

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
1200V	1.65V@15V	40A

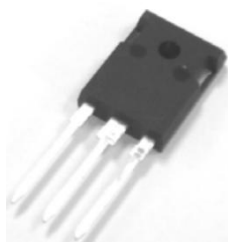
Feature

- High breakdown voltage to 1200V for improved reliability
- Maximum junction temperature 175°C
- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- High short circuit capability (10us)

Application

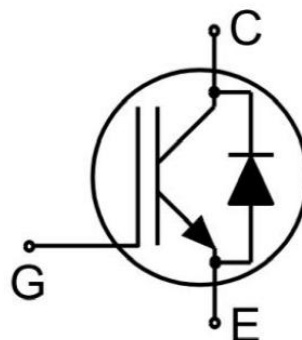
- Inverter for motor drive
- AC and DC servo drive amplifier

Package

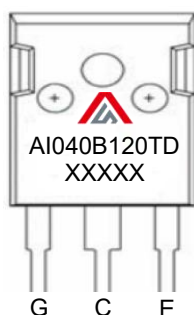


TO-247AB

Circuit diagram



Marking



Absolute maximum ratings ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	1200	V
Continuous Gate- Emitter Voltage	V_{GE}	± 20	V
Transient Gate-Emitter Voltage ($t_p \leq 10\mu\text{s}, D < 0.01$)	V_{GE}	± 30	V
Collector Current, limited by T_{jmax}	I_C	80	A
Collector Current, limited by T_{jmax} ($T_C = 100^{\circ}\text{C}$)	$I_C(100^{\circ}\text{C})$	40	A
Pulsed Collector Current, t_p limited by T_{jmax} ($V_{GE} = 15\text{V}$)	I_{CM}	120	A
Diode Continuous Forward Current, limited by T_{jmax}	I_F	80	A
Diode Continuous Forward Current, limited by T_{jmax} ($T_C = 100^{\circ}\text{C}$)	$I_F(100^{\circ}\text{C})$	40	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	120	A
Turn off Safe Operating Area ($V_{CE} \leq 1200\text{V}, T_J \leq 150^{\circ}\text{C}$)	-	120	A
Short Circuit Withstand Time ($V_{CE} \leq 1200\text{V}, V_{GE} = 15\text{V}, V_{CC} = 600\text{V}$)	T_{SC}	10	μs
Power Dissipation ($T_J = 175^{\circ}\text{C}$)	P_D	320	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1	$^{\circ}\text{C/W}$
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.47	$^{\circ}\text{C/W}$
Operating junction temperature range	T_J	$-40 \sim +175$	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^{\circ}\text{C}$

Electrical characteristics of the IGBT ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=250\mu A$	1200			V
Collector-Emitter Leakage Current	I_{CES}	$V_{GE}=0V, V_{CE}=1200V$			0.25	mA
		$V_{GE}=0V, V_{CE}=1200V, T_J=150^{\circ}C$			4	
Gate to Emitter Leakage Current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$			100	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1mA$	5.2	5.8	6.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$		1.65	1.95	V
		$V_{GE}=15V, I_C=40A, T_J=125^{\circ}C$		1.95		
		$V_{GE}=15V, I_C=40A, T_J=150^{\circ}C$		2.05		
Dynamic characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		6.76		nF
Output Capacitance	C_{oes}			0.19		
Reverse Transfer Capacitance	C_{res}			0.07		
Total Gate Charge	Q_g	$V_{CC}=600V, V_{GE}=15V, I_C=40A$		0.27		μC
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, V_{GE}=-5V\sim 15V$ $I_C=40A, R_G=20\Omega$		93		nS
Turn-on rise time	t_r			93		
Turn-off delay time	$t_{d(off)}$			269		
Turn-off fall time	t_f			190		
Turn-On Switching Loss	E_{on}			3.92		mJ
Turn-Off Switching Loss	E_{off}			2.53		

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Dynamic characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, V_{GE}=-5V\sim 15V$ $I_C=40A, R_G=20\Omega$ $T_J=125^\circ C$		87		nS
Turn-on rise time	t_r			96		
Turn-off delay time	$t_{d(off)}$			288		
Turn-off fall time	t_f			277		
Turn-On Switching Loss	E_{on}			4.33		mJ
Turn-Off Switching Loss	E_{off}			3.32		
Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, V_{GE}=-5V\sim 15V$ $I_C=40A, R_G=20\Omega$ $T_J=150^\circ C$		84		nS
Turn-on rise time	t_r			99		
Turn-off delay time	$t_{d(off)}$			300		
Turn-off fall time	t_f			313		
Turn-On Switching Loss	E_{on}			4.44		mJ
Turn-Off Switching Loss	E_{off}			3.58		

Electrical characteristics of the Diode ($T_J=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$I_F=40A$		2	2.6	V
		$I_F=40A, T_J=125^\circ C$		1.9		
		$I_F=40A, T_J=150^\circ C$		1.8		
Reverse Recovery Current	I_{rrm}	$V_R=600V, I_F=40A$ $di/dt=-500A/\mu s$		11		A
Reverse Recovery Charge	Q_{rr}			1.29		uC
Reverse Recovery Time	T_{rr}			225		nS
Reverse Recovery Energy	E_{rec}			0.33		mJ
Reverse Recovery Current	I_{rrm}	$V_R=600V, I_F=40A$ $di/dt=-500A/\mu s$ $T_J=125^\circ C$		15		A
Reverse Recovery Charge	Q_{rr}			3.58		uC
Reverse Recovery Time	T_{rr}			315		nS
Reverse Recovery Energy	E_{rec}			1.07		mJ
Reverse Recovery Current	I_{rrm}	$V_R=600V, I_F=40A$ $di/dt=-500A/\mu s$ $T_J=150^\circ C$		16		A
Reverse Recovery Charge	Q_{rr}			4.11		uC
Reverse Recovery Time	T_{rr}			344		nS
Reverse Recovery Energy	E_{rec}			1.23		mJ

Typical Characteristics

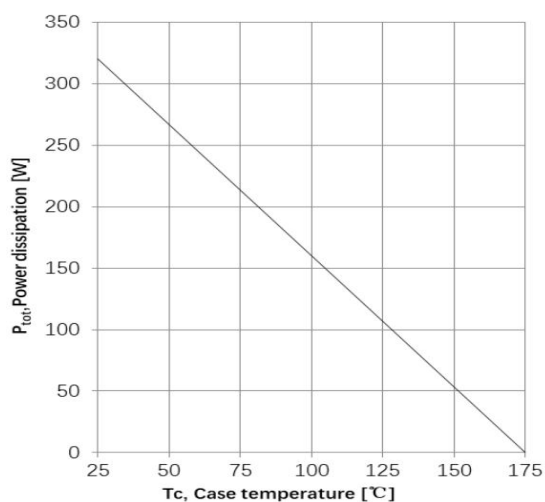


Fig1. Power dissipation as a function of case temperature ($T_j < 175^\circ\text{C}$)

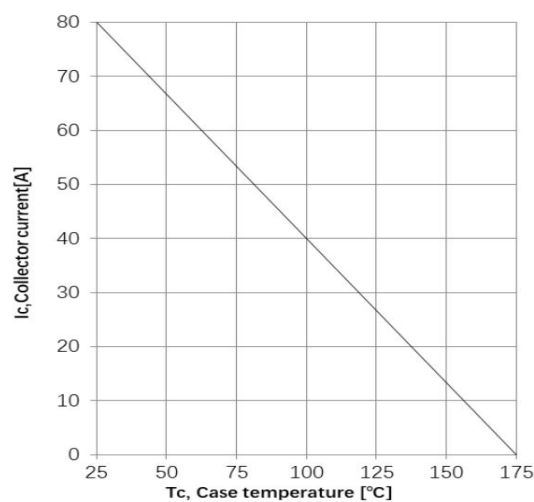


Fig2. Collector current as a function of case temperature ($V_{ge} > 15\text{V}$, $T_j < 175^\circ\text{C}$)

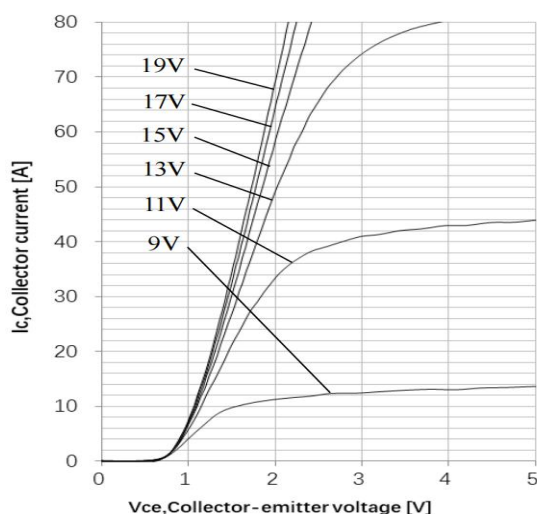


Fig3. Typical output characteristic ($T_j = 25^\circ\text{C}$)

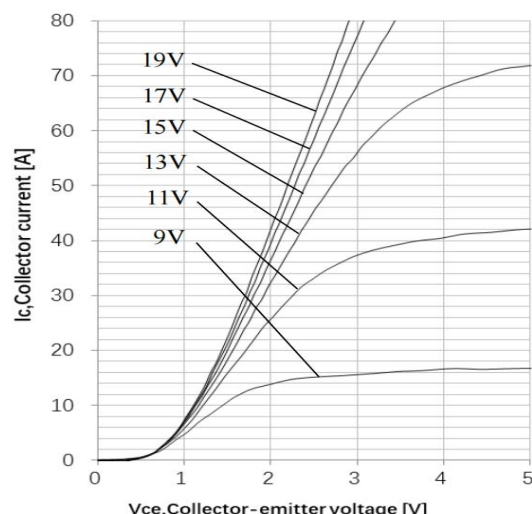


Fig4. Typical output characteristic ($T_j = 150^\circ\text{C}$)

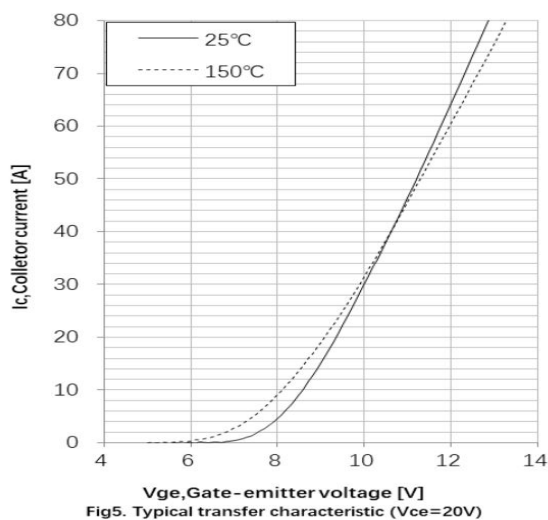


Fig5. Typical transfer characteristic ($V_{ce} = 20\text{V}$)

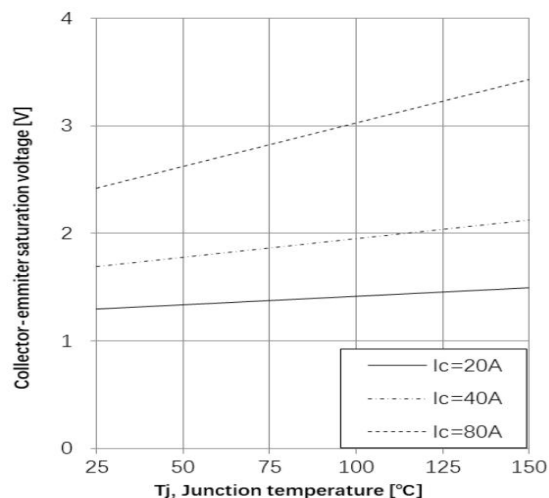
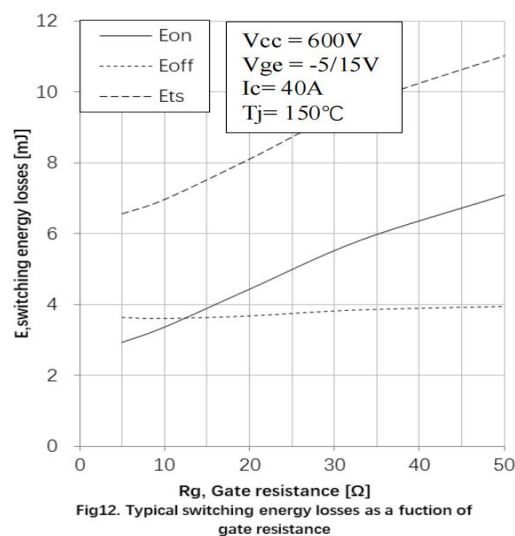
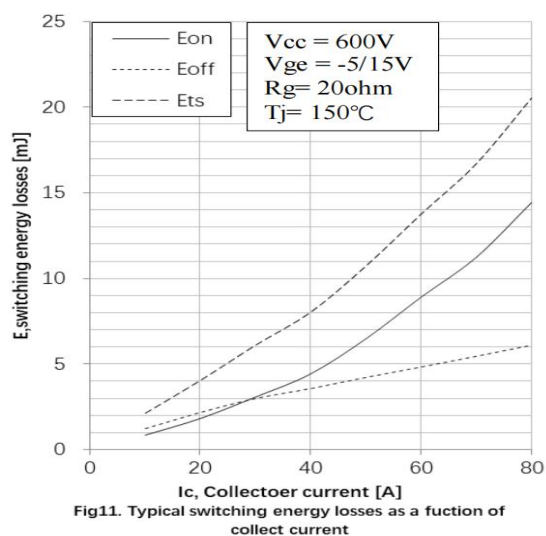
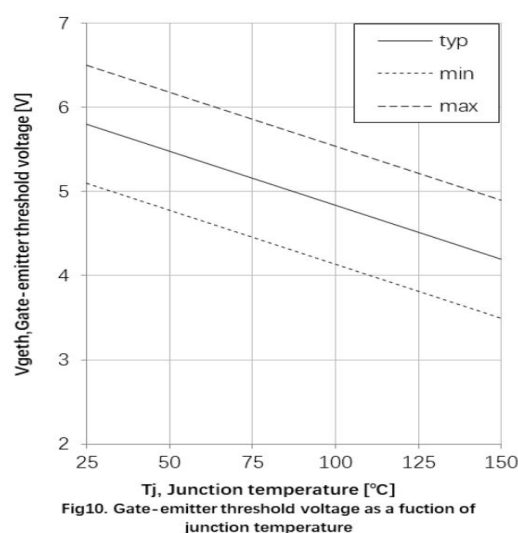
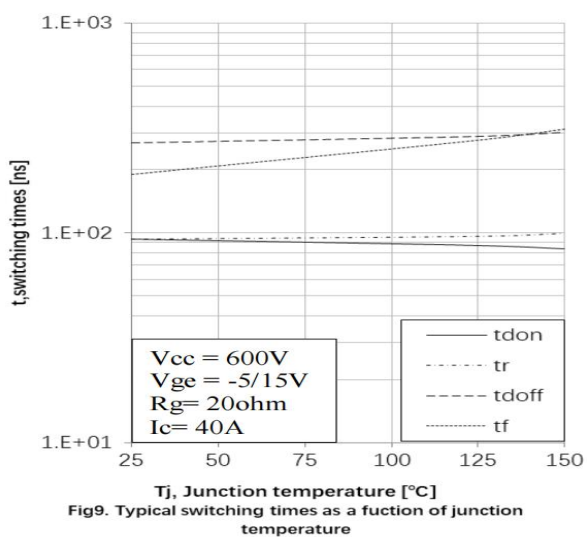
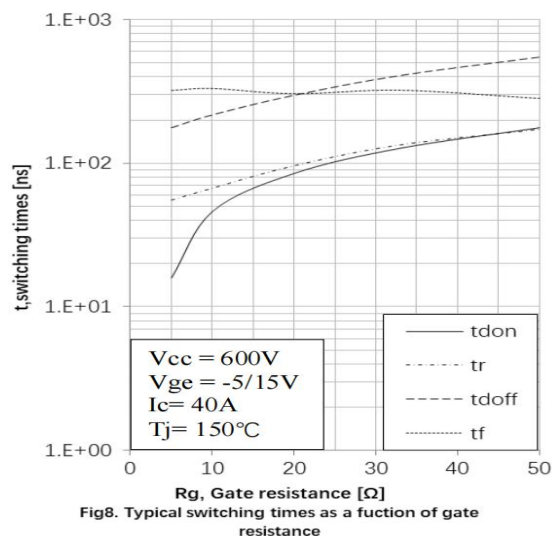
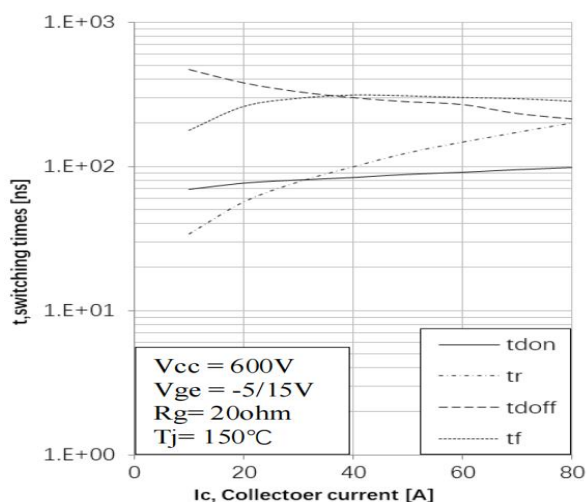
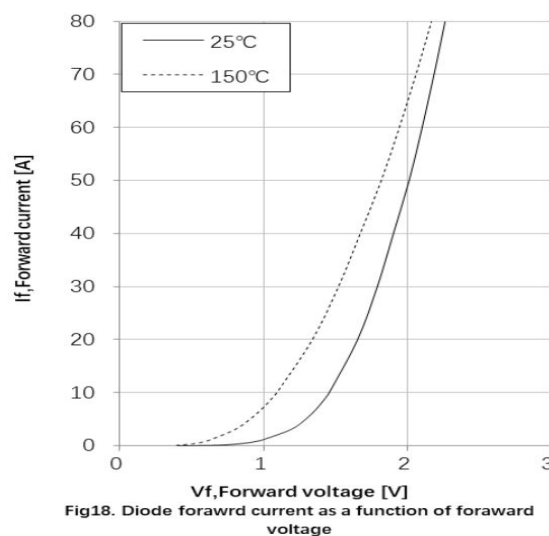
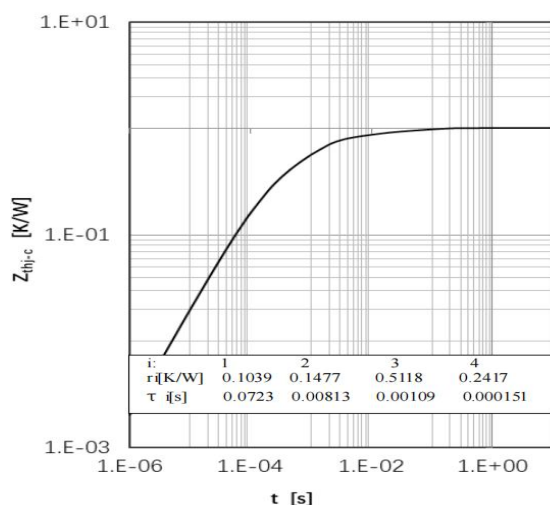
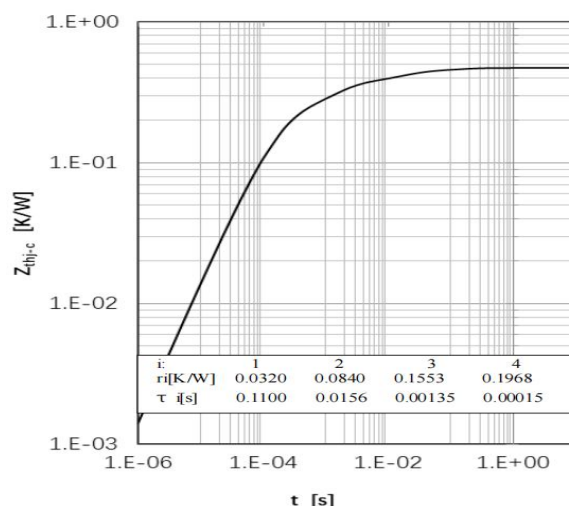
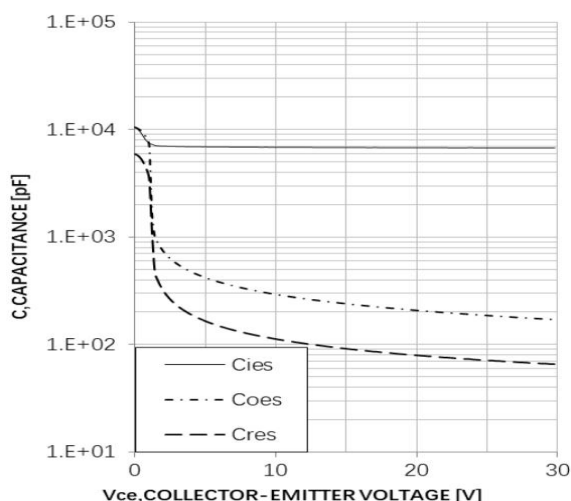
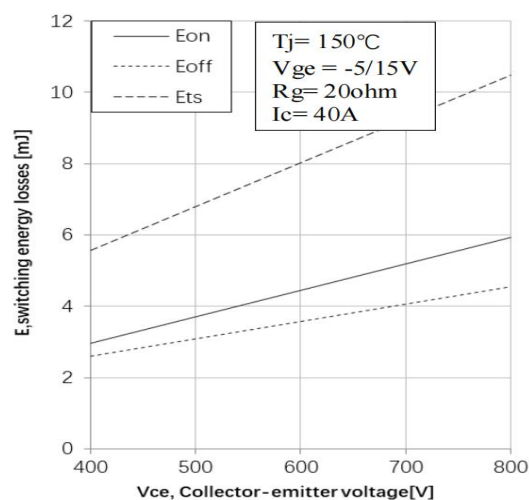
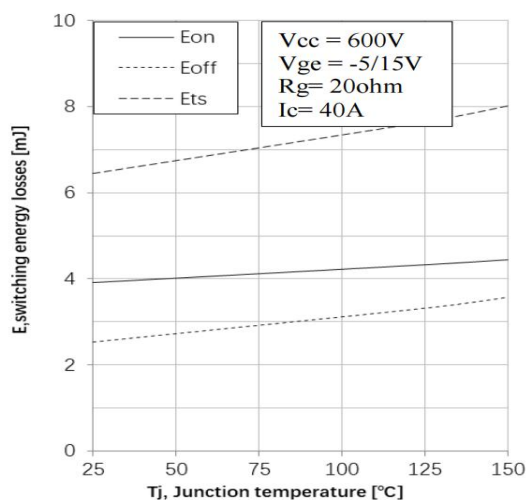


Fig6. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{ge} = 15\text{V}$)

Typical Characteristics



Typical Characteristics



Typical Characteristics

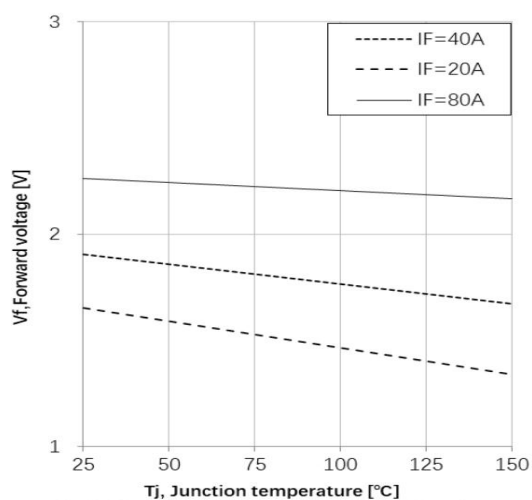
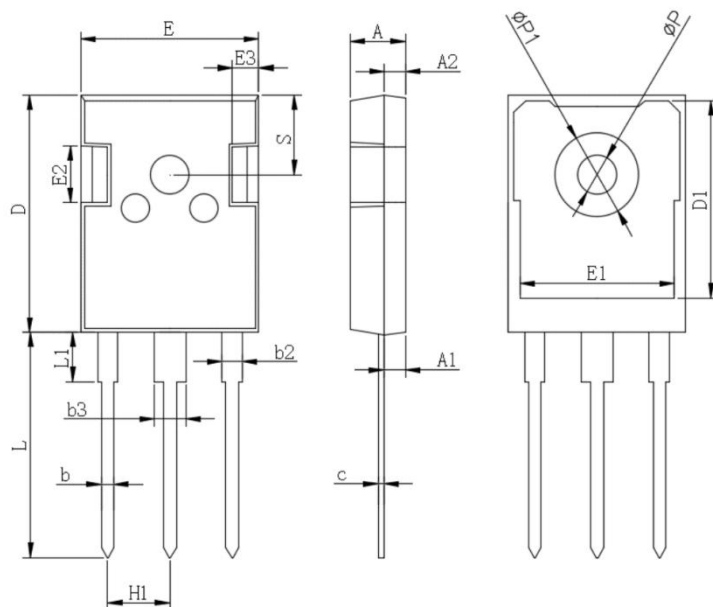


Fig19. Diode forward voltage as a function of junction temperature

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
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.	