AI4P75N65AS

Trench FS IGBT Discrete

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)MAX}$	I_C
650V	1.75V@15V	75A

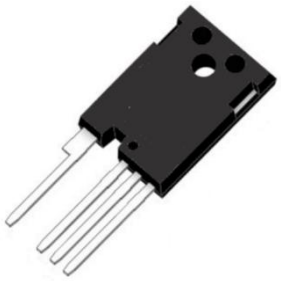
Feature

- High speed smooth switching device for hard and soft switching
- Positive temperature coefficient
- High ruggedness, temperature stable

Application

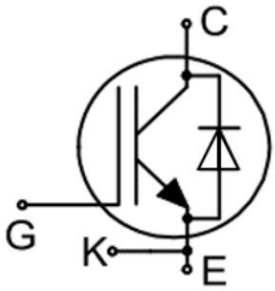
- Resonant converters
- Uninterruptible power supplies
- Welding converters
- Mid to high range switching frequency converters

Package



TO-247-4L

Circuit diagram



Marking

C E K G

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

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Continuous Gate- Emitter Voltage	V_{GES}	±20	V
Collector Current	I_C	85	A
Collector Current(T_C =100℃)	I_C(100℃)	80	A
Pulsed Collector Current, tp limited by T_{jmax},V_{GE}=15V	I_{CM}	300	A
Diode Continuous Forward Current	I_F	85	A
Diode Continuous Forward Current(T_C =100℃)	I_F(100℃)	80	A
Diode Forward Current, tp limited by T_{jmax}	I_{Fpuls}	300	A
Turn off Safe Operating Area V_{CE}≤ 650V,T_J≤150°C	-	300	A
Power Dissipation(T_J=175°C)	P_D	428	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	0.5	℃/W
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.35	℃/W
Soldering Temperature,wave soldering 1.6mm(0.063in.) from case for 10s	T_L	260	℃
Junction Temperature	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=250uA	650			V
Collector-Emitter Leakage Current	I_{CES}	V_{GE} = 0V,V_{CE}=650V			0.25	mA
		V_{GE} = 0V,V_{CE}=650V,Tj=150℃			3	
Gate to Emitter Leakage Current	I_{GES}	V_{GE} =±20V, V_{CE} = 0V			100	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V,I_C=75A	1.1	1.45	1.75	V
		V_{GE}=15V,I_C=75A,Tj=125℃		1.6		
		V_{GE}=15V,I_C=75A,Tj=150℃		1.7		
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} =V_{GE},I_C=750uA	3.2	4.0	4.8	V
Dynamic characteristics						
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V, f =1MHz		4.75		nF
Reverse Transfer Capacitance	C_{res}			0.04		
Total Gate Charge	Q_g	V_{CC}=520V,V_{GE} =15V,I_C=75A		0.18		uC
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V,V_{GE} =-5V~15V, I_C =75A,R_G=10Ω, Inductive Load		31		nS
Turn-on rise time	t_r			80		
Turn-off delay time	$t_{d(off)}$			121		
Turn-off fall time	t_f			47		
Turn-on Switching Energy	E_{on}			2.49		mJ
Turn-off Switching Energy	E_{off}			0.99		
Total Switching Energy	E_{ts}			3.48		
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V,V_{GE} =-5V~15V, I_C =75A,R_G=10Ω,Tj=125℃, Inductive Load		29		nS
Turn-on rise time	t_r			84		
Turn-off delay time	$t_{d(off)}$			134		
Turn-off fall time	t_f			66		
Turn-on Switching Energy	E_{on}			2.57		mJ
Turn-off Switching Energy	E_{off}			1.29		
Total Switching Loss	E_{ts}			3.86		
Turn-on delay time	$t_{d(on)}$	V_{CC}=400V, V_{GE} =-5V~15V, I_C =75A, R_G=10Ω, Tj=150℃, Inductive Load		28		nS
Turn-on rise time	t_r			85		
Turn-off delay time	$t_{d(off)}$			142		
Turn-off fall time	t_f			73		
Turn-on Switching Energy	E_{on}			2.62		mJ
Turn-off Switching Energy	E_{off}			1.41		
Total Switching Energy	E_{ts}			4.03		

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=75A		1.7	1.9	V
		I_F=75A,Tj=175℃		2.6		
Diode Capacitive Charge	Q_C	V_R=400V		135		nC
Diode Capacitive	C	V_R=0V, f=1MHz		2453		pF
		V_R=200V, f=1MHz		247		
		V_R=400V, f=1MHz		243		

Typical Characteristics

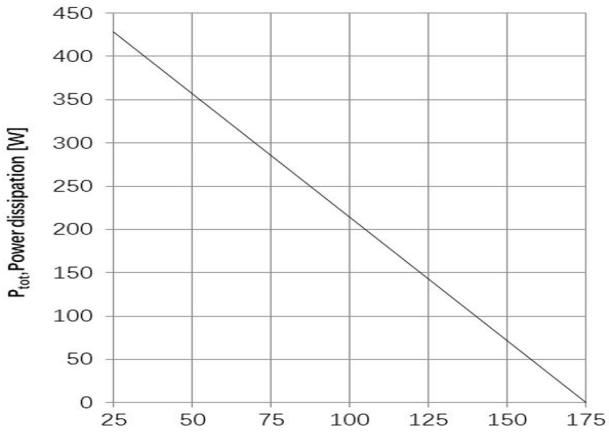


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

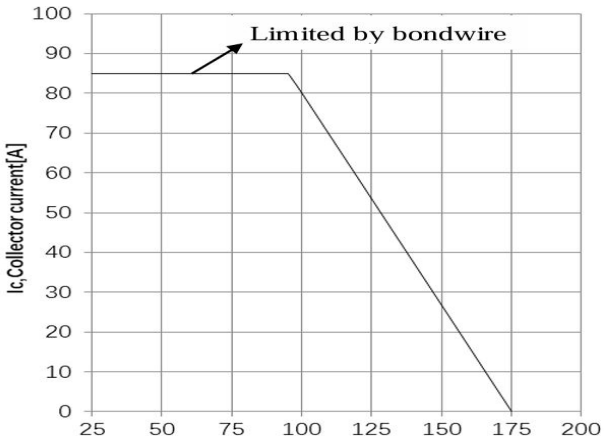


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

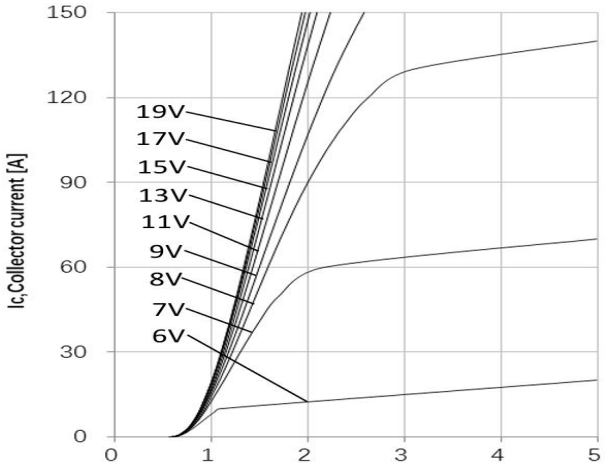


Fig3. Typical output characteristic (Tj=25°C)

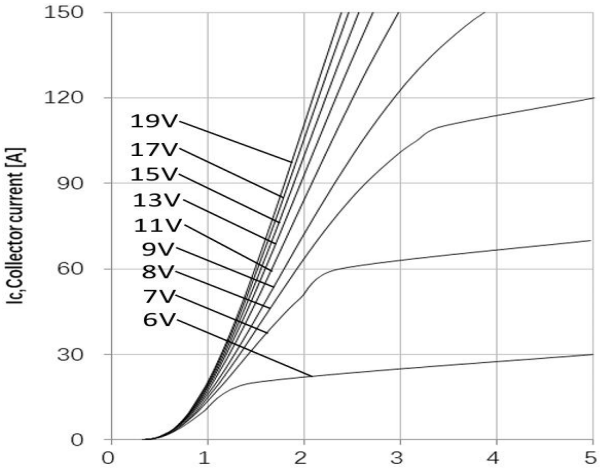


Fig4. Typical output characteristic (Tj=150°C)

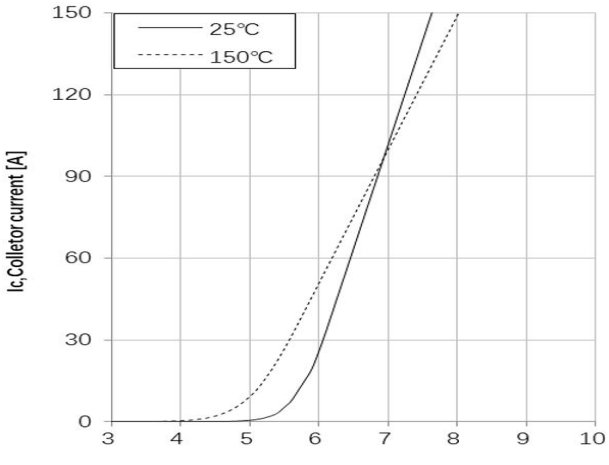


Fig5. Typical transfer characteristic (Vce=20V)

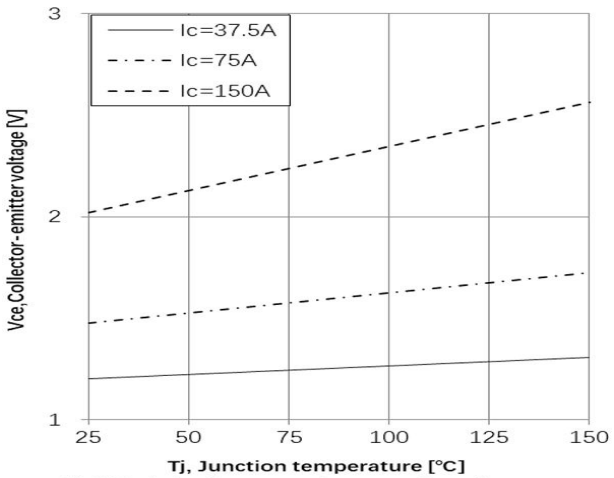


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

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AS-3320032	2023/05/08	2024/10/28	B	7

Typical Characteristics

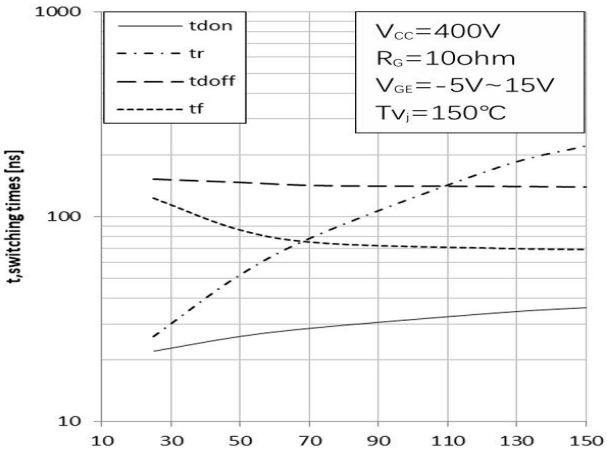


Fig7. Typical switching times as a function of collect current

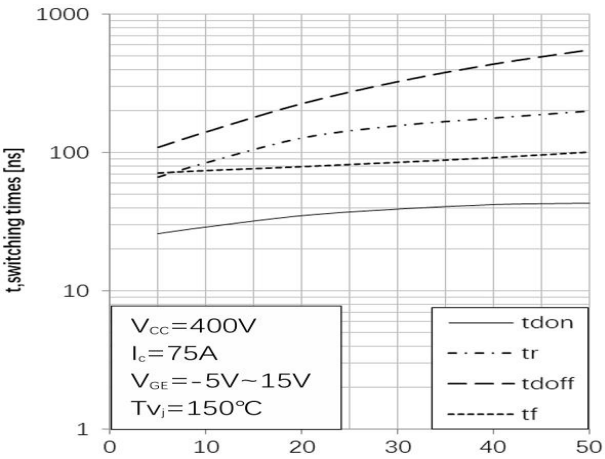


Fig8. Typical switching times as a fuction of gate resistance

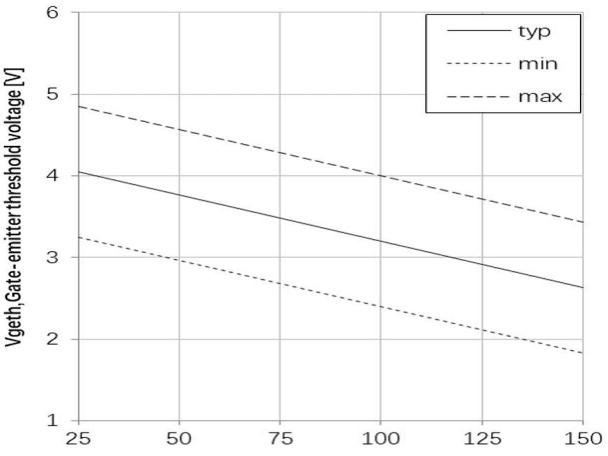


Fig9. Gate-emitter threshold voltage as a fuction of junction temperature(Ic=0.75mA)

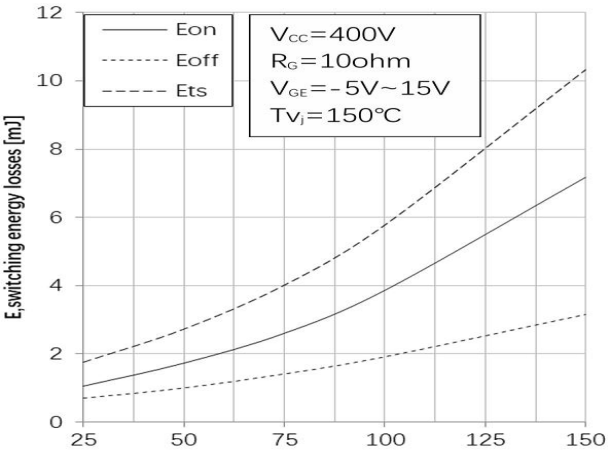


Fig10. Typical switching energy losses as a fuction of collect current

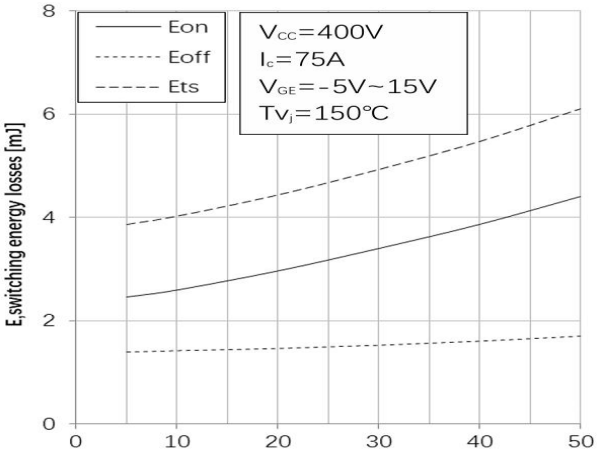


Fig11. Typical switching energy losses as a fuction of gate resistance

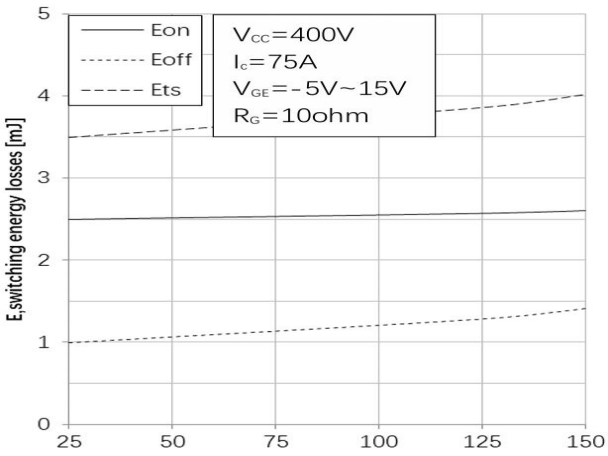


Fig12. Typical switching energy losses as a fuction of junction temperature

Typical Characteristics

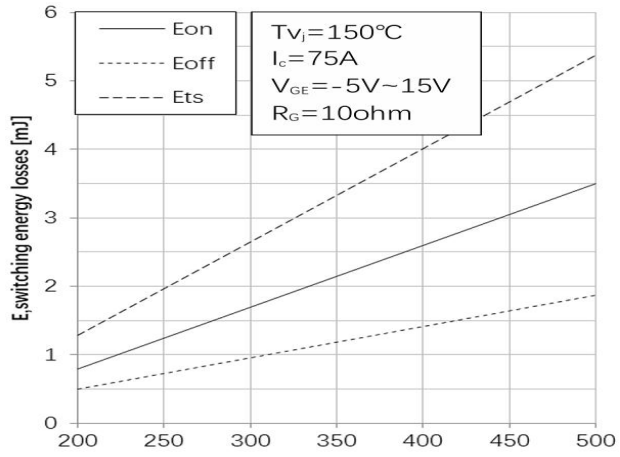


Fig13. Typical switching energy losses as a fuction of collector-emitter voltage

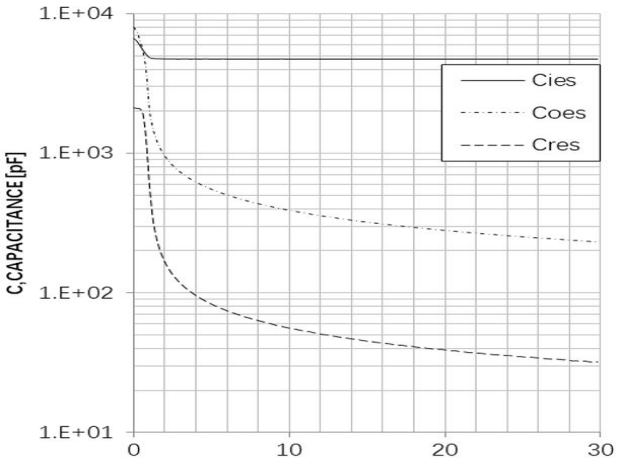


Fig14. Typical capacitance as a function of collector-emitter voltage

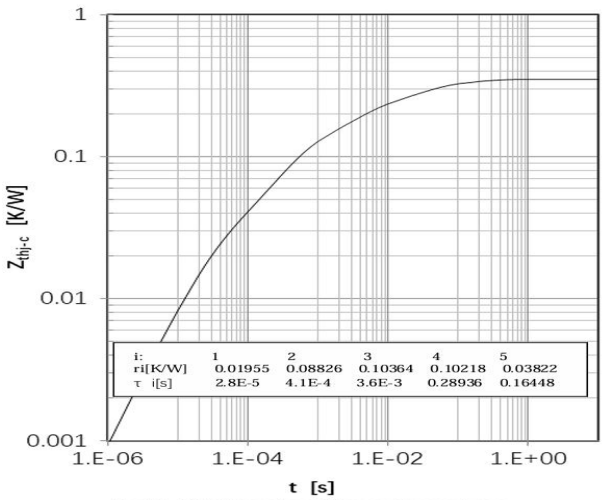


Fig 15. IGBT Transient Thermal Impedance

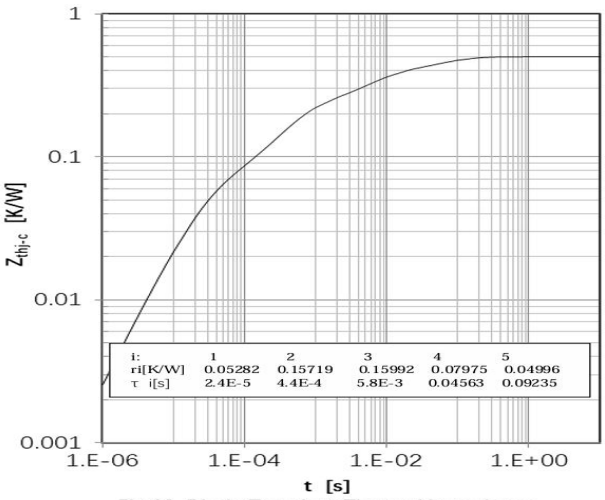


Fig 16. Diode Transient Thermal Impedance

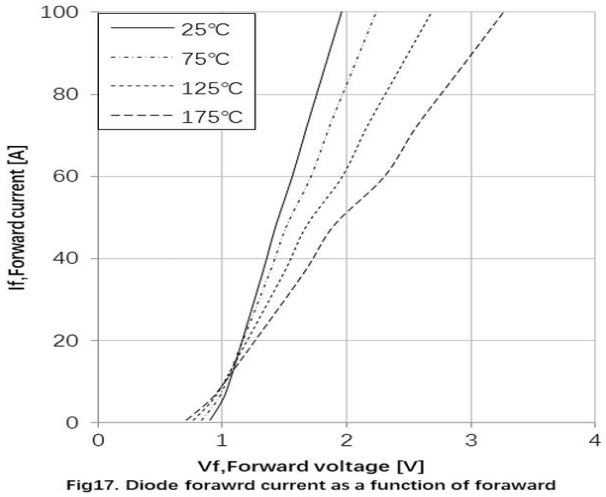


Fig17. Diode forawrd current as a function of foraward voltage

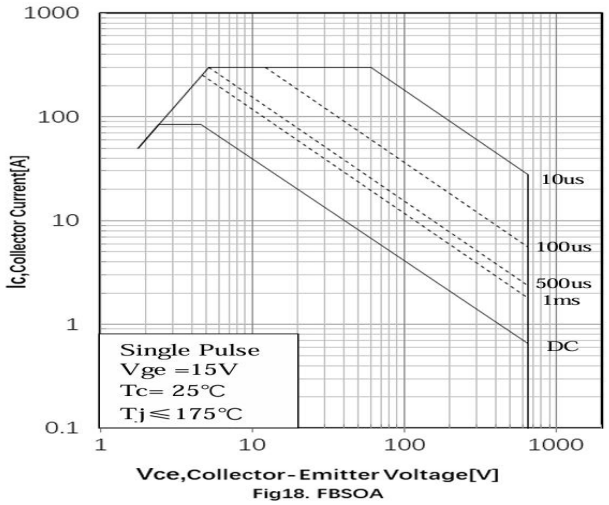
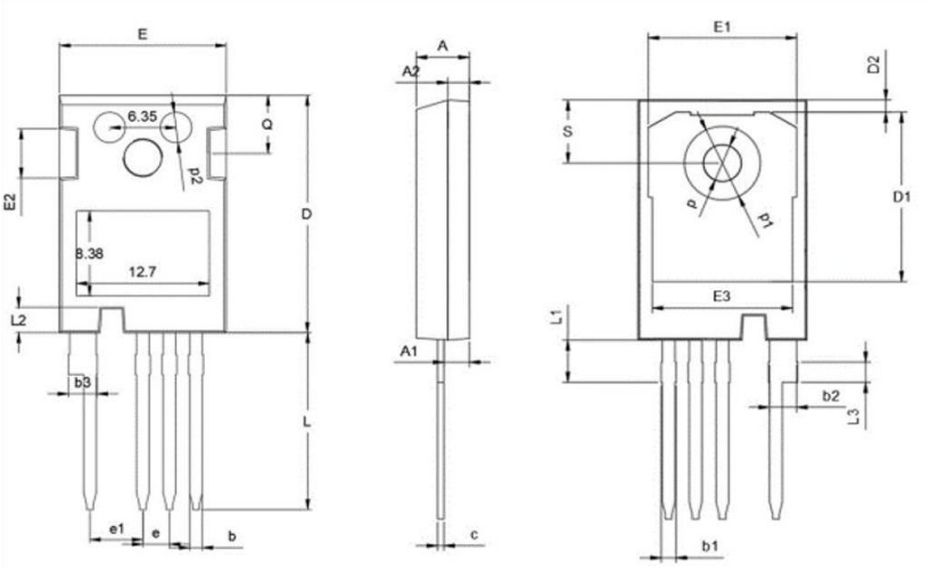


Fig18. FBSOA

TO-247-4L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.800	5.200	0.189	0.205
A1	2.300	2.500	0.091	0.098
A2	1.880	2.080	0.074	0.082
b	1.100	1.300	0.043	0.051
b1	1.200	1.500	0.047	0.059
b2	2.350	2.750	0.093	0.108
b3	2.450	2.850	0.096	0.112
c	0.550	0.650	0.022	0.026
D	23.300	23.600	0.917	0.929
D1	16.250	16.850	0.640	0.663
D2	1.000	1.300	0.039	0.051
e	2.540 TYP		0.100 YP	
e1	5.060 TYP		0.199 TYP	
E	15.750	16.050	0.620	0.632
E1	13.800	14.200	0.543	0.559
E2	4.400	5.100	0.173	0.201
E3	13.000	13.450	0.512	0.530
L	17.340	17.640	0.683	0.694
L1	4.000	4.300	0.157	0.169
L2	2.350	2.650	0.093	0.104
L3	1.980 TYP		0.078 TYP	
Q	5.600	6.000	0.220	0.236
S	6.050	6.300	0.238	0.248
p	3.580 TYP		0.141 TYP	
p1	7.180 TYP		0.283 TYP	
p2	3.000 TYP		0.118 TYP	