

Product Summary

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

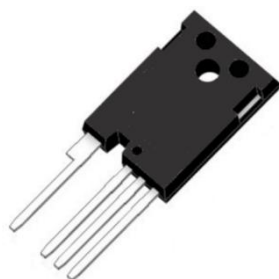
Feature

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

Application

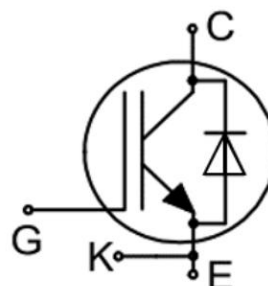
- Resonant converters
- Uninterruptible power supplies
- Welding converters
- Mid to high range switching frequency converters

Package

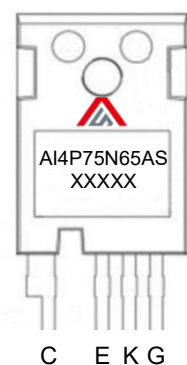


TO-247-4L

Circuit diagram



Marking



Absolute maximum ratings (Tc=25°C 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°C)	I _C (100°C)	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°C)	I _F (100°C)	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 _{θJC}	0.5	°C/W
Thermal Resistance, Junction to case for IGBT	R _{θJC}	0.35	°C/W
Soldering Temperature,wave soldering 1.6mm(0.063in.) from case for 10s	T _L	260	°C
Junction Temperature	T _J	-40 ~ +175	°C
Storage Temperature Range	T _{STG}	-55 ~ +150	°C

Electrical characteristics of the IGBT (T_J=25°C 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, T _J =150°C			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, T _J =125°C		1.6			
		V _{GE} =15V, I _C =75A, T _J =150°C		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, T _J =125°C, 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, T _J =150°C, 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 ($T_j=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$I_F=75\text{A}$		1.7	1.9	V
		$I_F=75\text{A}, T_j=175^\circ\text{C}$		2.6		
Diode Capacitive Charge	Q_C	$V_R=400\text{V}$		135		nC
Diode Capacitive	C	$V_R=0\text{V}, f=1\text{MHz}$		2453		pF
		$V_R=200\text{V}, f=1\text{MHz}$		247		
		$V_R=400\text{V}, f=1\text{MHz}$		243		

Typical Characteristics

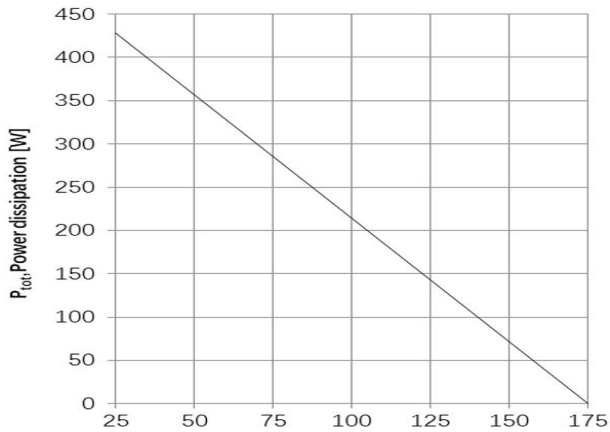


Fig1. Power dissipation as a function of case temperature ($T_J \leq 175^\circ\text{C}$)

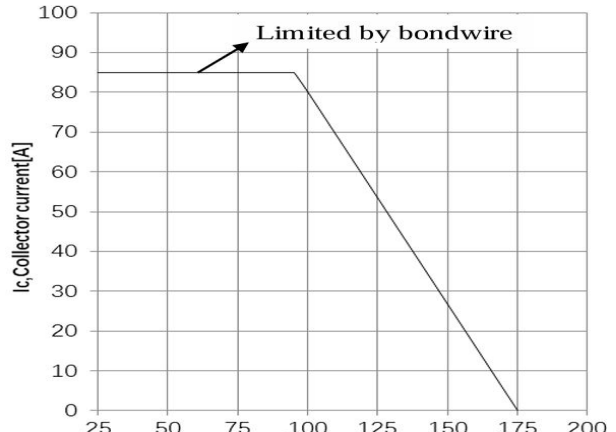


Fig2. Collector current as a function of case temperature ($V_{ge} \geq 15\text{V}$, $T_J \leq 175^\circ\text{C}$)

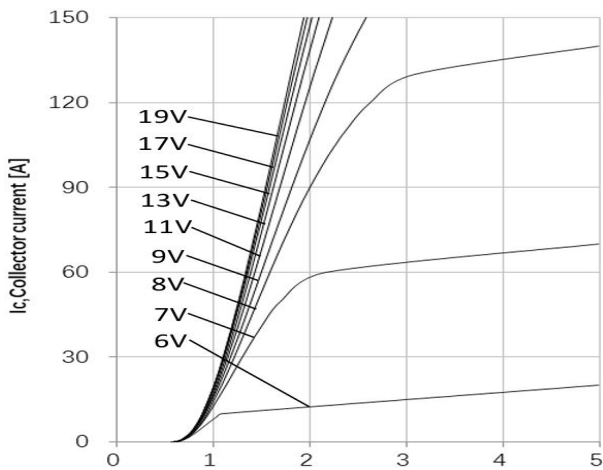


Fig3. Typical output characteristic ($T_J=25^\circ\text{C}$)

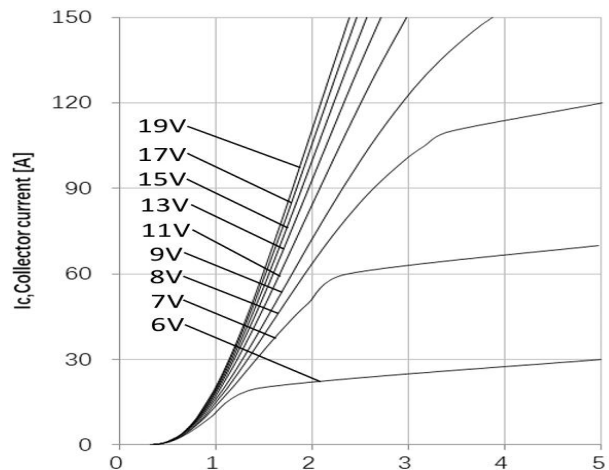


Fig4. Typical output characteristic ($T_J=150^\circ\text{C}$)

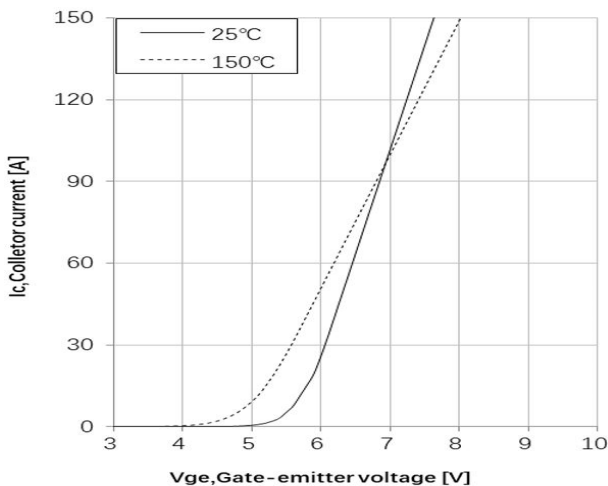


Fig5. Typical transfer characteristic ($V_{ce}=20\text{V}$)

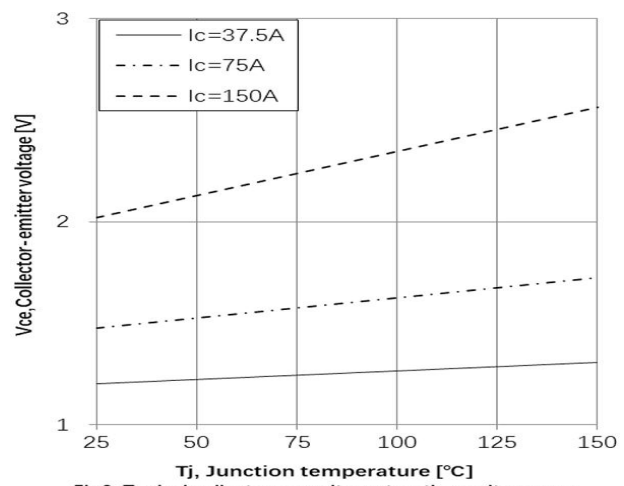


Fig6. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{ge}=15\text{V}$)

Typical Characteristics

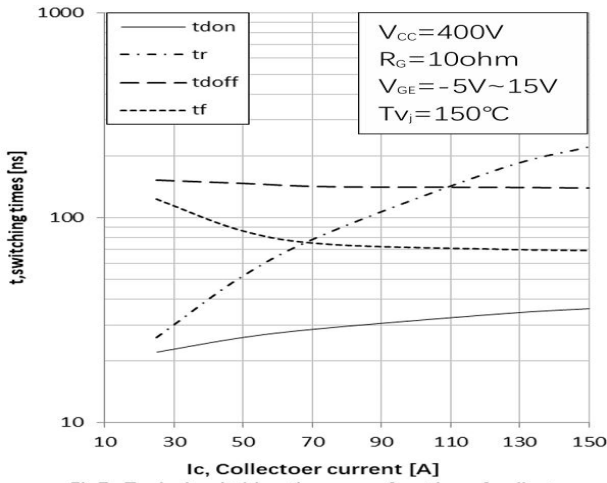


Fig7. Typical switching times as a function of collector current

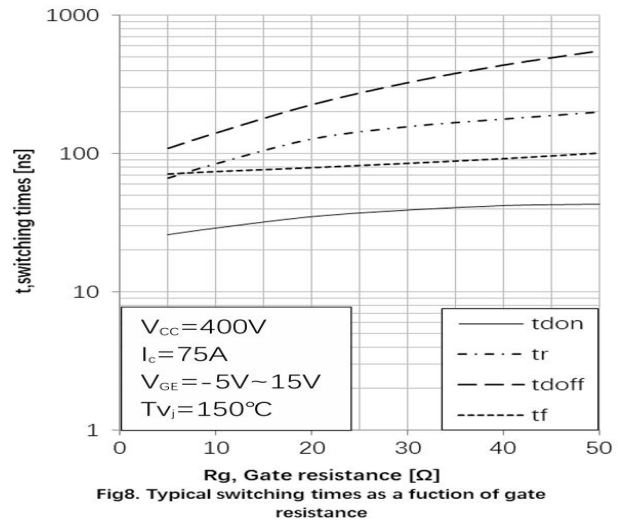


Fig8. Typical switching times as a function of gate resistance

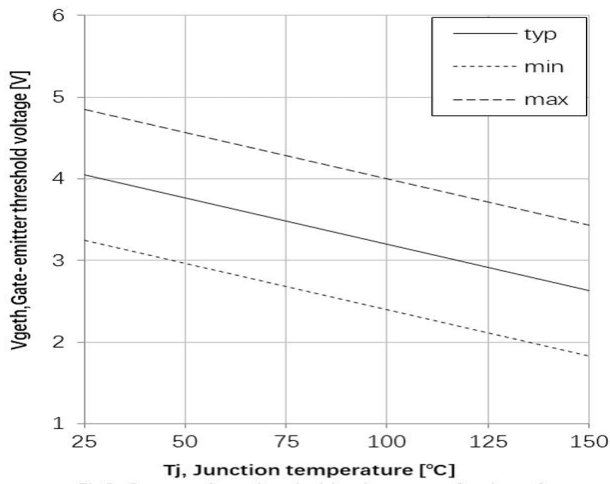


Fig9. Gate-emitter threshold voltage as a function of junction temperature ($I_C=0.75mA$)

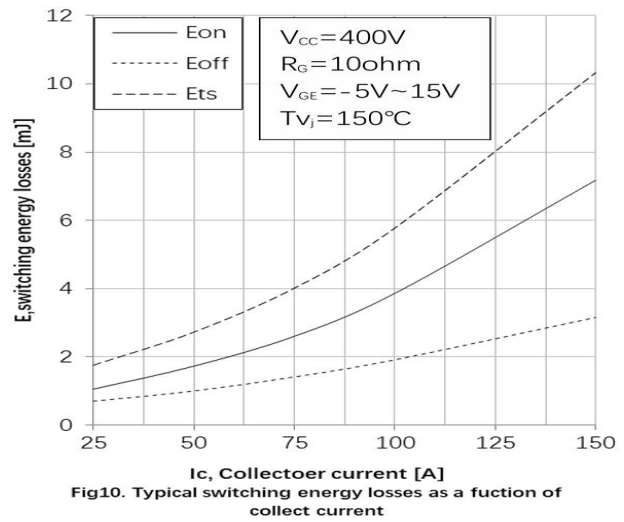


Fig10. Typical switching energy losses as a function of collector current

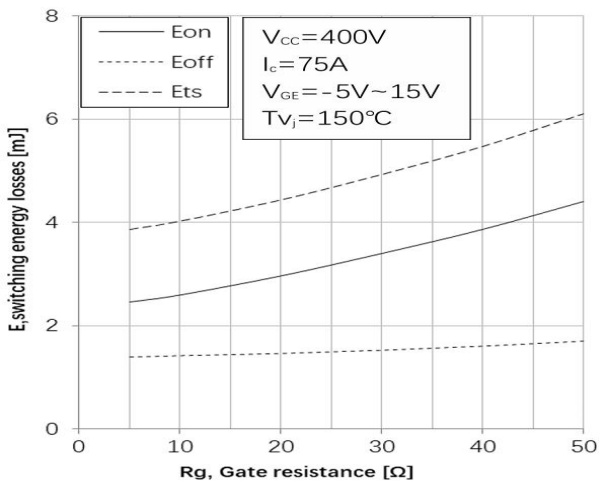


Fig11. Typical switching energy losses as a function of gate resistance

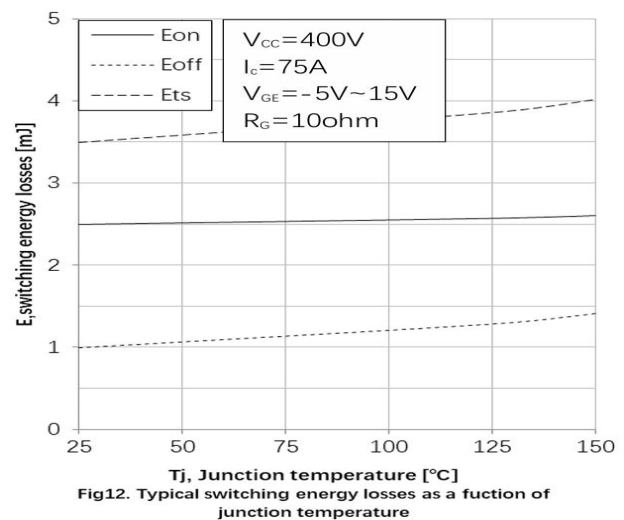


Fig12. Typical switching energy losses as a function of junction temperature

Typical Characteristics

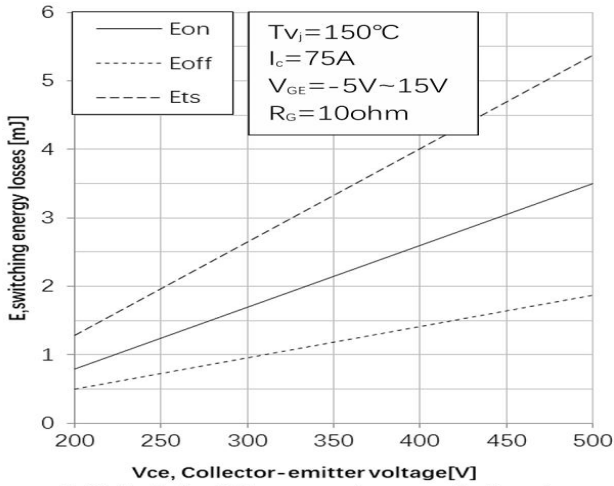


Fig13. Typical switching energy losses as a function of collector-emitter voltage

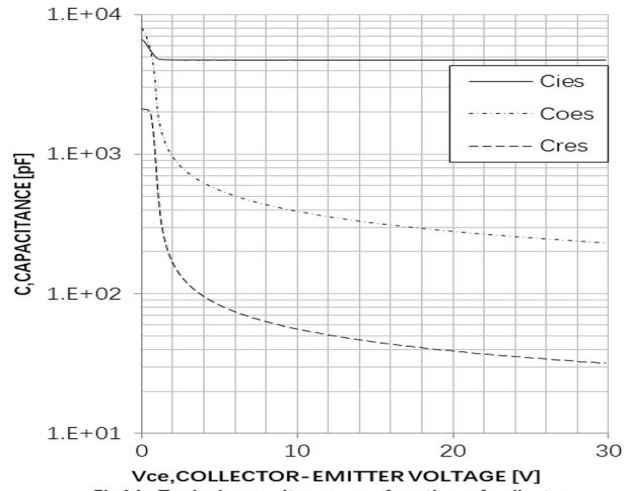


Fig14. Typical capacitance as a function of collector-emitter voltage

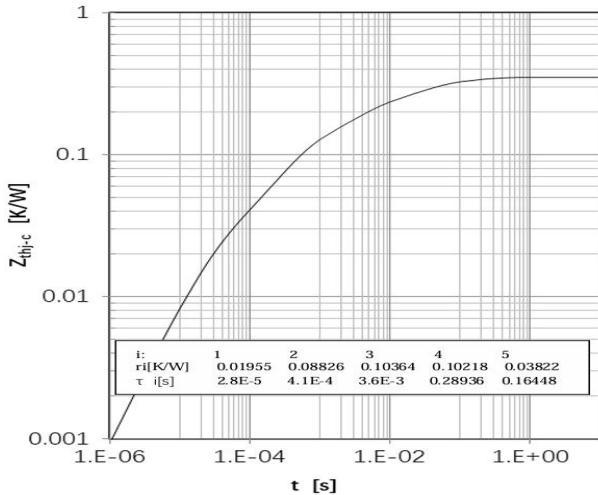


Fig 15. IGBT Transient Thermal Impedance

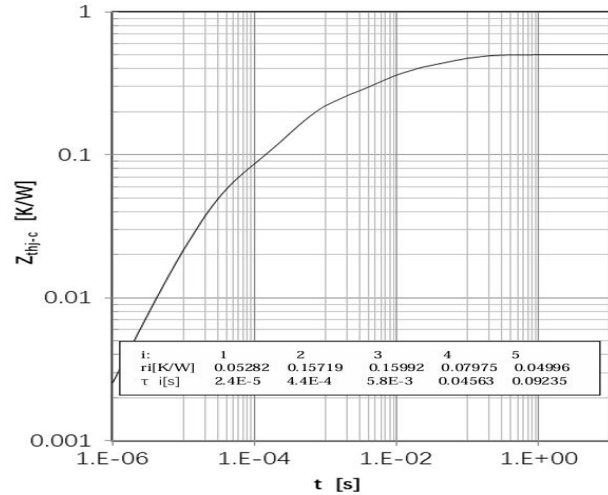


Fig 16. Diode Transient Thermal Impedance

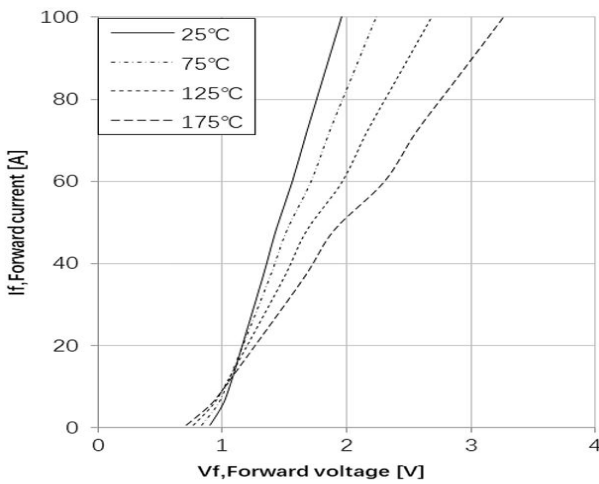


Fig17. Diode forward current as a function of forward voltage

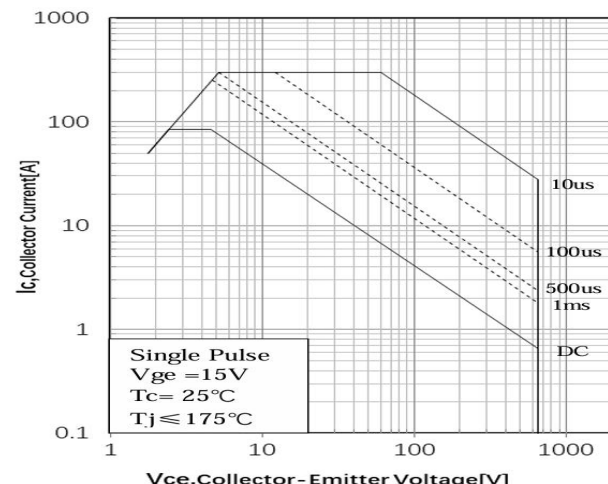
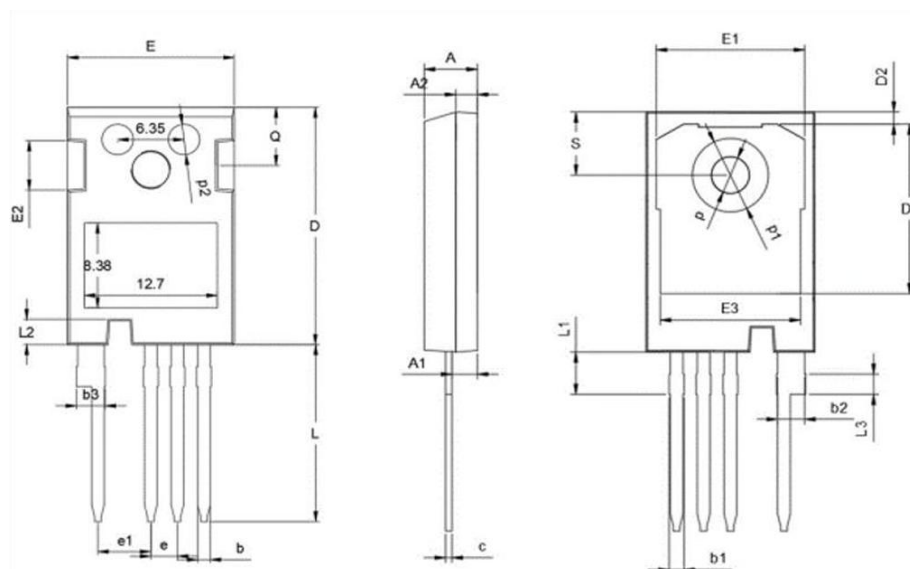


Fig18. FBSOA

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	