AI060M065TD

IGBT Discrete

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)MAX}$	I_C(100℃)
650V	2V@15V	60A

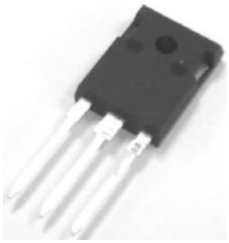
Feature

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

Application

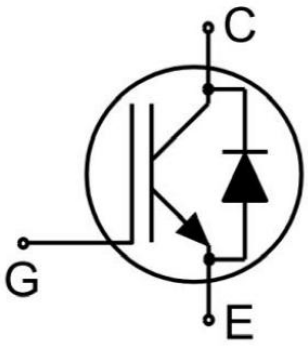
- Solar converters
- Uninterruptible power supplies
- Welding converters
- Mid to high range switching frequency converters

Package

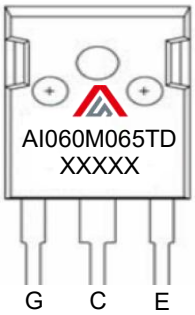


TO-247AB

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<0.01)	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℃)	60	A
Pulsed Collector Current, tp limited by T_{jmax} (V_{GE} =15V)	I_{CM}	200	A
Diode Continuous Forward Current, limited by T_{jmax}	I_F	80	A
Diode Continuous Forward Current, limited by T_{jmax} (T_C=100℃)	I_F(100℃)	60	A
Diode Pulsed Current, tp limited by T_{jmax}	I_{Fpuls}	200	A
Turn off Safe Operating Area (V_{CE}≤650V, T_J≤150°C)	-	200	A
Power Dissipation	P_D	283	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1.05	℃/W
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.53	℃/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 =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℃			3	
Gate to Emitter Leakage Current	I_{GES}	V_{GE} =20V, V_{CE} =0V			100	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE} =V_{CE}, I_C =500μA	3.8	4.8	5.8	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} =15V, I_C =60A	1.4	1.7	2	V
		V_{GE} =15V, I_C =60A,T_J =125℃		2		
		V_{GE} =15V, I_C =60A,T_J =150℃		2.1		
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 =60A		0.16		μC
Turn-on delay time	$t_{d(on)}$	V_{CC} =400V, V_{GE} =-5V~15V I_C =60A, R_G =10Ω Inductive Load		28		nS
Turn-on rise time	t_r			44		
Turn-off delay time	$t_{d(off)}$			72		
Turn-off fall time	t_f			34		
Turn-On Switching Loss	E_{on}			2.64		mJ
Turn-Off Switching Loss	E_{off}			0.45		
Total Switching Loss	E_{ts}			3.09		

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 =60A, R_G =10Ω Inductive Load T_J =125°C		28		nS
Turn-on rise time	t_r			55		
Turn-off delay time	$t_{d(off)}$			80		
Turn-off fall time	t_f			40		
Turn-On Switching Loss	E_{on}			2.72		mJ
Turn-Off Switching Loss	E_{off}			0.55		
Total Switching Loss	E_{ts}			3.27		
Turn-on delay time	$t_{d(on)}$	V_{CC} =400V, V_{GE} =-5V~15V I_C =60A, R_G =10Ω Inductive Load T_J=150°C		29		nS
Turn-on rise time	t_r			61		
Turn-off delay time	$t_{d(off)}$			86		
Turn-off fall time	t_f			43		
Turn-On Switching Loss	E_{on}			2.83		mJ
Turn-Off Switching Loss	E_{off}			0.58		
Total Switching Loss	E_{ts}			3.41		

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 =60A		1.7	2.2	V
		I_F =60A, T_J =125℃		1.65		
		I_F =60A, T_J =150℃		1.6		
Reverse Recovery Current	I_{rrm}	V_R =400V, I_F =60A di/dt =-450A/μs		16		A
Reverse Recovery Charge	Q_{rr}			1.69		uC
Reverse Recovery Time	t_{rr}			166		nS
Reverse Recovery Energy	E_{rec}			0.35		mJ
Reverse Recovery Current	I_{rrm}	V_R =400V, I_F =60A di/dt =-450A/μs T_J =125°C		23		A
Reverse Recovery Charge	Q_{rr}			2.84		uC
Reverse Recovery Time	t_{rr}			198		nS
Reverse Recovery Energy	E_{rec}			0.78		mJ
Reverse Recovery Current	I_{rrm}	V_R =400V, I_F =60A di/dt =-450A/μs T_J =150°C		26		A
Reverse Recovery Charge	Q_{rr}			3.73		uC
Reverse Recovery Time	t_{rr}			241		nS
Reverse Recovery Energy	E_{rec}			0.95		mJ

Typical Characteristics

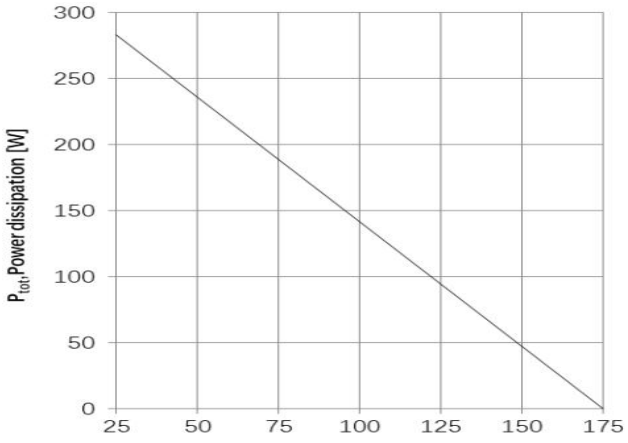


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

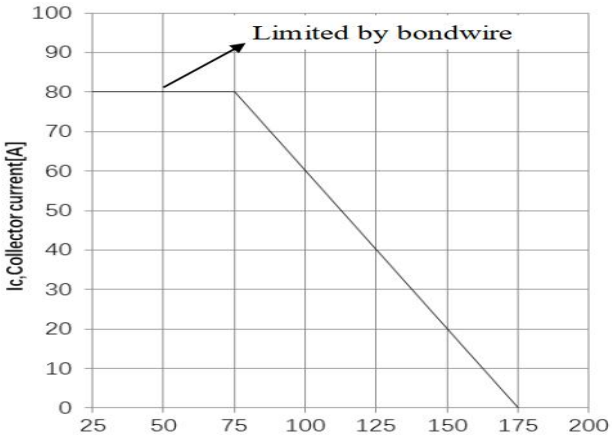


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

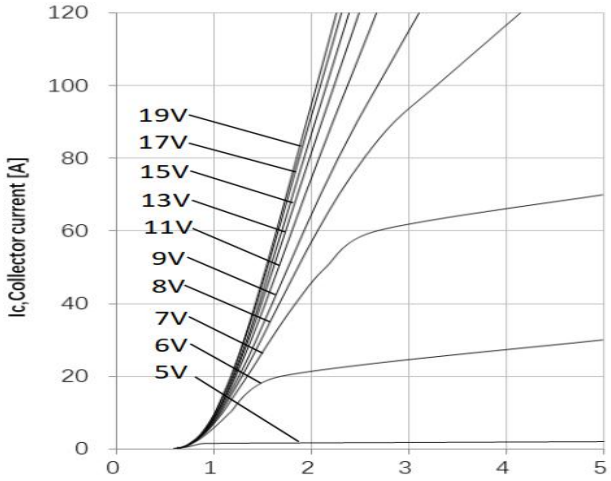


Fig3. Typical output characteristic (Tj=25℃)

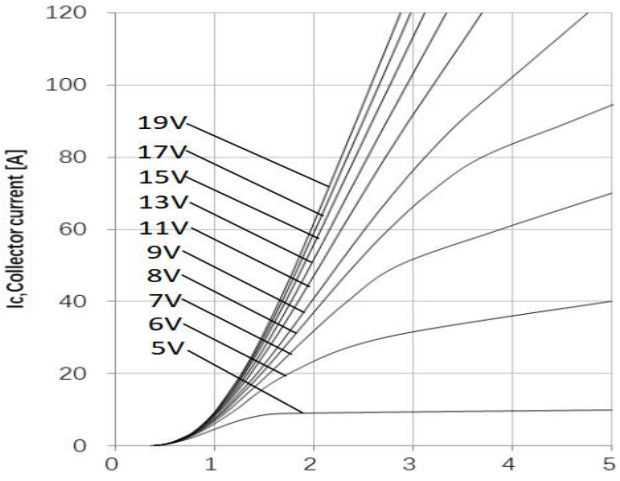


Fig4. Typical output characteristic (Tj=150℃)

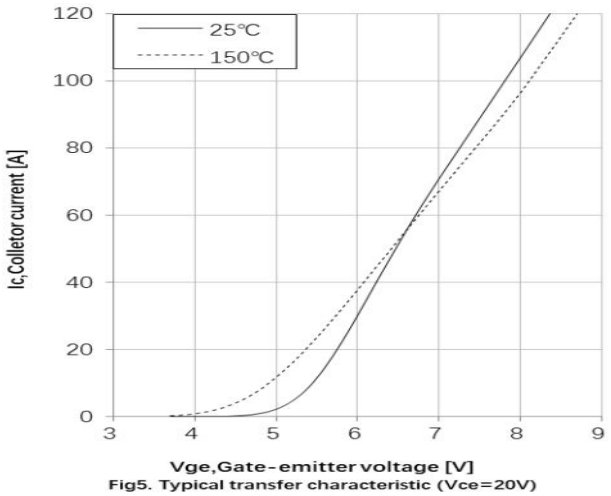


Fig5. Typical transfer characteristic (Vce=20V)

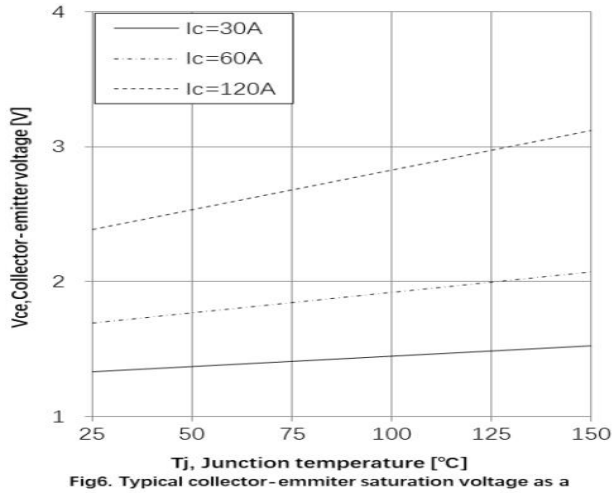


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

Typical Characteristics

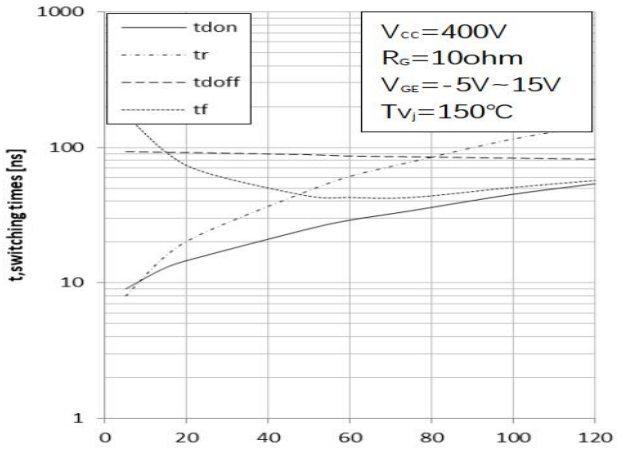


Fig7. Typical switching times as a function of collect current

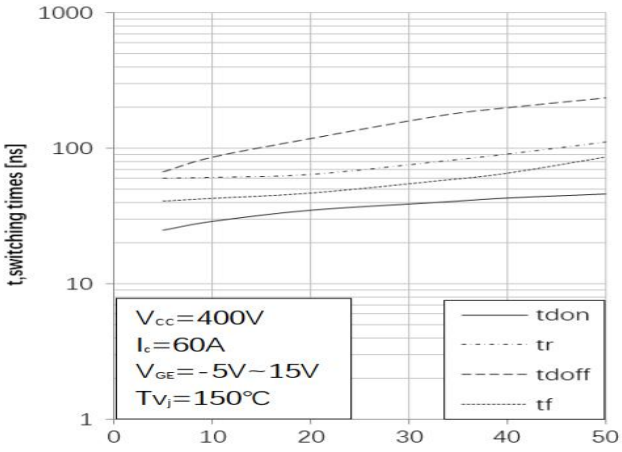


Fig8. Typical switching times as a fuction of gate resistance

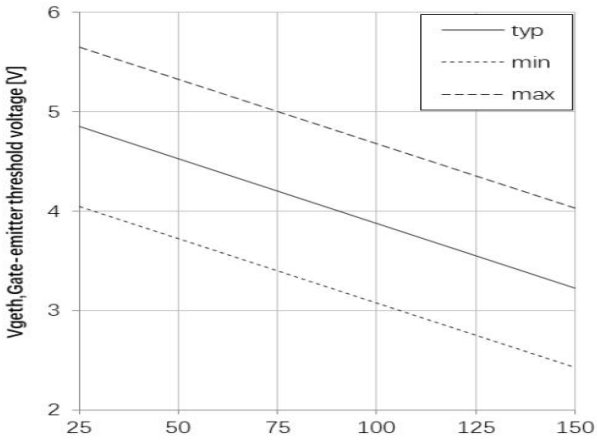


Fig9. Gate-emitter threshold voltage as a fuction of junction temperature(Ic=0.5mA)

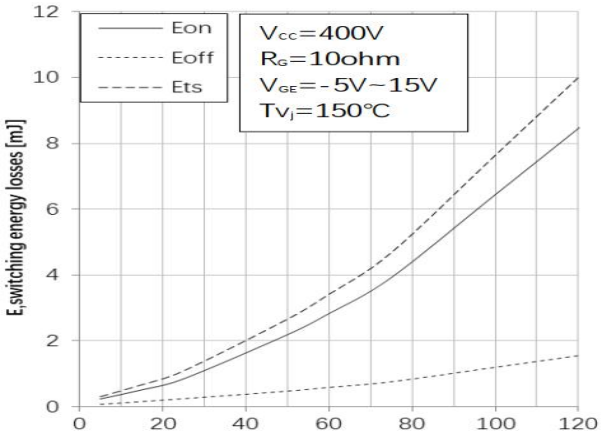


Fig10. Typical switching energy losses as a fuction of collect current

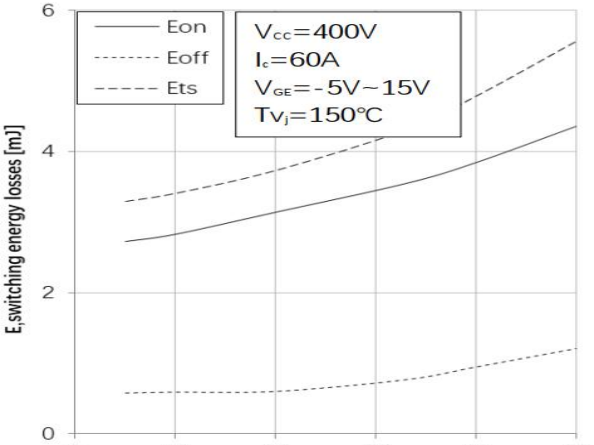


Fig11. Typical switching energy losses as a fuction of gate resistance

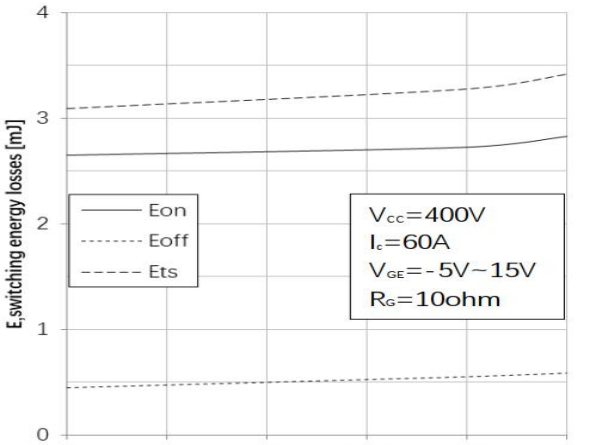


Fig12. Typical switching energy losses as a fuction of junction temperature

Typical Characteristics

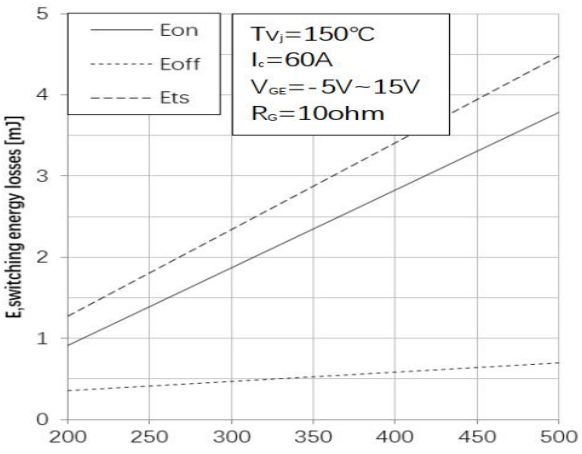


Fig13. Typical switching energy losses as a fuction of collector-emitter voltage

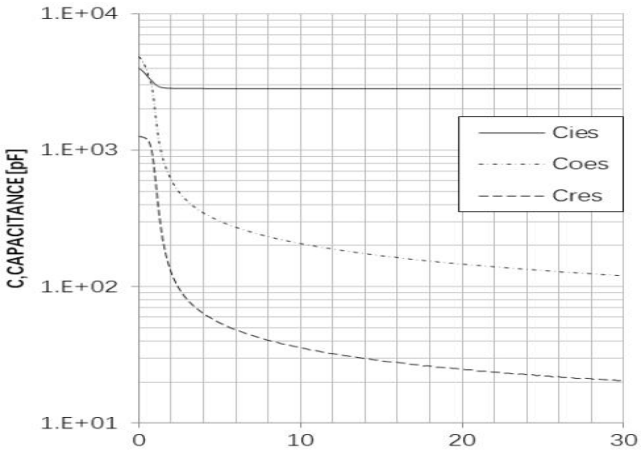


Fig14. Typical capacitance as a function of collector-emitter voltage

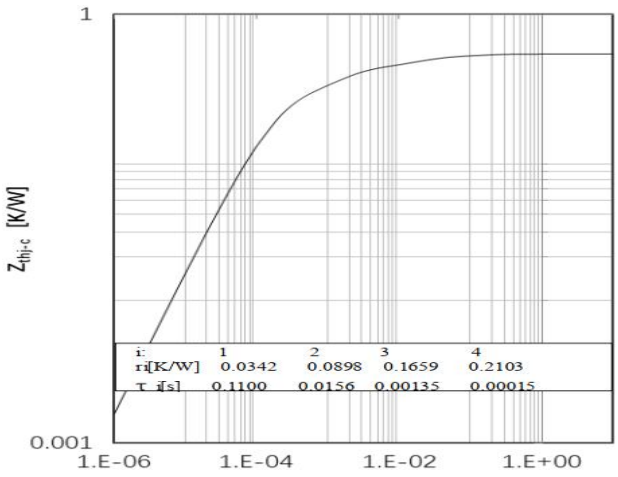


Fig 15. IGBT Transient Thermal Impedance

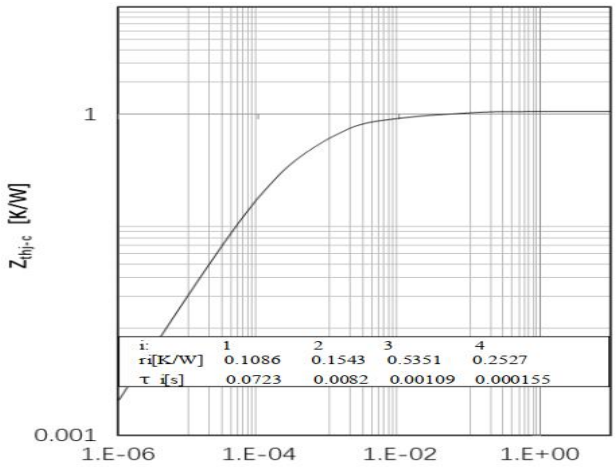


Fig 16. Diode Transient Thermal Impedance

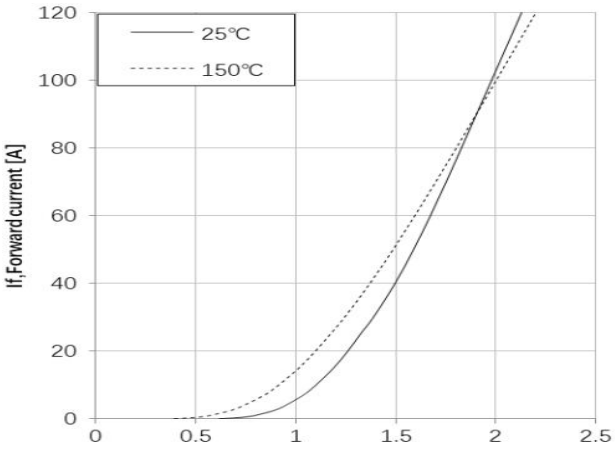


Fig17. Diode forawrd current as a function of foraward voltage

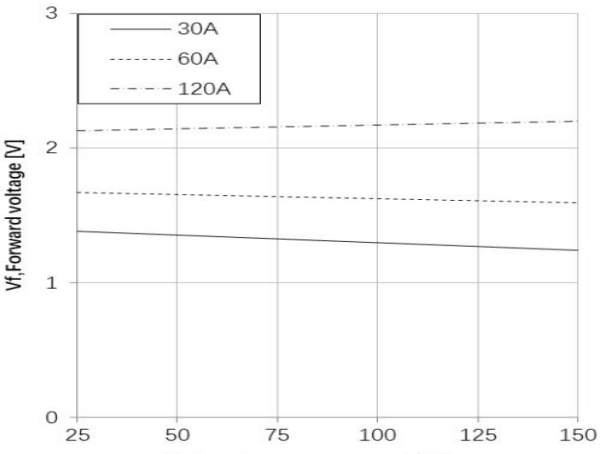


Fig18. Diode forawrd voltage as a function of junction temperature

Typical Characteristics

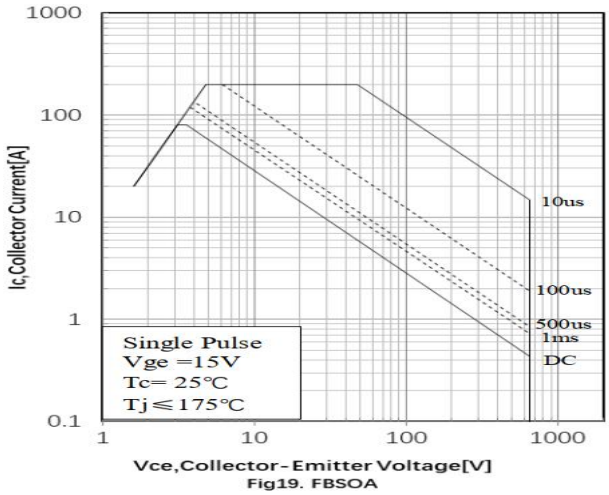
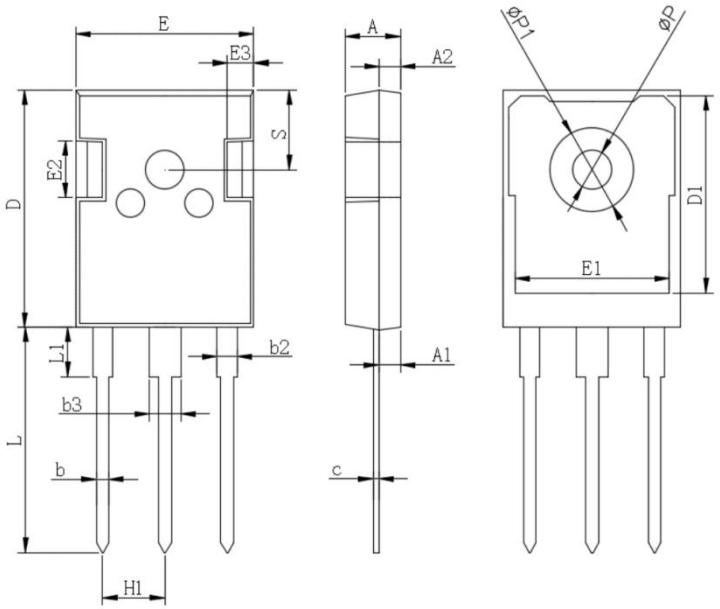


Fig19. FBSOA

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	