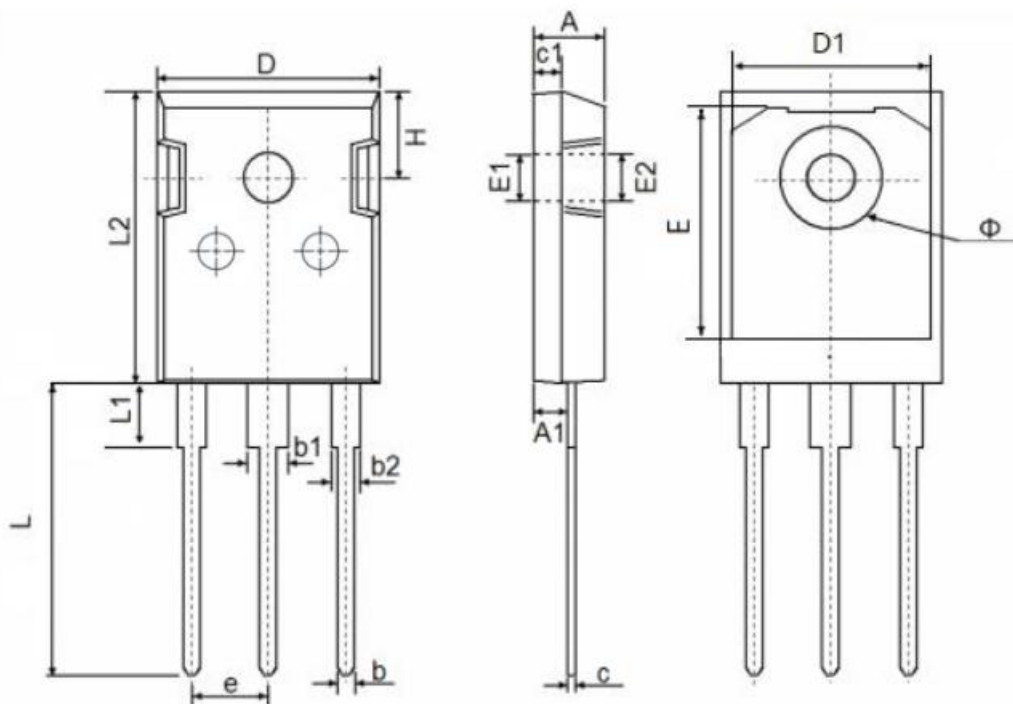


Fig19. Diode forward voltage as a function of junction temperature

### 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	0.500	0.700	0.020	0.028
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