AI015K065TC

IGBT Discrete

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	I_C(100℃)
650V	1.65V@15V	15A

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

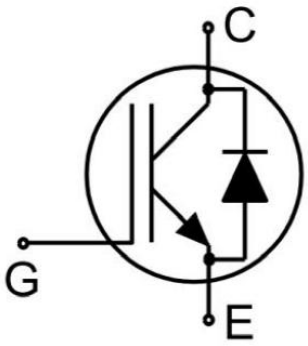
Application

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

Package

TO-220AB

Circuit diagram



Marking

G C E

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	30	A
Collector Current, limited by T_{jmax} (T_C =100℃)	I_C(100℃)	15	A
Pulsed Collector Current, tp limited by T_{jmax} (V_{GE} =15V)	I_{CM}	45	A
Diode Continuous Forward Current, limited by T_{jmax}	I_F	30	A
Diode Continuous Forward Current, limited by T_{jmax} (T_C =100℃)	I_F(100℃)	15	A
Diode Pulsed Current, tp limited by T_{jmax}	I_{Fpuls}	45	A
Turn off Safe Operating Area (V_{CE} ≤650V, T_J ≤150°C)	-	45	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	150	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1.5	℃/W
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	1	℃/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			0.25	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	5.5	6.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} =15V, I_C =15A		1.65	2.15	V
		V_{GE} =15V, I_C =15A, T_J =125℃		1.8		
		V_{GE} =15V, I_C =15A, T_J =150℃		1.85		
Dynamic characteristics						
Input Capacitance	C_{ies}	V_{CE} =25V, V_{GE} =0V, f =1MHz		0.74		nF
Reverse Transfer Capacitance	C_{res}			0.02		
Total Gate Charge	Q_g	V_{CC} =400V, V_{GE} =15V, I_C =15A		0.08		μC
Turn-on delay time	$t_{d(on)}$	V_{CC} =400V, V_{GE} =-5V~15V I_C =15A, R_G =10Ω		10		nS
Turn-on rise time	t_r			27		
Turn-off delay time	$t_{d(off)}$			58		
Turn-off fall time	t_f			64		
Turn-On Switching Loss	E_{on}			0.33		mJ
Turn-Off Switching Loss	E_{off}			0.22		

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Dynamic characteristics						
Turn-on delay time	$t_{d(on)}$	V_{CC} =400V, V_{GE} =-5V~15V I_C =15A, R_G =10Ω T_J =125°C		10		nS
Turn-on rise time	t_r			27		
Turn-off delay time	$t_{d(off)}$			74		
Turn-off fall time	t_f			105		
Turn-On Switching Loss	E_{on}			0.35		mJ
Turn-Off Switching Loss	E_{off}			0.35		
Turn-on delay time	$t_{d(on)}$	V_{CC} =400V, V_{GE} =-5V~15V I_C =15A, R_G =10Ω T_J=150°C		9		nS
Turn-on rise time	t_r			27		
Turn-off delay time	$t_{d(off)}$			81		
Turn-off fall time	t_f			122		
Turn-On Switching Loss	E_{on}			0.36		mJ
Turn-Off Switching Loss	E_{off}			0.41		

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 =15A		1.6	2.1	V
		I_F =15A, T_J =125℃		1.5		
		I_F =15A, T_J =150℃		1.45		
Reverse Recovery Current	I_{rrm}	V_R =400V, I_F =15A di/dt =-450A/μs		8		A
Reverse Recovery Charge	Q_{rr}			0.36		uC
Reverse Recovery Time	T_{rr}			78		nS
Reverse Recovery Energy	E_{rec}			0.08		mJ
Reverse Recovery Current	I_{rrm}	V_R =400V, I_F =15A di/dt =-450A/μs T_J =125°C		12		A
Reverse Recovery Charge	Q_{rr}			0.77		uC
Reverse Recovery Time	T_{rr}			126		nS
Reverse Recovery Energy	E_{rec}			0.2		mJ
Reverse Recovery Current	I_{rrm}	V_R =400V, I_F =15A di/dt =-450A/μs T_J =150°C		14		A
Reverse Recovery Charge	Q_{rr}			0.94		uC
Reverse Recovery Time	T_{rr}			146		nS
Reverse Recovery Energy	E_{rec}			0.25		mJ

Typical Characteristics

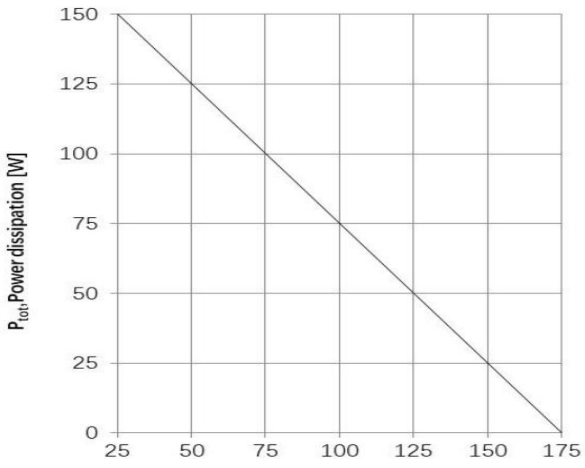


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

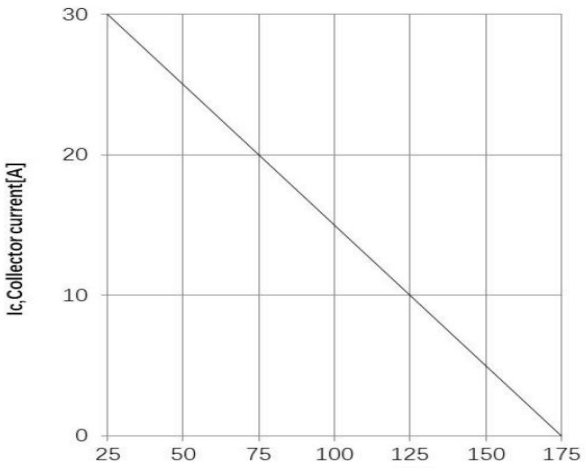


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

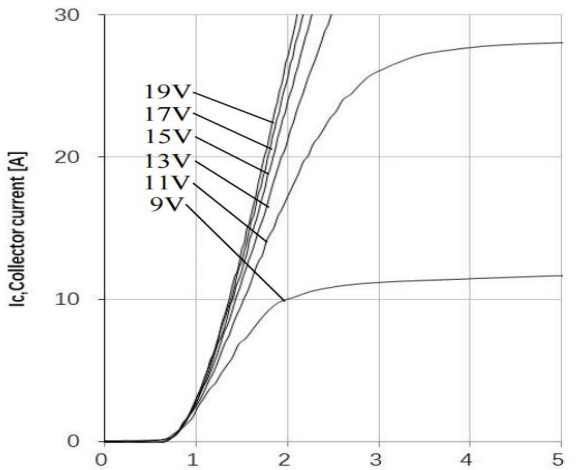


Fig3. Typical output characteristic (Tj=25℃)

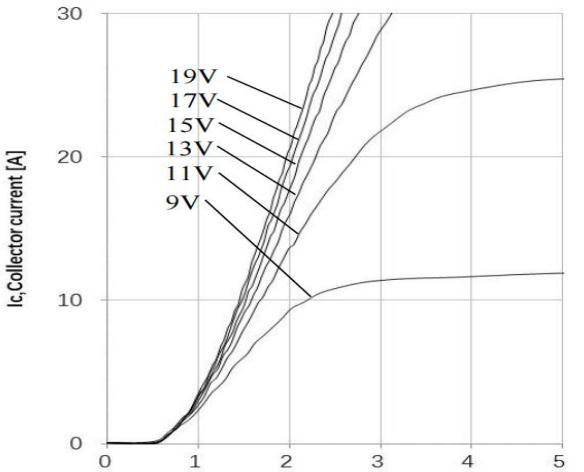


Fig4. Typical output characteristic (Tj=150℃)

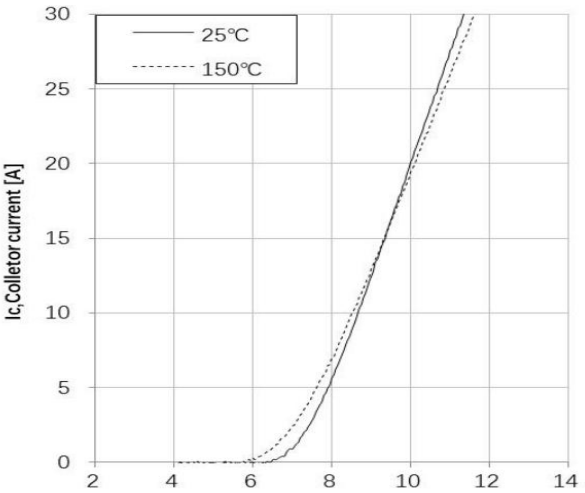


Fig5. Typical transfer characteristic (Vce=20V)

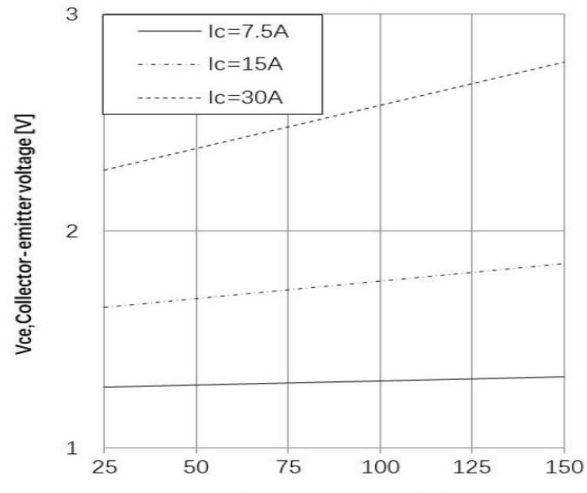


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

Typical Characteristics

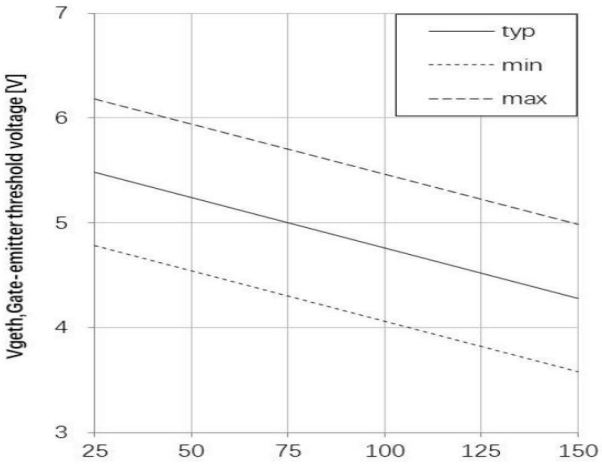


Fig7. Gate-emitter threshold voltage as a function of junction temperature(Ic=0.60mA)

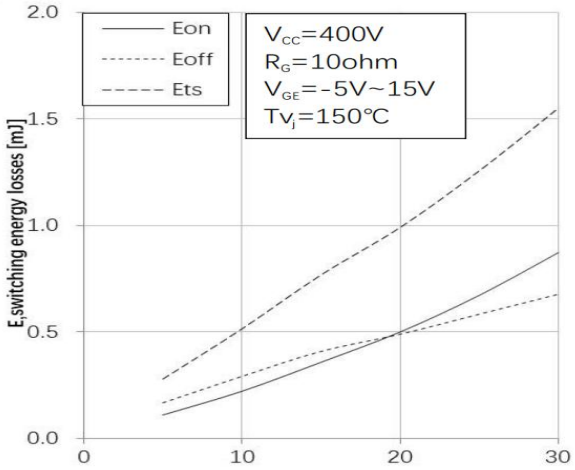


Fig8. Typical switching energy losses as a function of collect current

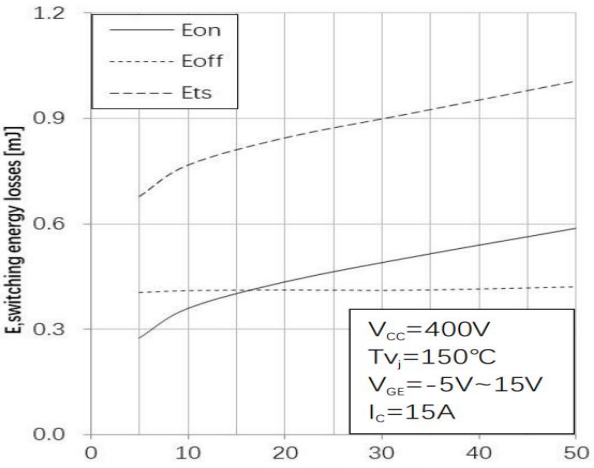


Fig9. Typical switching energy losses as a function of gate resistance

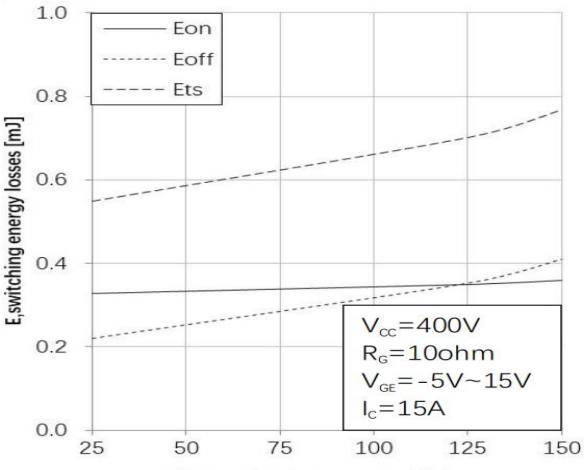


Fig10. Typical switching energy losses as a function of junction temperature

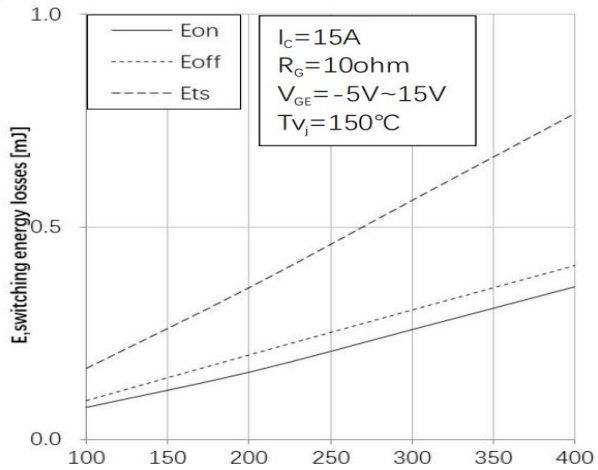


Fig11. Typical switching energy losses as a function of collector-emitter voltage

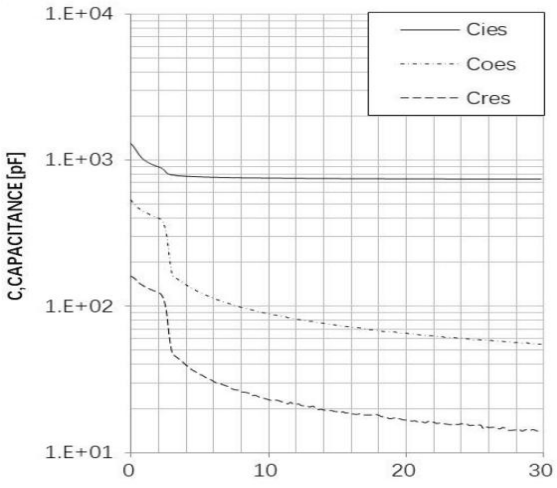


Fig12. Typical capacitance as a function of collector-emitter voltage

Typical Characteristics

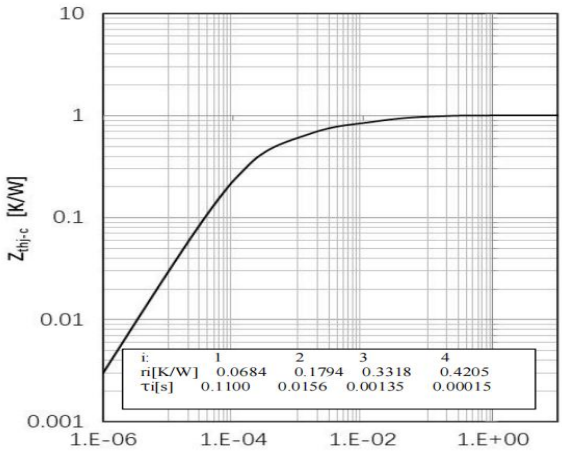


Fig 13. IGBT Transient Thermal Impedance

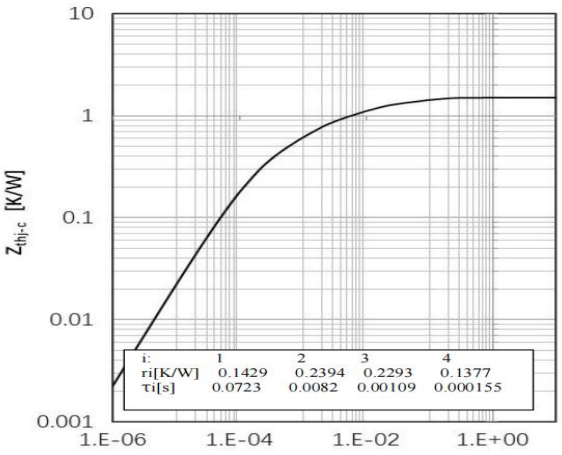


Fig 14.Diode Transient Thermal Impedance

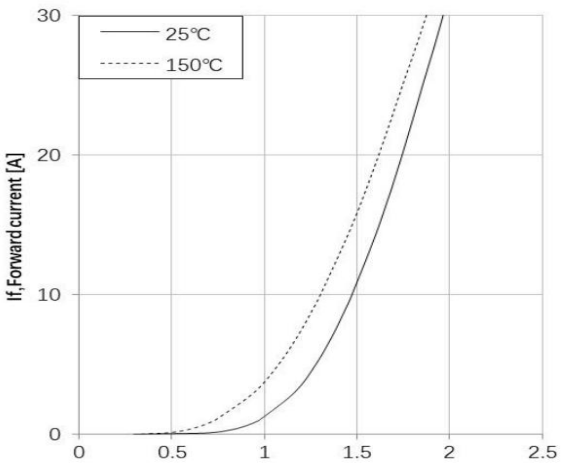


Fig15. Diode forawrd current as a function of foraward voltage

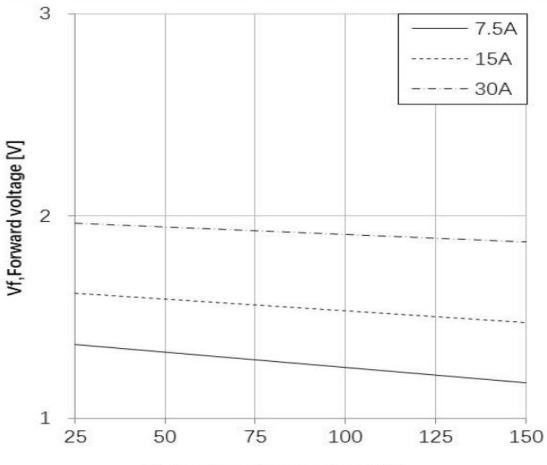
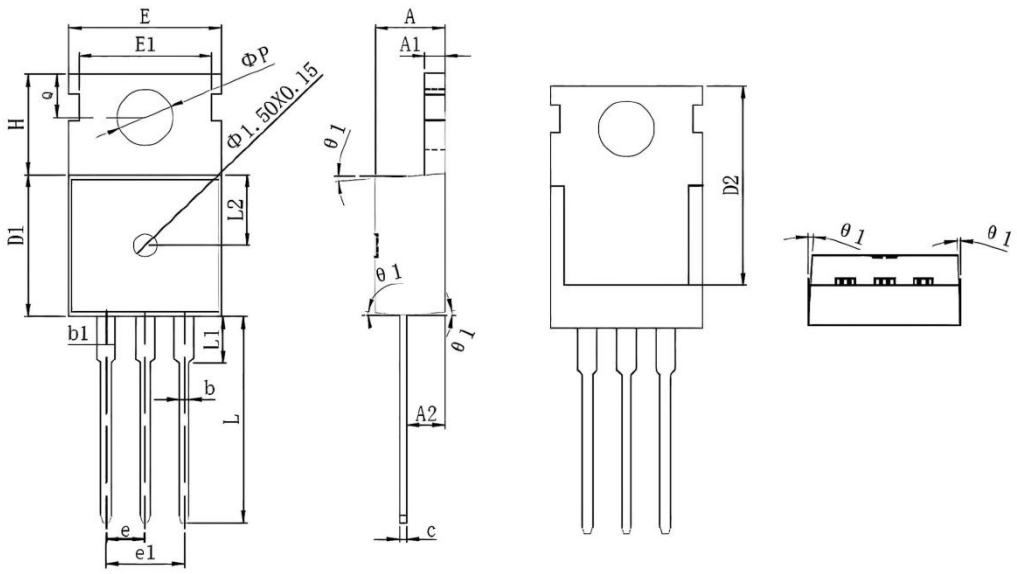


Fig16. Typical diode foraward voltage as a function of junction temperature

TO-220AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	1.250	1.350	0.049	0.053
A2	2.300	2.500	0.091	0.098
b	0.750	0.850	0.030	0.033
b1	1.250	1.420	0.049	0.056
C	0.450	0.550	0.018	0.022
D1	9.100	9.300	0.358	0.366
D2	12.900	13.300	0.508	0.524
E	9.800	10.150	0.386	0.400
E1	8.550	8.850	0.337	0.348
e	2.500	2.580	0.098	0.102
e1	5.080 BSC.		0.200 BSC.	
H	6.400	6.600	0.252	0.260
L	13.000	13.450	0.512	0.530
L1	-	3.400	-	0.134
L2	4.550	4.750	0.179	0.187
ϕP	3.600	3.750	0.142	0.148
Q	2.700	2.900	0.106	0.114
θ1	2°	7°	2°	7°