AI040H065TD

IGBT Discrete

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)MAX}$	I_C(100℃)
650V	1.95V@15V	40A

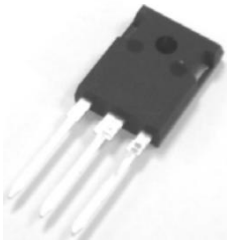
Feature

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175℃
- Positive temperature coefficient
- High ruggedness, temperature stable

Application

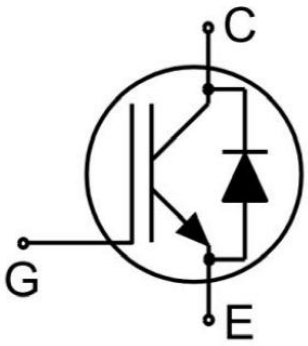
- Solar converters
- Uninterruptible power supplies
- Welding converters
- Mid to high range switching frequency converters

Package

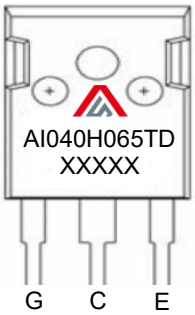


TO-247AB

Circuit diagram



Marking



Absolute maximum ratings (T_C=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Continuous Gate- Emitter Voltage	V_{GE}	±20	V
Transient Gate-Emitter Voltage (tp≤10us,D<0.010)	V_{GE}	±30	V
Collector Current, limited by T_{jmax}	I_C	80	A
Collector Current, limited by T_{jmax} (T_C=100℃)	I_C(100℃)	40	A
Pulsed Collector Current, V_{GE}=15V, tp limited by T_{jmax}	I_{CM}	80	A
Diode Continuous Forward Current	I_F	80	A
Diode Continuous Forward Current (T_C=100℃)	I_F(100℃)	40	A
Diode Pulsed Current, tp limited by T_{jmax}	I_{Fpuls}	80	A
Turn off Safe Operating Area V_{CE}≤650V,T_J≤150°C	-	80	A
Power Dissipation (T_J=175℃)	P_D	214	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1.05	℃/W
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.70	℃/W
Thermal Resistance, Junction - Ambient	$R_{\theta JA}$	40	℃/W
Operating junction temperature range	T_J	-40 ~ +175	℃
Storage Temperature Range	T_{STG}	-55 ~ +175	℃

Electrical characteristics of the IGBT (T_J=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE} =0V, I_C =250μA	650			V
Collector-Emitter Leakage Current	I_{CES}	V_{GE} =0V,V_{CE}=650V			0.25	mA
		V_{GE} =0V,V_{CE}=650V,T_J=150℃			4.00	
Gate to Emitter Leakage Current	I_{GES}	V_{GE} =20V, V_{CE} =0V			100	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} =V_{GE},I_C=0.25mA	3.5	4.5	5.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=40A		1.65	1.95	V
		V_{GE}=15V,I_C=40A,T_J=125℃		2.10		
		V_{GE}=15V,I_C=40A,T_J=150℃		2.20		
Dynamic characteristics						
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V, f =1MHz		2.83		nF
Reverse Transfer Capacitance	C_{res}			0.02		
Total Gate Charge	Q_g	V_{CC}=520V,V_{GE}=15V,I_C=40A		0.10		μC
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V,V_{GE}=-5V~15V, I_C =40A,R_G=20Ω,		52		nS
Turn-on rise time	t_r			68		
Turn-off delay time	$t_{d(off)}$			149		
Turn-off fall time	t_f			39		
Turn-On Switching Loss	E_{on}			1.94		mJ
Turn-Off Switching Loss	E_{off}			0.51		
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V,V_{GE}=-5V~15V, I_C =40A,R_G=20Ω, T_J=125°C		50		nS
Turn-on rise time	t_r			68		
Turn-off delay time	$t_{d(off)}$			156		
Turn-off fall time	t_f			38		
Turn-On Switching Loss	E_{on}			2.03		mJ
Turn-Off Switching Loss	E_{off}			0.55		

Turn-on delay time	$t_{d(on)}$	V_{CC}=400V,V_{GE}=-5V~15V, I_C =40A,R_G=20Ω, T_J=150°C		49		nS
Turn-on rise time	t_r			69		
Turn-off delay time	$t_{d(off)}$			161		
Turn-off fall time	t_f			39		
Turn-On Switching Loss	E_{on}			2.08		mJ
Turn-Off Switching Loss	E_{off}			0.56		

Electrical characteristics of the Diode (T_J=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	I_F=40A		1.50	1.90	V
		I_F=40A,T_J=125℃		1.40		
		I_F=40A,T_J=150℃		1.35		
Reverse Recovery Current	I_{rr}	V_R=400V,I_F =40A, -di/dt=480A/μs		34		A
Reverse Recovery Charge	Q_{rr}			3.22		uC
Reverse Recovery Time	t_{rr}			161		nS
Reverse recovery energy	E_{rec}			0.78		mJ
Reverse Recovery Current	I_{rr}	V_R=400V,I_F =40A, -di/dt=480A/μs, T_J=125°C		37		A
Reverse Recovery Charge	Q_{rr}			4.32		uC
Reverse Recovery Time	t_{rr}			203		nS
Reverse recovery energy	E_{rec}			1.11		mJ
Reverse Recovery Current	I_{rr}	V_R=400V,I_F =40A, -di/dt=480A/μs, T_J=150°C		38		A
Reverse Recovery Charge	Q_{rr}			4.87		uC
Reverse Recovery Time	t_{rr}			224		nS
Reverse recovery energy	E_{rec}			1.28		mJ

Typical Characteristics

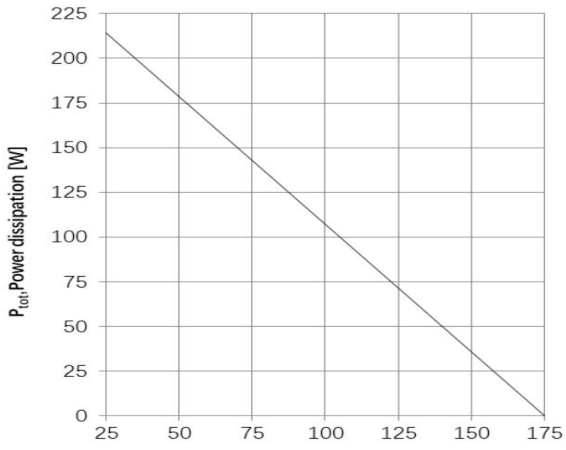


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

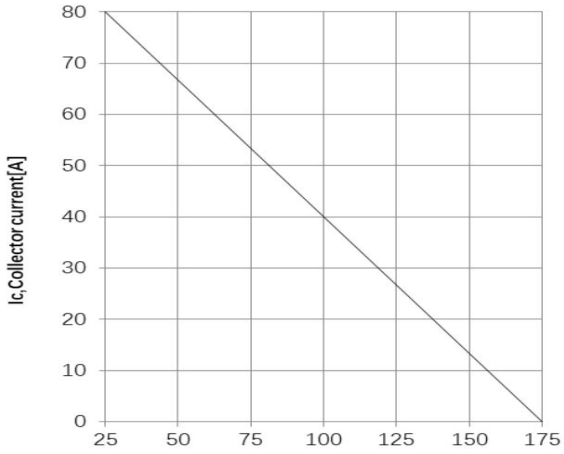


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

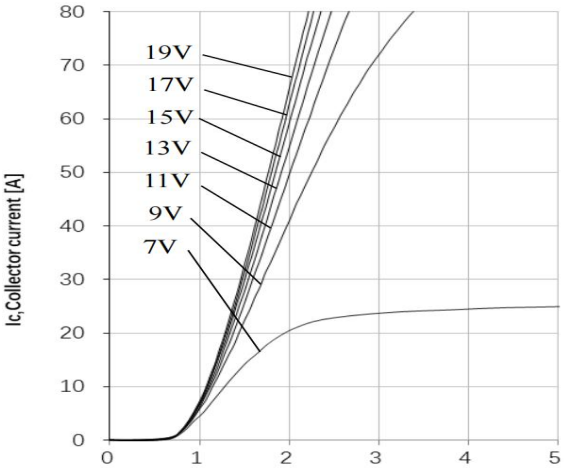


Fig3. Typical output characteristic (Tj=25℃)

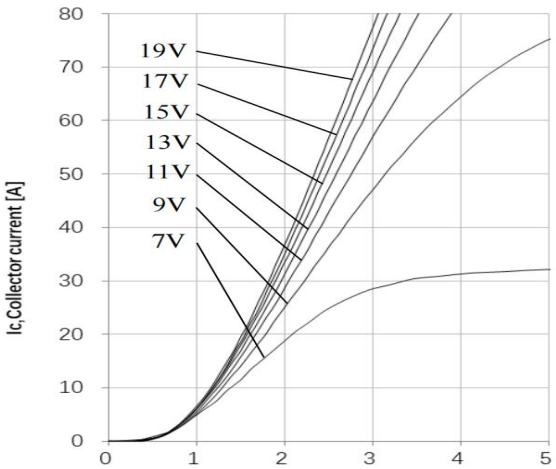


Fig4. Typical output characteristic (Tj=150℃)

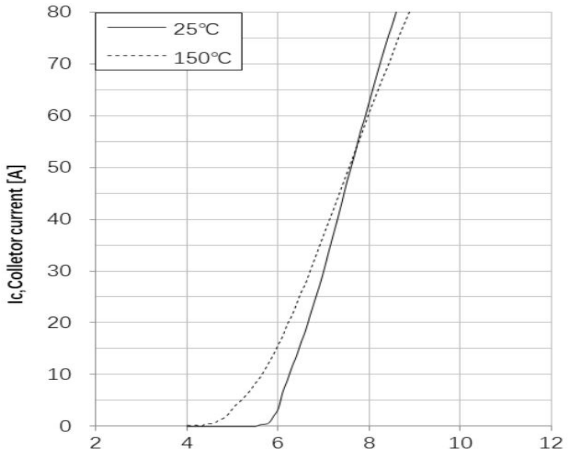


Fig5. Typical transfer characteristic (Vce=20V)

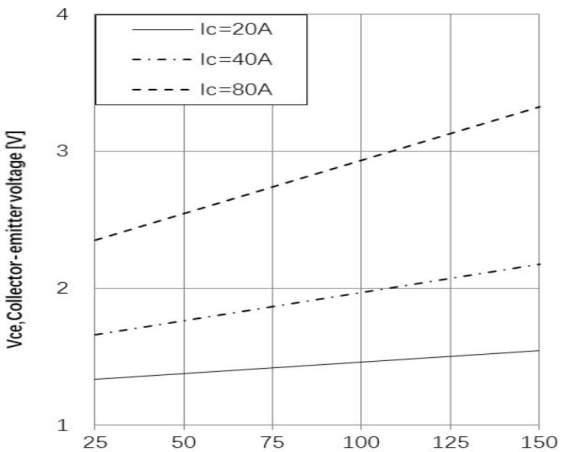


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

Typical Characteristics

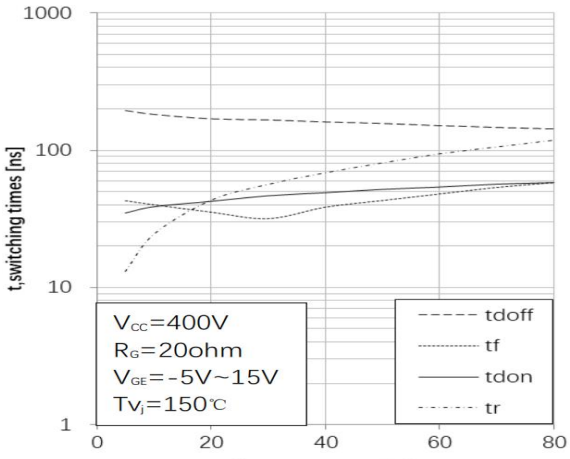


Fig7. Typical switching times as a function of collect current

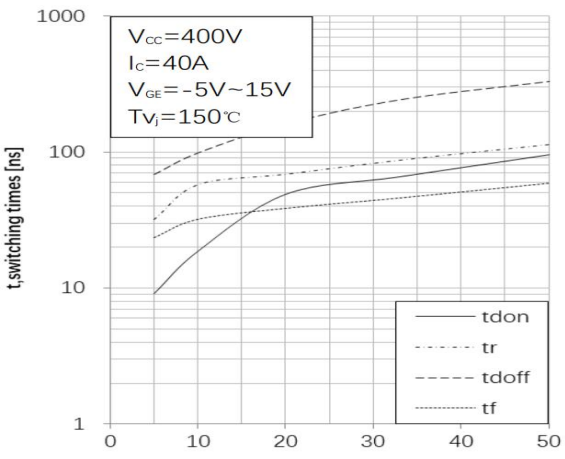


Fig8. Typical switching times as a fuction of gate resistance

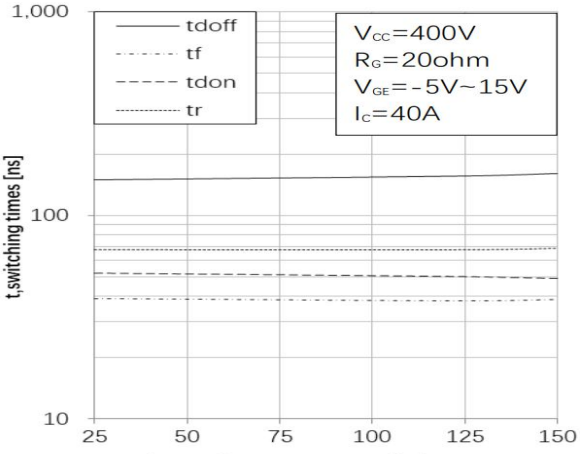


Fig9. Typical switching times as a fuction of junction temperature

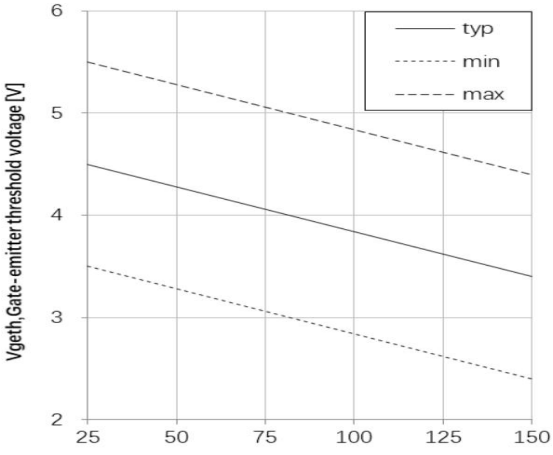


Fig10. Gate-emitter threshold voltage as a fuction of junction temperature(Ic=0.25mA)

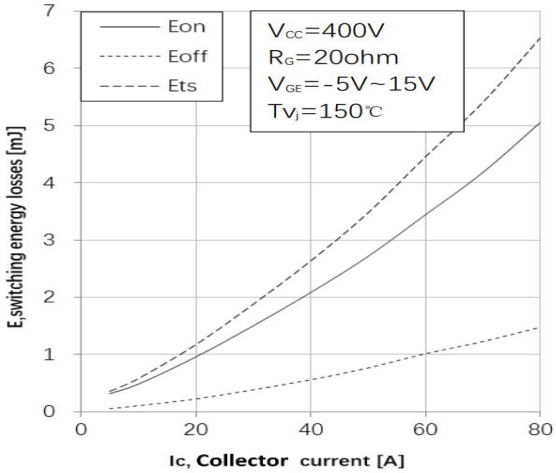


Fig11. Typical switching energy losses as a fuction of collect current

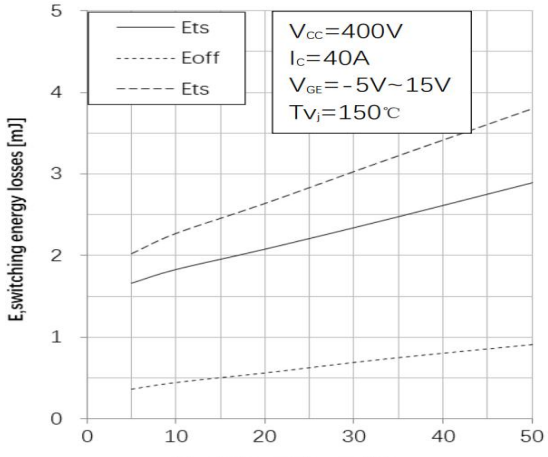
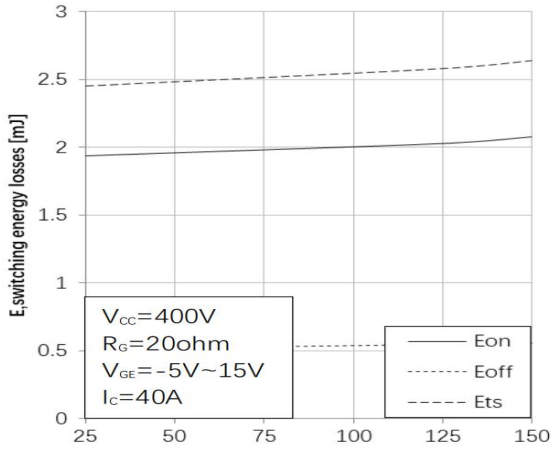
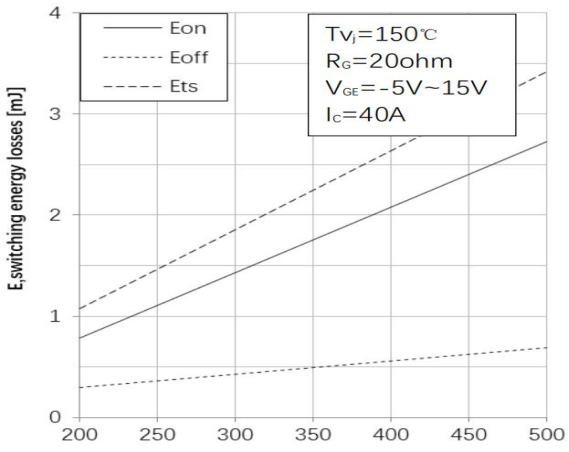


Fig12. Typical switching energy losses as a fuction of gate resistance

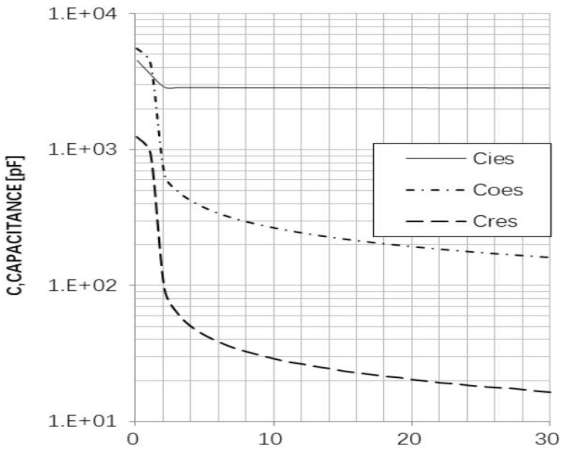
Typical Characteristics



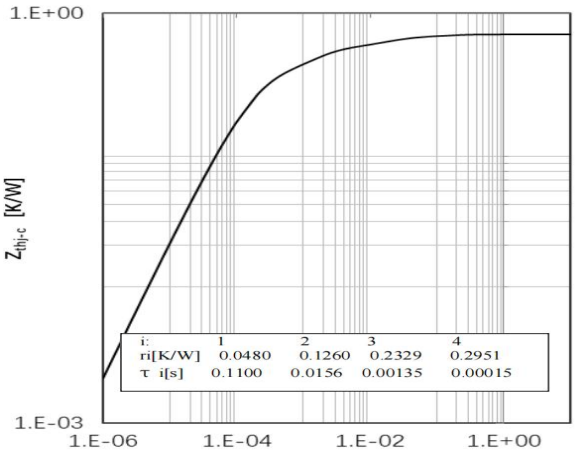
Tj, Junction temperature [°C]
Fig13. Typical switching energy losses as a fuction of junction temperature



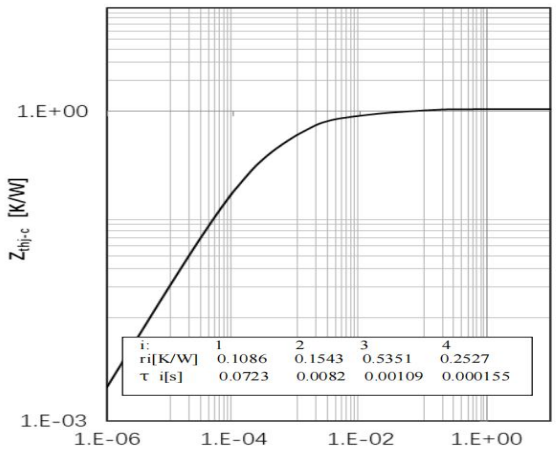
Vce, Collector-emitter voltage[V]
Fig14. Typical switching energy losses as a fuction of collector-emitter voltage



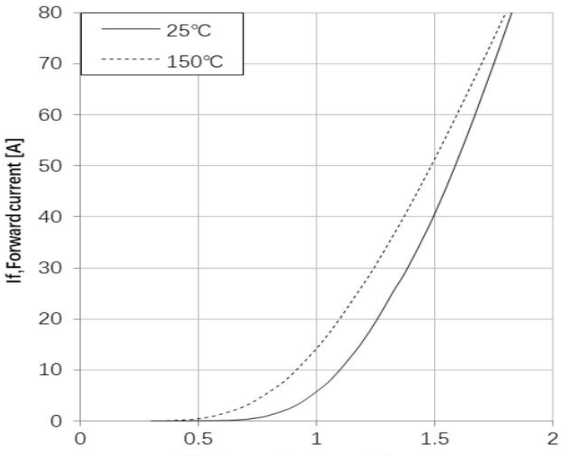
Vce,COLLECTOR-EMITTER VOLTAGE [V]
Fig15. Typical capacitance as a function of collector-emitter voltage



t [s]
Fig 16. IGBT Transient Thermal Impedance



t [s]
Fig 17. Diode Transient Thermal Impedance



Vf,Forward voltage [V]
Fig18. Diode forawrd current as a function of foraward voltage

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AS-3320053	2023/05/10	2025/07/04	B	8

Typical Characteristics

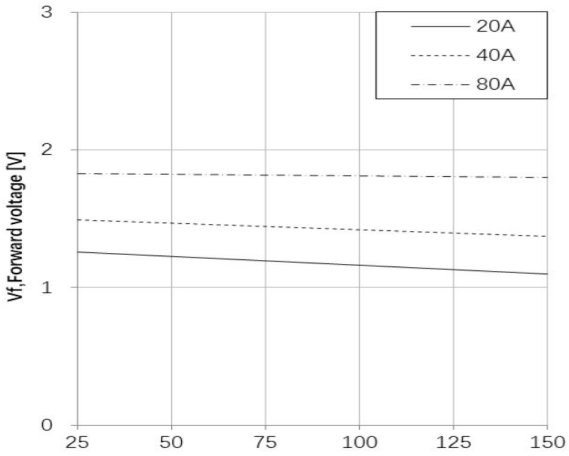
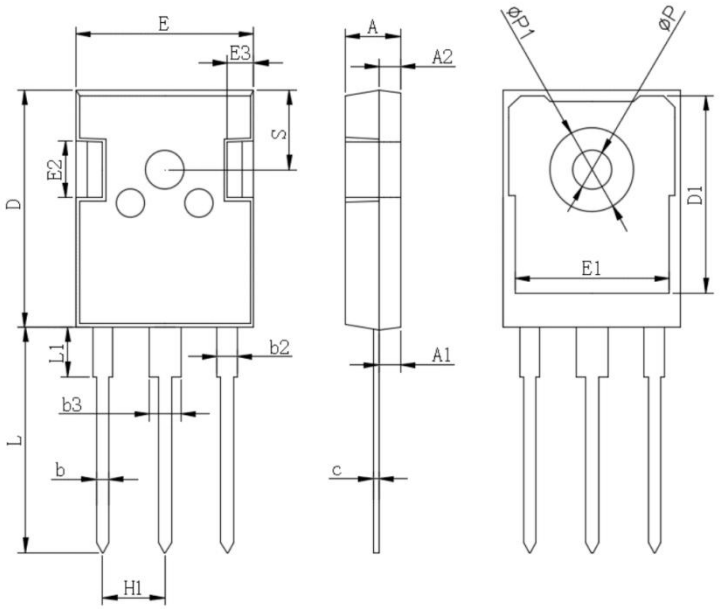


Fig19. Typical diode foraward voltageas a function of Junction temperature

TO-247AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.800	5.200	0.189	0.205
A1	2.210	2.610	0.087	0.103
A2	1.850	2.150	0.073	0.085
b	1.000	1.400	0.039	0.055
b2	1.910	2.210	0.075	0.087
b3	2.800	3.200	0.110	0.126
C	0.500	0.700	0.020	0.028
D	20.700	21.300	0.815	0.839
D1	16.250	16.850	0.640	0.663
E	15.500	16.100	0.610	0.634
E1	13.000	13.600	0.512	0.535
E2	4.800	5.200	0.189	0.205
E3	2.300	2.700	0.091	0.106
L	19.620	20.220	0.772	0.796
L1	-	4.300	-	0.169
Φ P	3.400	3.800	0.134	0.150
Φ P1	-	7.300	-	0.287
S	6.150 TYP		0.242 TYP	
H1	5.440 TYP		0.214 TYP	