AI020K065TF

IGBT Discrete

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	I_C(100℃)
650V	1.60V@15V	20A

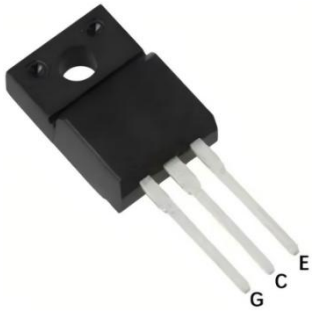
Feature

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175℃
- Positive temperature coefficient
- High short circuit capability(5us)
- High ruggedness, temperature stable

Application

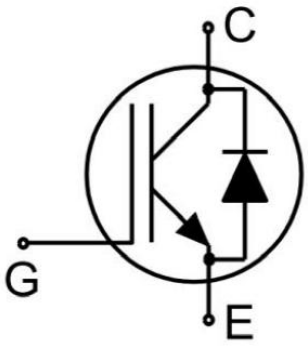
- Inverter for motor drive
- Air conditioning
- Uninterruptible power supply

Package

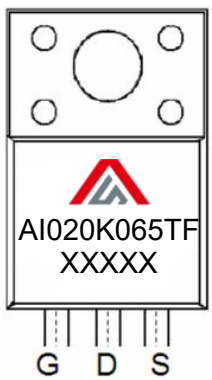


ITO-220AB

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 <0.01)	V_{GE}	±30	V
Collector Current, limited by T_{jmax}	I_C	40	A
Collector Current, limited by T_{jmax} (T_C =100℃)	I_C(100℃)	20	A
Pulsed Collector Current, tp limited by T_{jmax} (V_{GE} =15V)	I_{CM}	60	A
Diode Continuous Forward Current, limited by T_{jmax}	I_F	40	A
Diode Continuous Forward Current, limited by T_{jmax} (T_C =100℃)	I_F(100℃)	20	A
Diode Pulsed Current, tp limited by T_{jmax}	I_{Fpuls}	60	A
Turn off Safe Operating Area (V_{CE} ≤650V, T_J ≤150°C)	-	60	A
Short Circuit Withstand Time (V_{GE} =15V, V_{CC} =400V, V_{CEM} ≤650V)	T_{sc}	5	μS
Power Dissipation (T_J =175℃)	P_D	55	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	4.8	℃/W
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	2.7	℃/W
Operating junction temperature range	T_J	-40 ~ +175	℃
Storage Temperature Range	T_{STG}	-55 ~ +150	℃

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 =1mA	650			V
Collector-Emitter Leakage Current	I_{CES}	V_{GE} =0V, V_{CE} =650V			1	mA
		V_{GE} =0V, V_{CE} =650V, T_J =150℃			5	
Gate to Emitter Leakage Current	I_{GES}	V_{GE} =±20V, V_{CE} =0V			±200	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE} =V_{CE}, I_C =250μA	4	5	6.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} =15V, I_C =20A		1.6	1.9	V
		V_{GE} =15V, I_C =20A, T_J =125℃		1.8		
		V_{GE} =15V, I_C =20A, T_J =150℃		1.9		
Dynamic characteristics						
Input Capacitance	C_{ies}	V_{CE} =25V, V_{GE} =0V, f =1MHz		1.05		nF
Reverse Transfer Capacitance	C_{res}			0.02		
Total Gate Charge	Q_g	V_{CC} =300V, V_{GE} =15V, I_C =20A		0.09		μC
Turn-on delay time	$t_{d(on)}$	V_{CC} =300V, V_{GE} =-5V~15V I_C =20A, R_G =20Ω		46		nS
Turn-on rise time	t_r			47		
Turn-off delay time	$t_{d(off)}$			80		
Turn-off fall time	t_f			74		
Turn-On Switching Loss	E_{on}			0.36		mJ
Turn-Off Switching Loss	E_{off}			0.25		

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Dynamic characteristics						
Turn-on delay time	$t_{d(on)}$	V_{CC} =300V, V_{GE} =-5V~15V I_C =20A, R_G =20Ω T_J =125°C		39		nS
Turn-on rise time	t_r			53		
Turn-off delay time	$t_{d(off)}$			95		
Turn-off fall time	t_f			131		
Turn-On Switching Loss	E_{on}			0.39		mJ
Turn-Off Switching Loss	E_{off}			0.37		
Turn-on delay time	$t_{d(on)}$	V_{CC} =300V, V_{GE} =-5V~15V I_C =20A, R_G =20Ω T_J=150°C		40		nS
Turn-on rise time	t_r			55		
Turn-off delay time	$t_{d(off)}$			95		
Turn-off fall time	t_f			138		
Turn-On Switching Loss	E_{on}			0.41		mJ
Turn-Off Switching Loss	E_{off}			0.40		

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 =20A		1.75	2.3	V
		I_F =20A, T_J =125℃		1.65		
		I_F =20A, T_J =150℃		1.6		
Reverse Recovery Current	I_{rrm}	V_R =300V, I_F =20A di/dt =-360A/μs		6		A
Reverse Recovery Charge	Q_{rr}			0.25		uC
Reverse Recovery Time	T_{rr}			200		nS
Reverse Recovery Energy	E_{rec}			0.07		mJ
Reverse Recovery Current	I_{rrm}	V_R =300V, I_F =20A di/dt =-360A/μs T_J =125°C		8		A
Reverse Recovery Charge	Q_{rr}			0.59		uC
Reverse Recovery Time	T_{rr}			218		nS
Reverse Recovery Energy	E_{rec}			0.13		mJ
Reverse Recovery Current	I_{rrm}	V_R =300V, I_F =20A di/dt =-360A/μs T_J =150°C		9		A
Reverse Recovery Charge	Q_{rr}			0.78		uC
Reverse Recovery Time	T_{rr}			227		nS
Reverse Recovery Energy	E_{rec}			0.16		mJ

Typical Characteristics

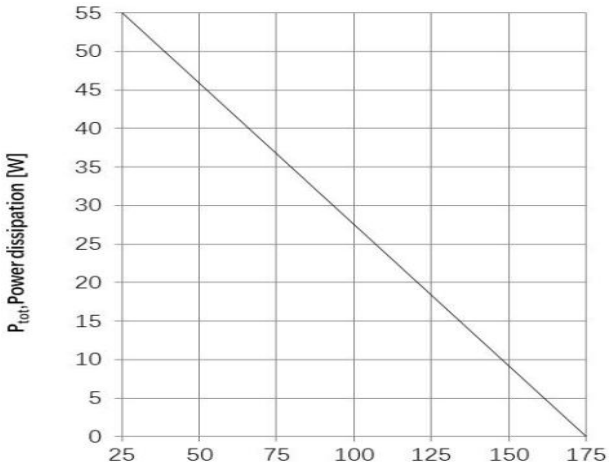


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

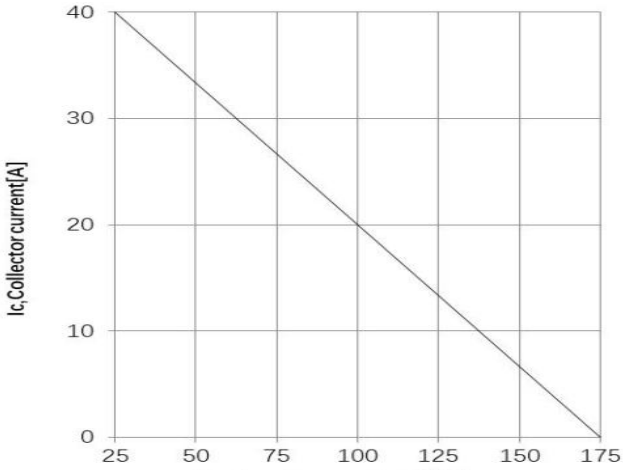


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

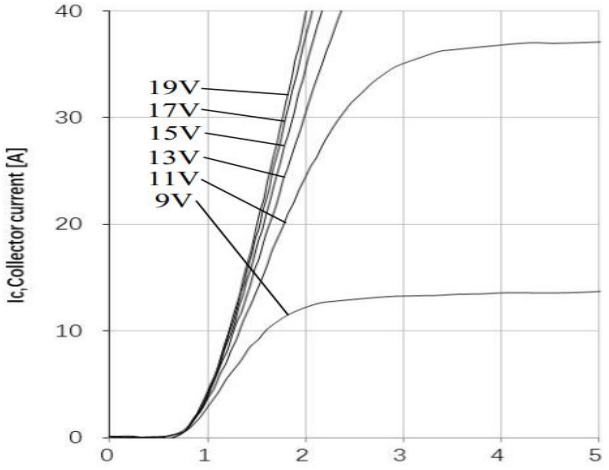


Fig3. Typical output characteristic (Tj=25℃)

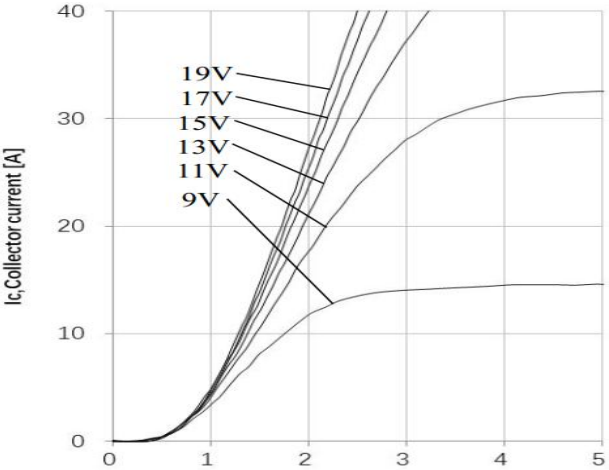


Fig4. Typical output characteristic (Tj=150℃)

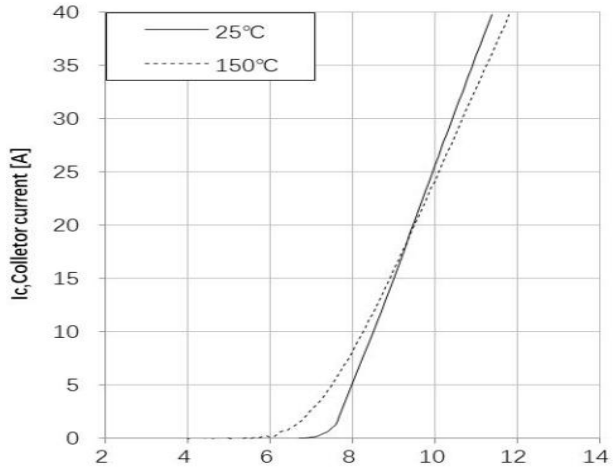


Fig5. Typical transfer characteristic (Vce=20V)

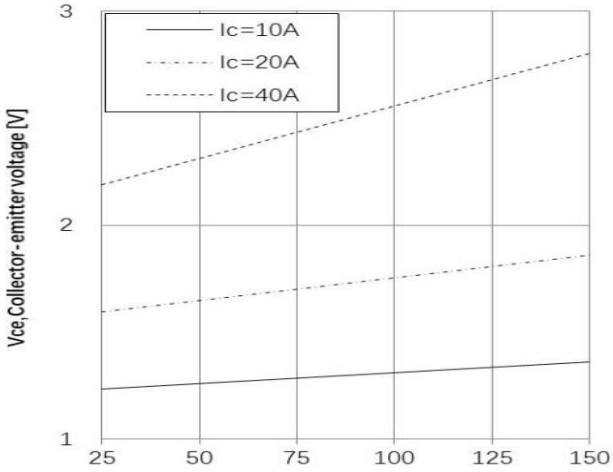


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

Typical Characteristics

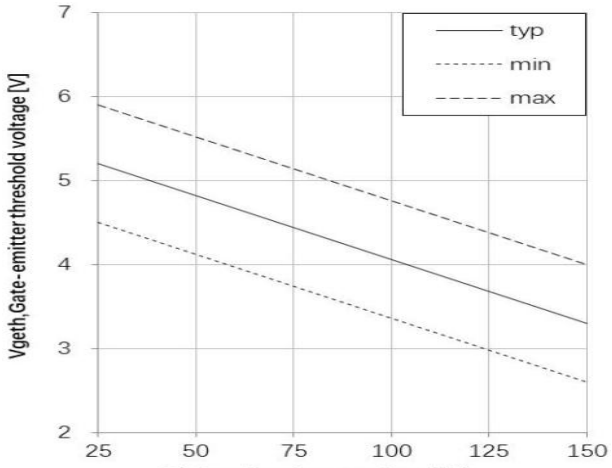


Fig7. Gate-emitter threshold voltage as a function of junction temperature(Ic=0.60mA)

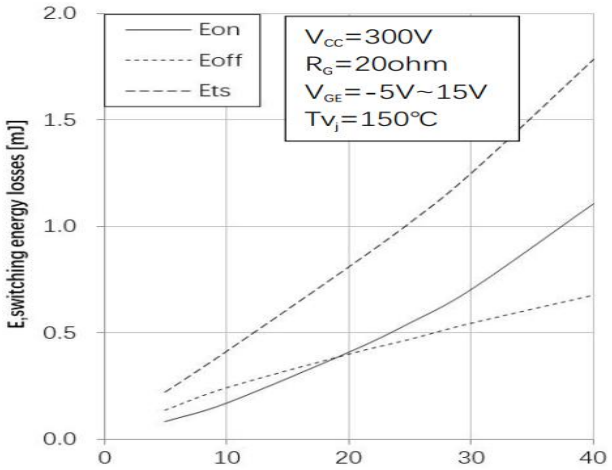


Fig8. Typical switching energy losses as a function of collect current

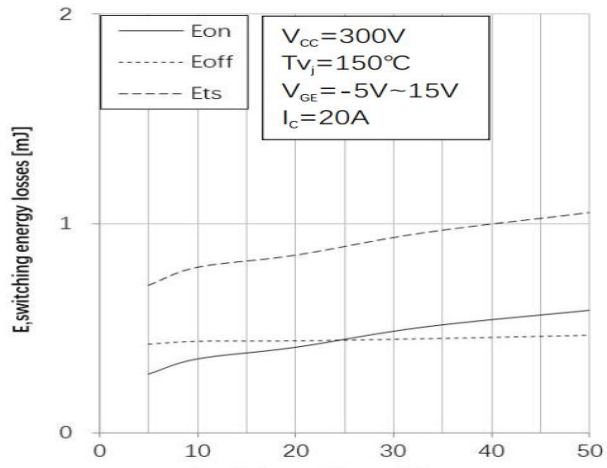


Fig9. Typical switching energy losses as a function of gate resistance

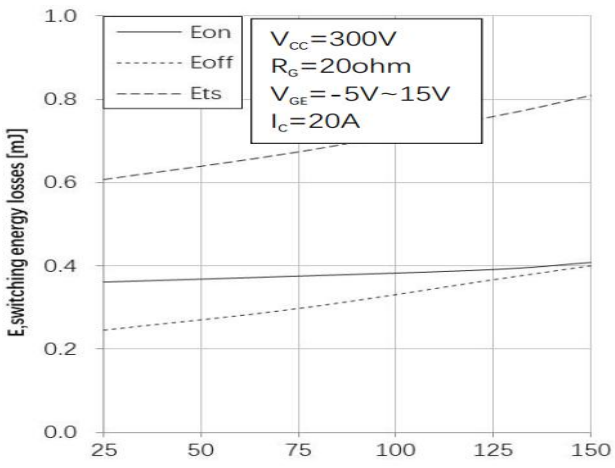


Fig10. Typical switching energy losses as a function of junction temperature

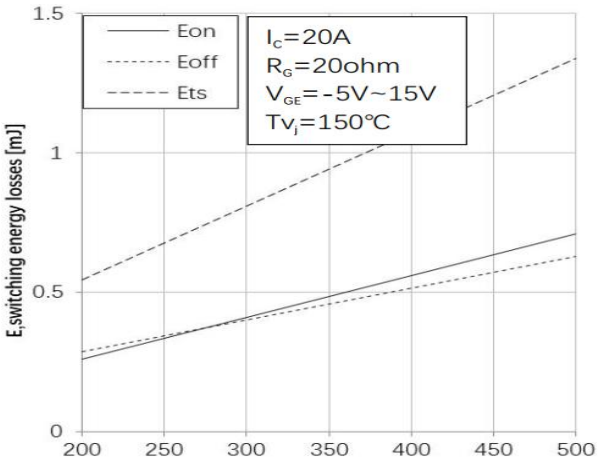


Fig11. Typical switching energy losses as a function of collector-emitter voltage

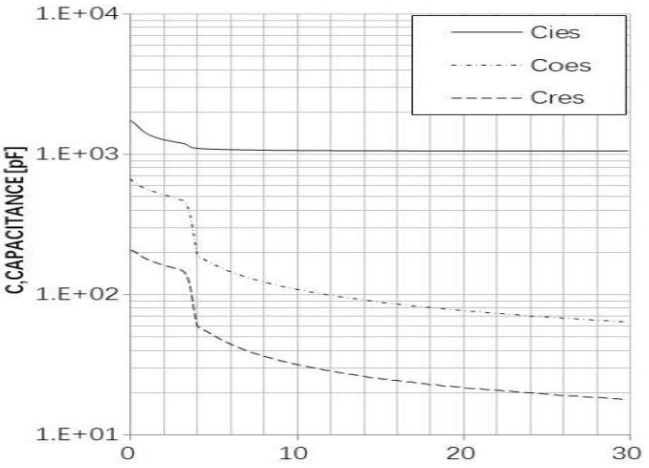


Fig12. Typical capacitance as a function of collector-emitter voltage

Typical Characteristics

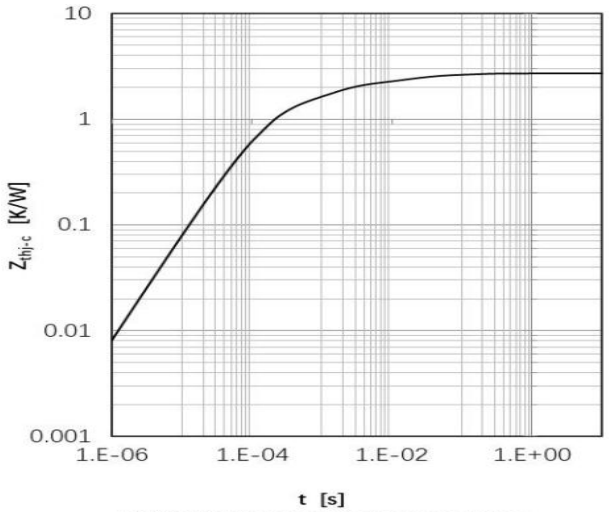


Fig 13. IGBT Transient Thermal Impedance

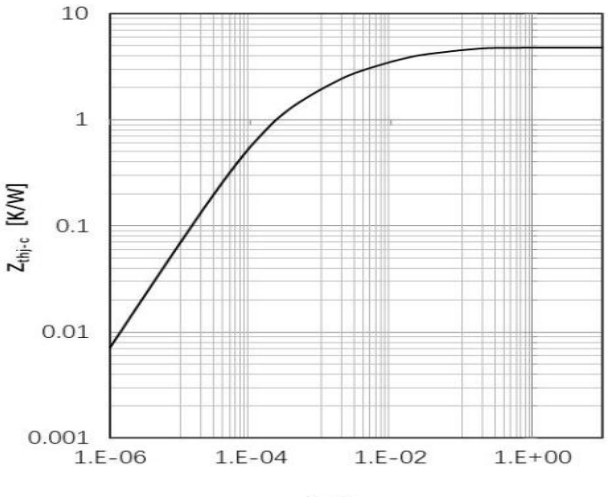


Fig14.Diode Transient Thermal Impedance

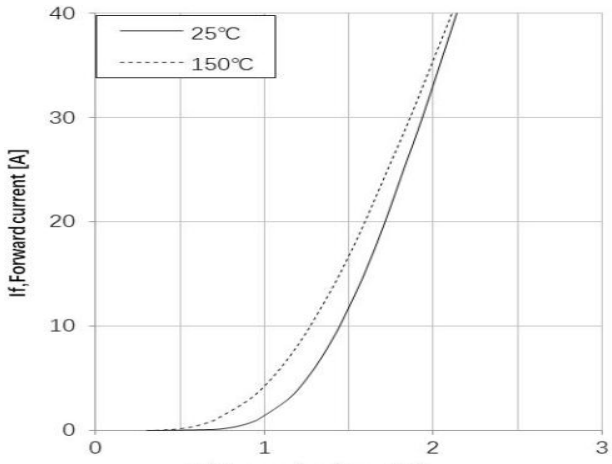


Fig15. Diode forawrd current as a function of foraward voltage

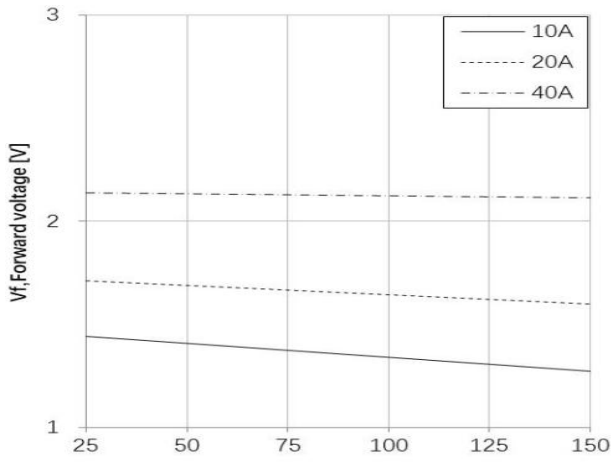
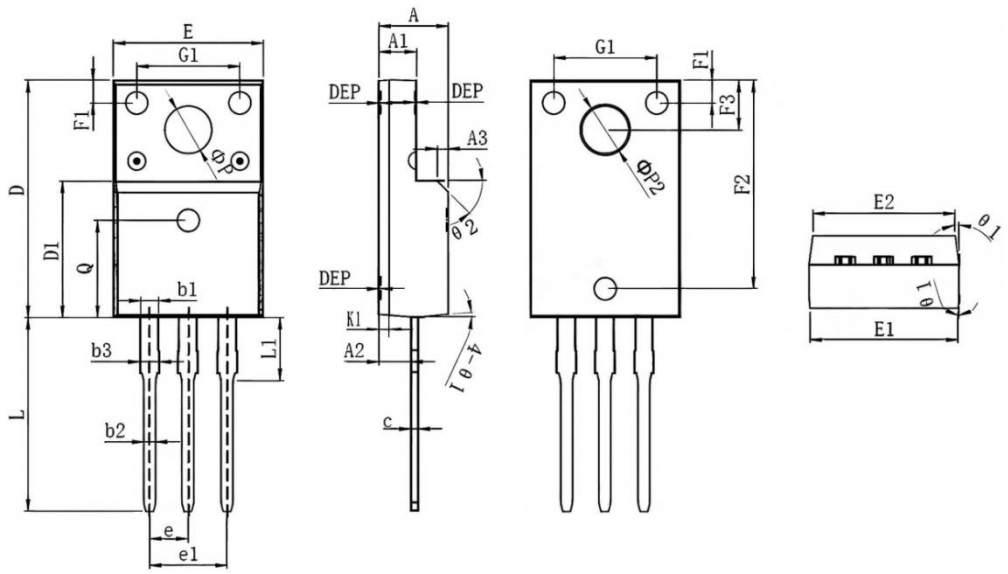


Fig16. Typical diode foraward voltage as a function of junction temperature

ITO-220AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.340	2.740	0.092	0.108
A2	2.660	2.860	0.105	0.113
A3	1.000 REF.		0.039 REF.	
b1	1.180	1.240	0.046	0.049
b2	0.750	0.850	0.030	0.033
b3	1.220	1.380	0.048	0.054
C	0.450	0.550	0.018	0.022
D	15.670	16.070	0.617	0.633
D1	9.040	9.200	0.356	0.362
E	10.000	10.300	0.394	0.406
E1	9.940	10.200	0.391	0.402
E2	9.400	9.600	0.370	0.378
e	2.500	2.580	0.098	0.102
e1	5.080 REF.		0.200 REF.	
F1	1.400	1.600	0.055	0.063
F2	13.800	14.000	0.543	0.551
F3	3.200	3.400	0.126	0.134
G1	6.900	7.100	0.272	0.280
K1	0.650	0.750	0.026	0.030
L	12.780	13.180	0.503	0.519
L1	3.400	3.600	0.134	0.142
Q	6.500 REF.		0.256 REF.	
Φ P	3.080	3.280	0.121	0.129
Φ P2	3.300	3.500	0.130	0.138
θ1	3°	73°	3°	73°
θ2	42°	48°	42°	48°