

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)MAX}$	$I_C(100^{\circ}C)$
650V	2.15V@15V	15A

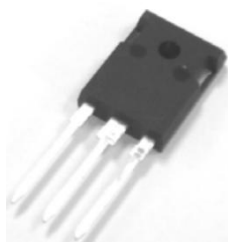
Feature

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

Application

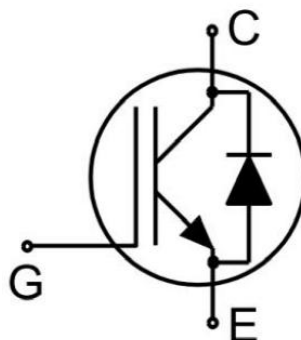
- Inverter for motor drive
- Air conditioning
- Uninterruptible power supply

Package



TO-247AB

Circuit diagram



Marking



Absolute maximum ratings (Tc=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CE}	650	V
Continuous Gate- Emitter Voltage	V_{GE}	± 20	V
Transient Gate-Emitter Voltage (tp≤10us,D<0.010)	V_{GE}	± 30	V
Collector Current	I_C	30	A
Collector Current(Tc =100°C)	$I_C(100^\circ\text{C})$	15	A
Pulsed Collector Current, tp limited by Tjmax, VGE=15V	I_{CM}	45	A
Diode Continuous Forward Current	I_F	30	A
Diode Continuous Forward Current(Tc =100°C)	$I_F(100^\circ\text{C})$	15	A
Diode Forward Pulsed Current,tp limited by Tjmax	I_{Fpuls}	45	A
Turn off Safe Operating Area $V_{CE}\leq 650\text{V}, T_J\leq 150^\circ\text{C}$	-	45	A
Power Dissipation(Tj=175°C, Tc=25°C)	P_D	150	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1.5	K/W
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	1.0	K/W
Thermal Resistance, Junction - Ambient	$R_{\theta JA}$	40	K/W
Short Circuit Withstand Time (VGE= 15V, VCC=400V, VCEM≤650V)	T_{SC}	5	uS
Maximum Temperature for Soldering,wave soldering 1.6mm (0.063in.) from case for 10s	T_L	260	°C
Junction Temperature Range	T_J	-40 ~ +175	°C
Storage Temperature Range	T_{STG}	-55 ~ +150	°C

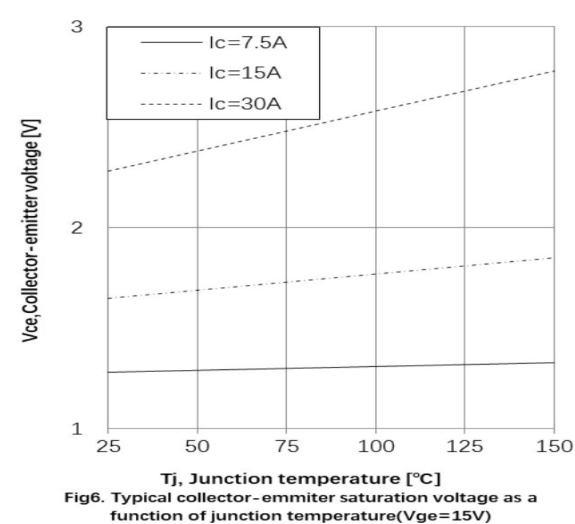
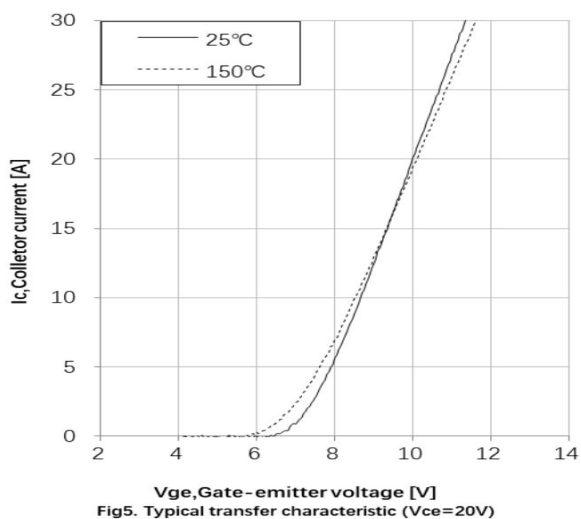
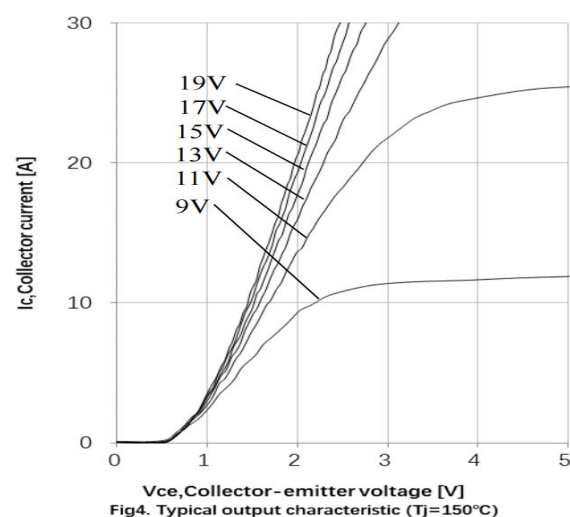
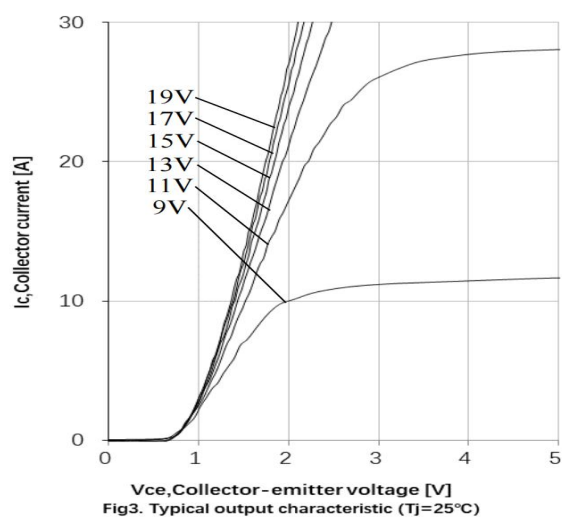
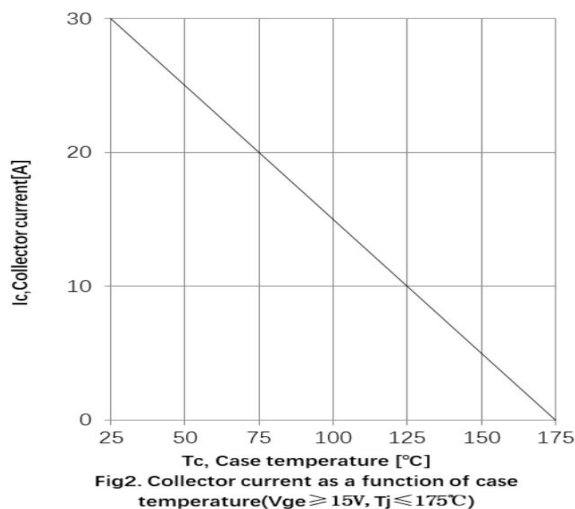
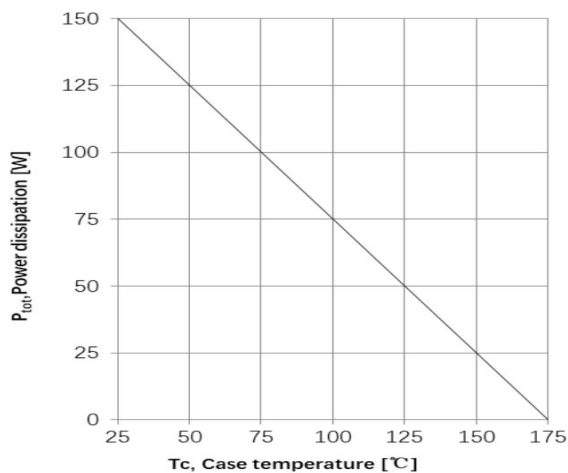
Electrical characteristics of the IGBT (Tj=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE} = 0\text{V}, I_{CE} = 1\text{mA}$	650			V
Collector-Emitter Leakage Current	I_{CES}	$V_{GE} = 0\text{V}, V_{CE} = 650\text{V}$			0.25	mA
		$V_{GE} = 0\text{V}, V_{CE} = 650\text{V}, T_J = 150^\circ\text{C}$			5	
Gate to Emitter Leakage Current	I_{GES}	$V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}$			± 200	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{V}, I_C = 15\text{A}$		1.65	2.15	V
		$V_{GE} = 15\text{V}, I_C = 15\text{A}, T_J = 125^\circ\text{C}$		1.80		
		$V_{GE} = 15\text{V}, I_C = 15\text{A}, T_J = 150^\circ\text{C}$		1.85		
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\mu\text{A}$	4.0	5.5	6.5	V
Dynamic characteristics						
Input Capacitance	C_{ies}	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		0.74		nF
Reverse Transfer Capacitance	C_{res}			0.02		
Total Gate Charge	Q_g	$V_{CC} = 400\text{V}, V_{GE} = 15\text{V}, I_C = 15\text{A}$		0.08		uC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 400\text{V}, V_{GE} = -5\text{V} \sim 15\text{V}, I_C = 15\text{A}, R_G = 10\Omega$		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 energy	E_{on}	$V_{CC} = 400\text{V}, V_{GE} = -5\text{V} \sim 15\text{V}, I_C = 15\text{A}, R_G = 10\Omega, T_J = 125^\circ\text{C}$		0.33		mJ
Turn-Off Switching energy	E_{off}			0.22		
Turn-on delay time	$t_{d(on)}$			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 energy	E_{on}	$V_{CC} = 400\text{V}, V_{GE} = -5\text{V} \sim 15\text{V}, I_C = 15\text{A}, R_G = 10\Omega, T_J = 150^\circ\text{C}$		0.35		mJ
Turn-Off Switching energy	E_{off}			0.35		
Turn-on delay time	$t_{d(on)}$			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 energy	E_{on}			0.36		mJ
Turn-Off Switching energy	E_{off}			0.41		

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_{FM}	$I_F=15\text{A}$		1.60	2.10	V
		$I_F=15\text{A}, T_j=125^{\circ}\text{C}$		1.50		
		$I_F=15\text{A}, T_j=150^{\circ}\text{C}$		1.45		
Reverse Recovery Current	I_{rr}	$I_F=15\text{A}, V_R=400\text{V},$ $-di/dt=450\text{A/us}$		8		A
Diode reverse recovery time	t_{rr}			78		ns
Reverse Recovery Charge	Q_{rr}			0.36		uC
Reverse recovery energy	E_{rec}			0.08		mJ
Reverse Recovery Current	I_{rr}	$I_F=15\text{A}, V_R=400\text{V},$ $-di/dt=450\text{A/us}, T_j=125^{\circ}\text{C}$		12		A
Diode reverse recovery time	t_{rr}			126		ns
Reverse Recovery Charge	Q_{rr}			0.77		uC
Reverse recovery energy	E_{rec}			0.20		mJ
Reverse Recovery Current	I_{rr}	$I_F=15\text{A}, V_R=400\text{V},$ $-di/dt=450\text{A/us}, T_j=150^{\circ}\text{C}$		14		A
Diode reverse recovery time	t_{rr}			146		ns
Reverse Recovery Charge	Q_{rr}			0.94		uC
Reverse recovery energy	E_{rec}			0.25		mJ

Typical Characteristics



Typical Characteristics

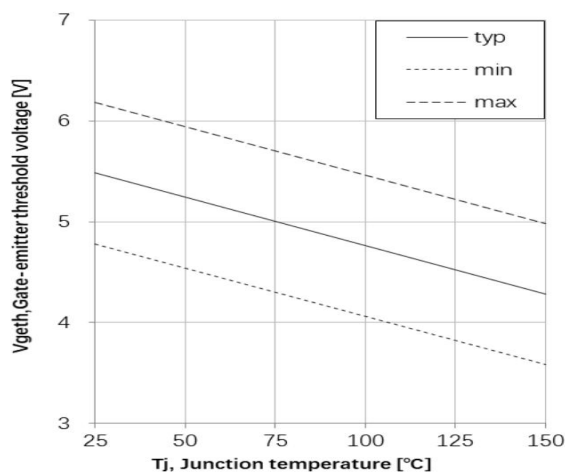


Fig7. Gate-emitter threshold voltage as a function of junction temperature ($I_c=0.60mA$)

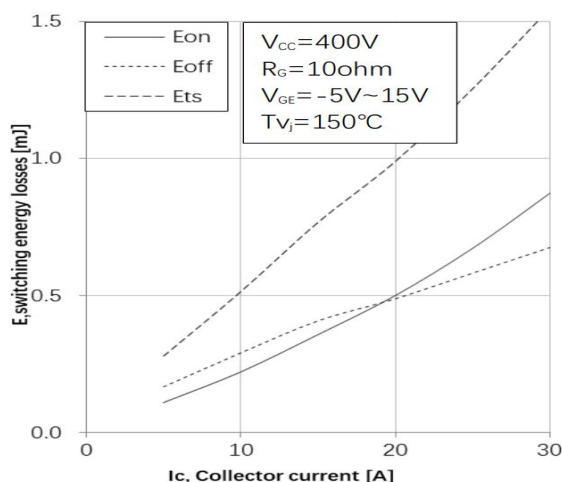


Fig8. Typical switching energy losses as a function of collector current

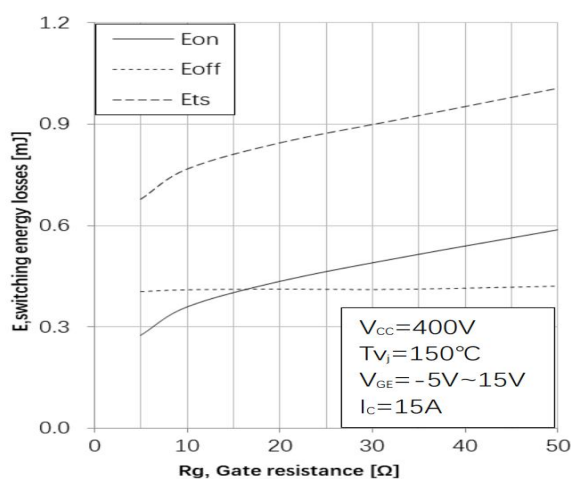


Fig9. Typical switching energy losses as a function of gate resistance

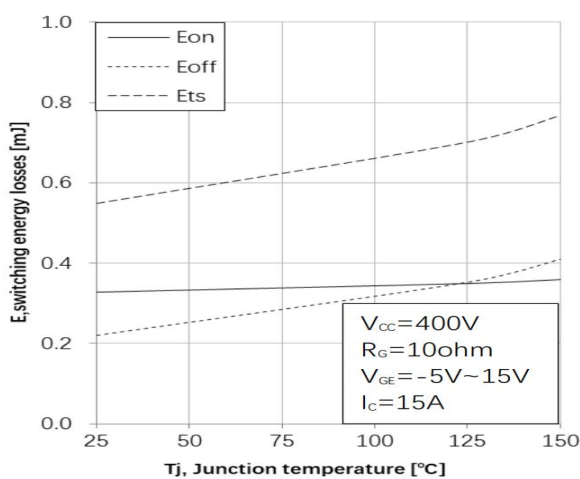


Fig10. Typical switching energy losses as a function of junction temperature

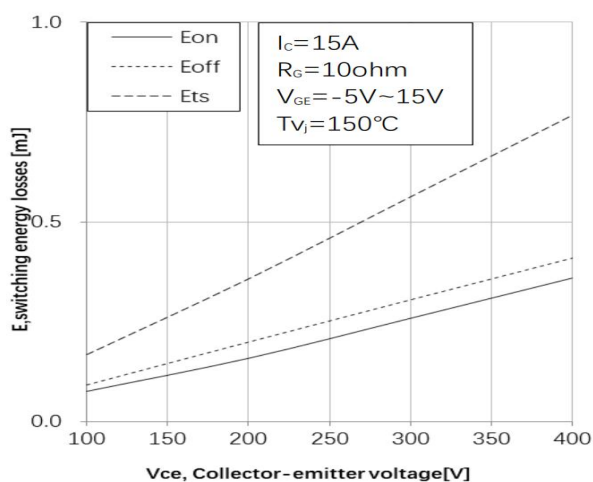


Fig11. Typical switching energy losses as a function of collector-emitter voltage

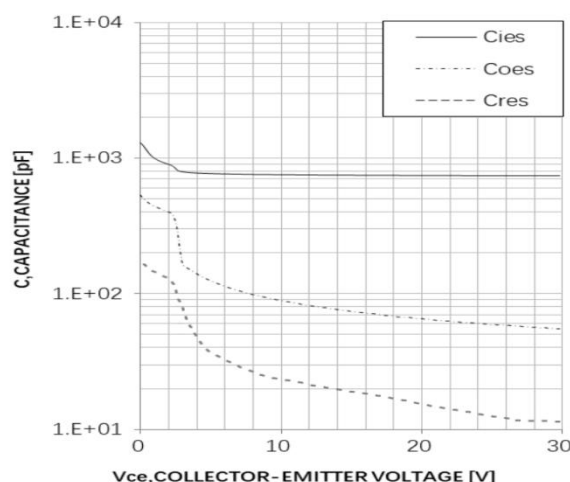


Fig12. Typical capacitance as a function of collector-emitter voltage

Typical Characteristics

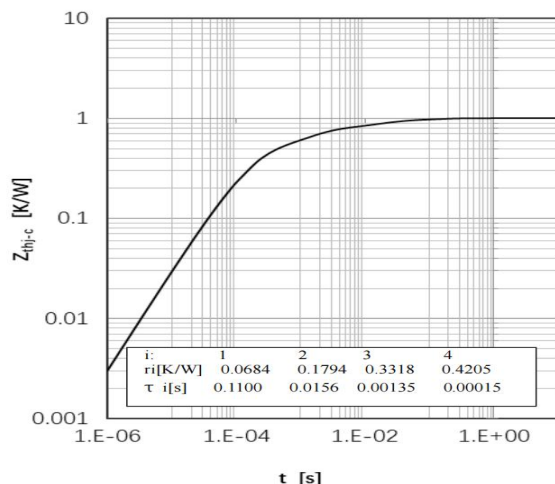


Fig 13. IGBT Transient Thermal Impedance

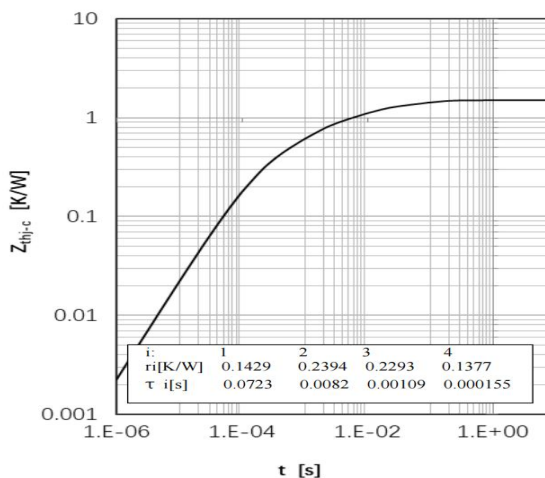


Fig 14. Diode Transient Thermal Impedance

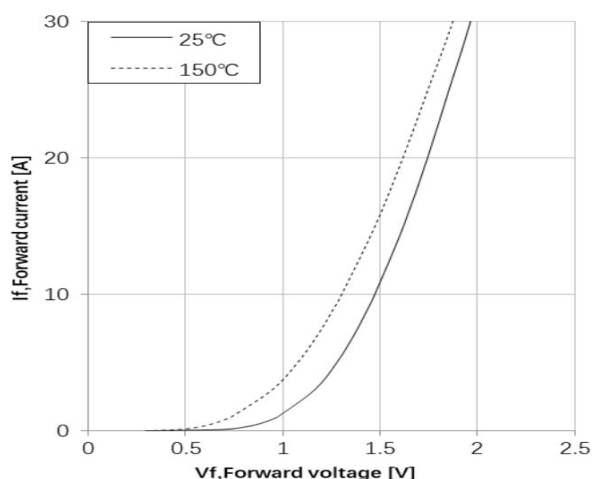


Fig15. Diode forward current as a function of forward voltage

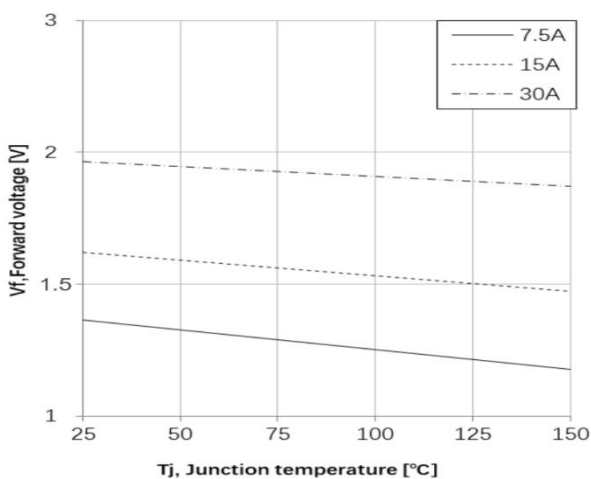
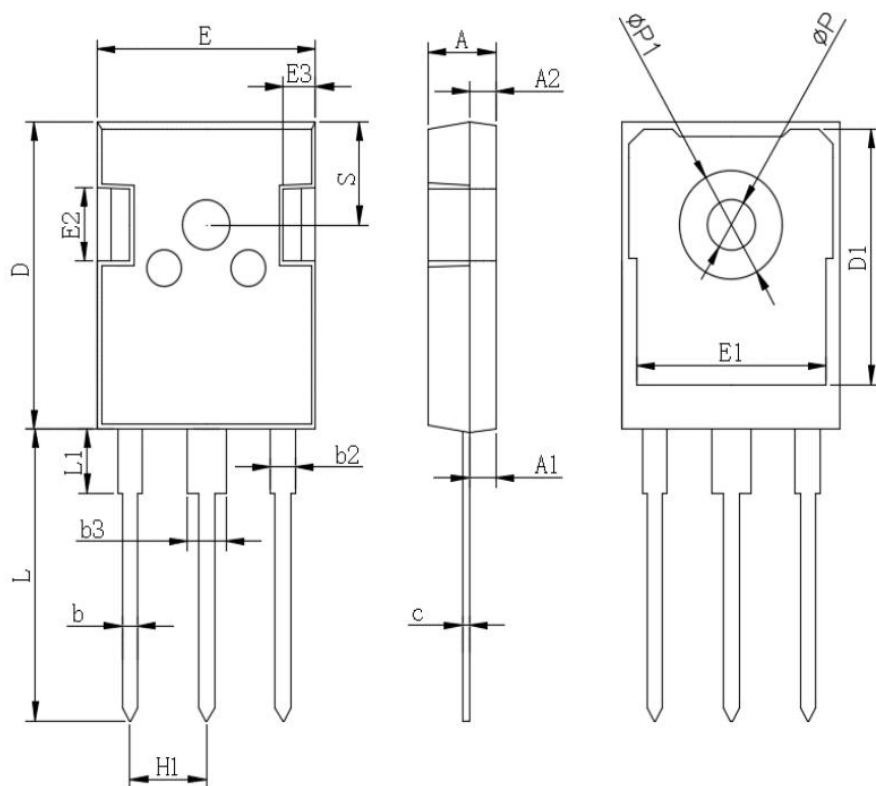


Fig16. Typical diode forward voltage as a function of junction temperature

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
φP	3.400	3.800	0.134	0.150
φP1	-	7.300	-	0.287
S	6.150 TYP		0.242 TYP	
H1	5.440 TYP		0.214 TYP	