

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
650V	1.35V@15V	100A

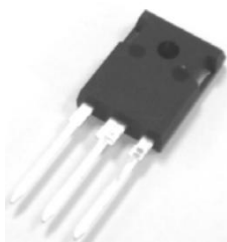
Feature

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

Application

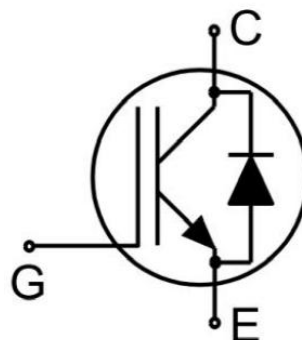
- General purpose inverters
- Motor drives
- Uninterruptible power supply
- Medium to low switching frequency power converters

Package

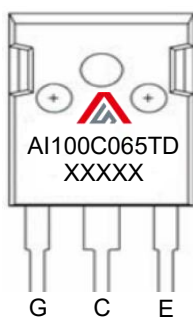


TO-247AB

Circuit diagram



Marking



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

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	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	160	A
Collector Current, limited by T_{jmax} ($T_C = 100^{\circ}\text{C}$)	$I_C(100^{\circ}\text{C})$	100	A
Pulsed Collector Current, t_p limited by T_{jmax} ($V_{GE} = 15\text{V}$)	I_{CM}	400	A
Diode Continuous Forward Current, limited by T_{jmax}	I_F	160	A
Diode Continuous Forward Current, limited by T_{jmax} ($T_C = 100^{\circ}\text{C}$)	$I_F(100^{\circ}\text{C})$	100	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	400	A
Turn off Safe Operating Area ($V_{CE} \leq 650\text{V}, T_J \leq 150^{\circ}\text{C}$)	-	400	A
Power Dissipation ($T_J = 175^{\circ}\text{C}$)	P_D	428	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	0.45	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.35	$^{\circ}\text{C}/\text{W}$
Operating junction temperature range	T_J	$-40 \sim +175$	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +175$	$^{\circ}\text{C}$

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 =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°C			3	
Gate to Emitter Leakage Current	I _{GES}	V _{GE} =20V, V _{CE} =0V			200	nA
Gate Threshold Voltage	V _{GE(th)}	V _{GE} =V _{CE} , I _C =1.2mA	3.25	3.75	4.25	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =100A	1	1.35	1.7	V
		V _{GE} =15V, I _C =100A, T _J =125°C		1.5		
		V _{GE} =15V, I _C =100A, T _J =150°C		1.55		
Dynamic characteristics						
Input Capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f =1MHz		4.96		nF
Reverse Transfer Capacitance	C _{res}			0.05		
Total Gate Charge	Q _g	V _{CC} =300V, V _{GE} =-5V~15V I _C =100A		0.34		μC
Turn-on delay time	t _{d(on)}	V _{CC} =300V, V _{GE} =-5V~15V I _C =100A, R _G =10Ω Inductive Load		19		nS
Turn-on rise time	t _r			95		
Turn-off delay time	t _{d(off)}			204		
Turn-off fall time	t _f			44		
Turn-On Switching Loss	E _{on}			4		mJ
Turn-Off Switching Loss	E _{off}			1.1		
Total Switching Energy	E _{ts}			5.1		

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Dynamic characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}=300V$, $V_{GE}=-5V\sim 15V$ $I_C=100A$, $R_G=10\Omega$ Inductive Load $T_J=125^\circ C$		22		nS
Turn-on rise time	t_r			88		
Turn-off delay time	$t_{d(off)}$			220		
Turn-off fall time	t_f			55		
Turn-On Switching Loss	E_{on}			4.1		mJ
Turn-Off Switching Loss	E_{off}			1.4		
Total Switching Energy	E_{is}			5.5		
Turn-on delay time	$t_{d(on)}$	$V_{CC}=300V$, $V_{GE}=-5V\sim 15V$ $I_C=100A$, $R_G=10\Omega$ Inductive Load $T_J=150^\circ C$		23		nS
Turn-on rise time	t_r			84		
Turn-off delay time	$t_{d(off)}$			226		
Turn-off fall time	t_f			59		
Turn-On Switching Loss	E_{on}			4.2		mJ
Turn-Off Switching Loss	E_{off}			1.6		
Total Switching Energy	E_{is}			5.8		

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	$I_F=100A$		1.4	1.9	V
		$I_F=100A$, $T_J=125^\circ C$		1.35		
		$I_F=100A$, $T_J=150^\circ C$		1.3		
Reverse Recovery Current	I_{rrm}	$V_R=300V$, $I_F=100A$ $di/dt=-550A/\mu s$		23		A
Reverse Recovery Charge	Q_{rr}			1.8		μC
Reverse Recovery Time	t_{rr}			116		nS
Reverse Recovery Energy	E_{rec}			0.16		mJ
Reverse Recovery Current	I_{rrm}	$V_R=300V$, $I_F=100A$ $di/dt=-550A/\mu s$ $T_J=125^\circ C$		36		A
Reverse Recovery Charge	Q_{rr}			4.2		μC
Reverse Recovery Time	t_{rr}			158		nS
Reverse Recovery Energy	E_{rec}			0.47		mJ
Reverse Recovery Current	I_{rrm}	$V_R=300V$, $I_F=100A$ $di/dt=-550A/\mu s$ $T_J=150^\circ C$		41		A
Reverse Recovery Charge	Q_{rr}			5.7		μC
Reverse Recovery Time	t_{rr}			197		nS
Reverse Recovery Energy	E_{rec}			0.61		mJ

Typical Characteristics

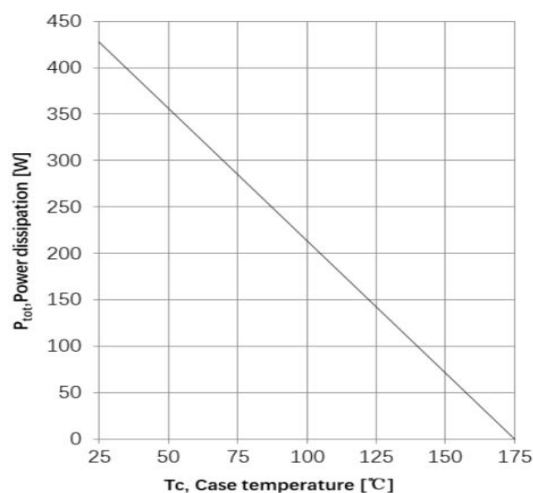


Fig1. Power dissipation as a function of case temperature ($T_j \leq 175^\circ\text{C}$)

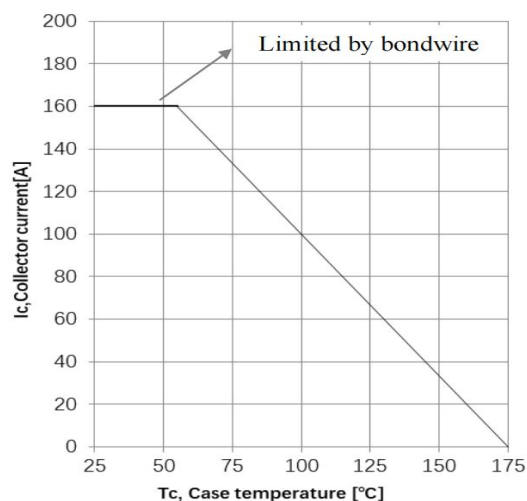


Fig2. Collector current as a function of case temperature ($V_{ge} \geq 15\text{V}$, $T_j \leq 175^\circ\text{C}$)

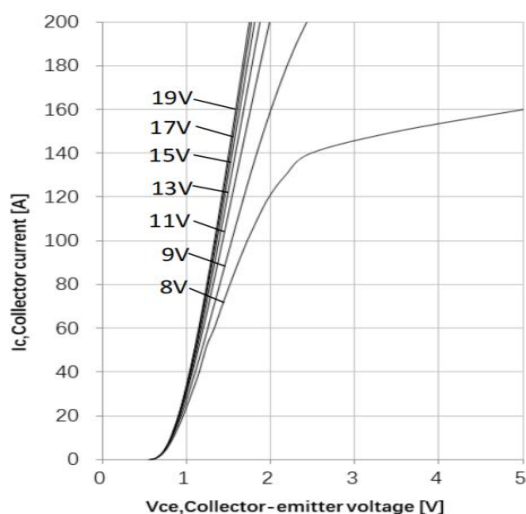


Fig3. Typical output characteristic ($T_j = 25^\circ\text{C}$)

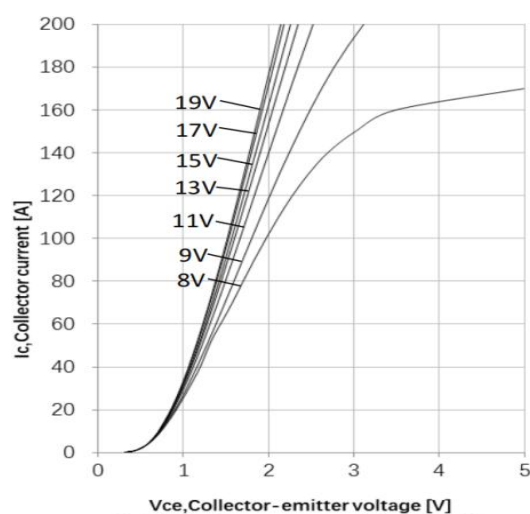


Fig4. Typical output characteristic ($T_j = 150^\circ\text{C}$)

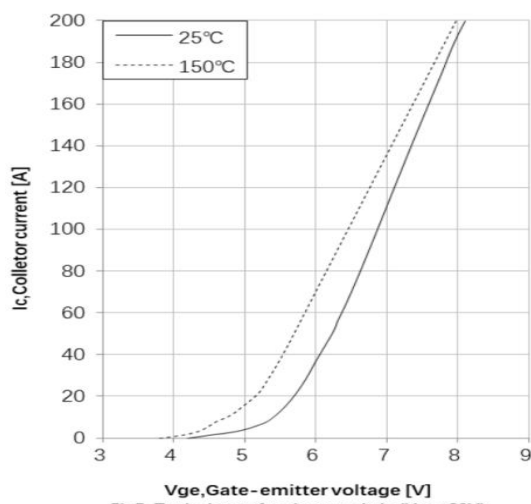


Fig5. Typical transfer characteristic ($V_{ce} = 20\text{V}$)

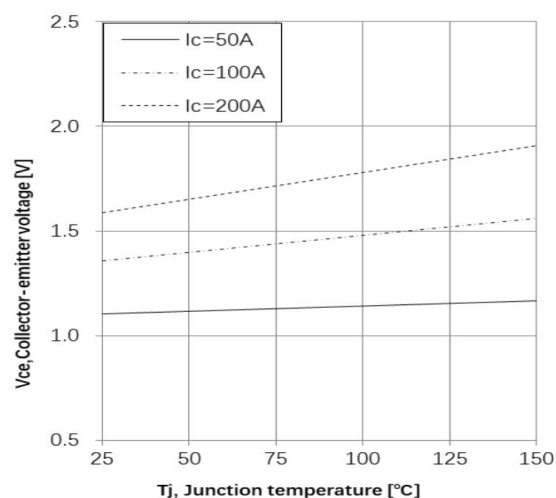
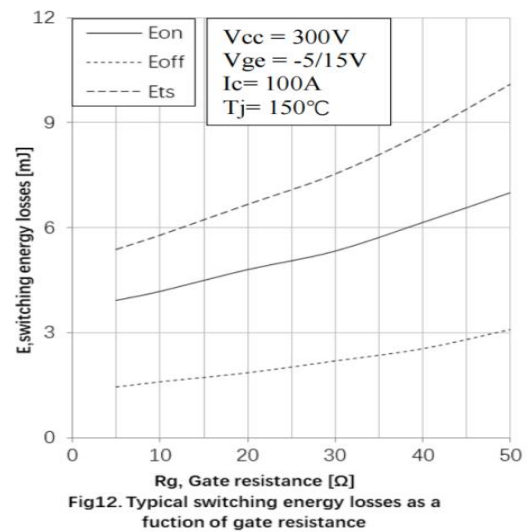
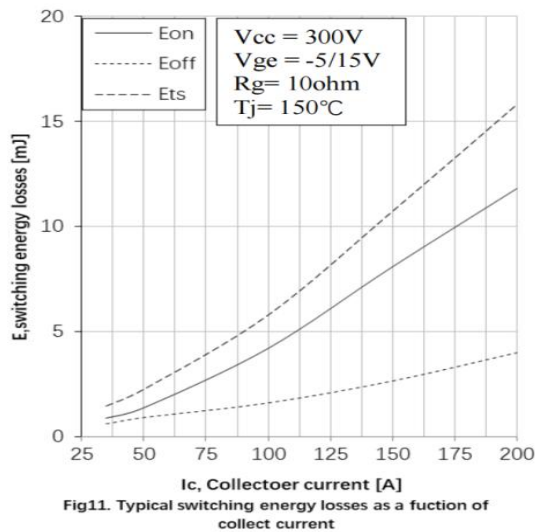
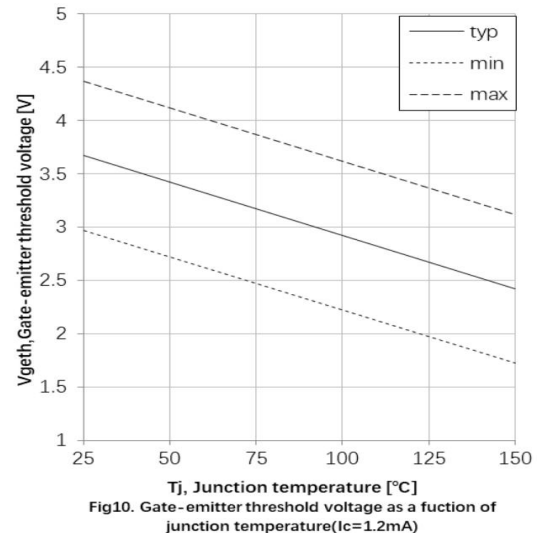
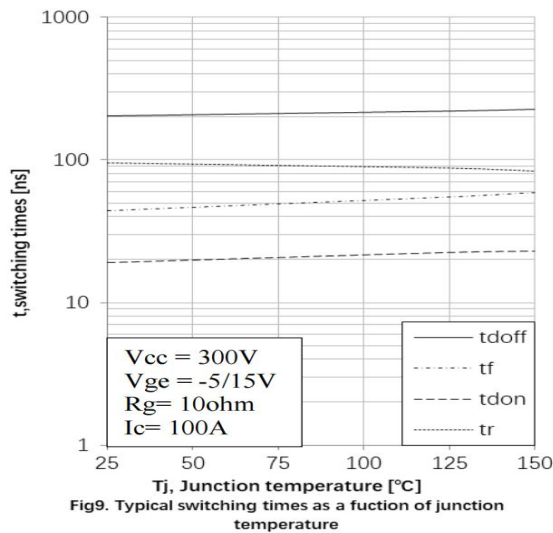
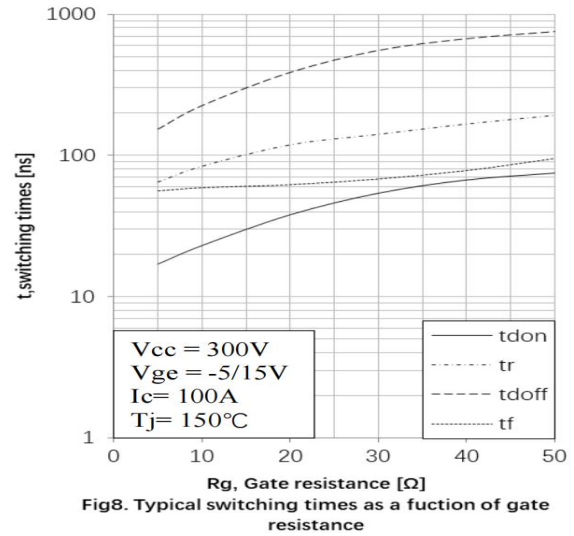
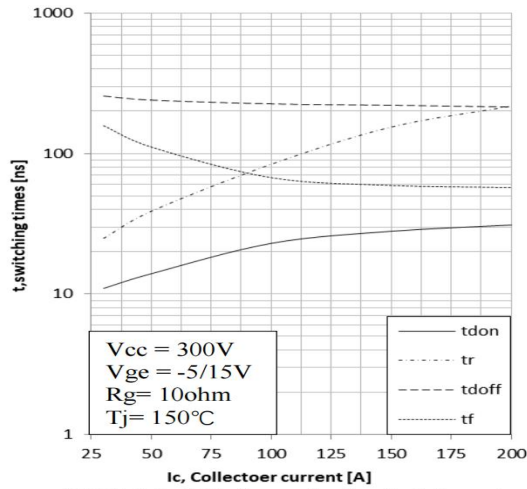
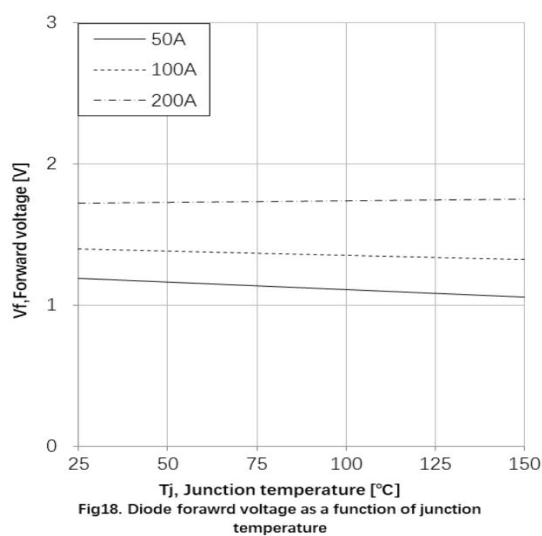
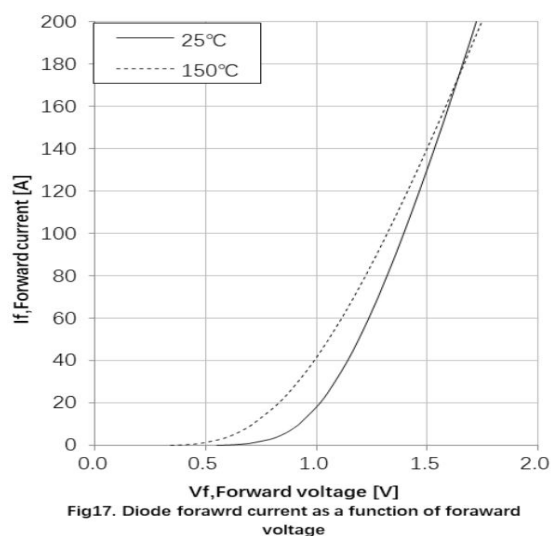
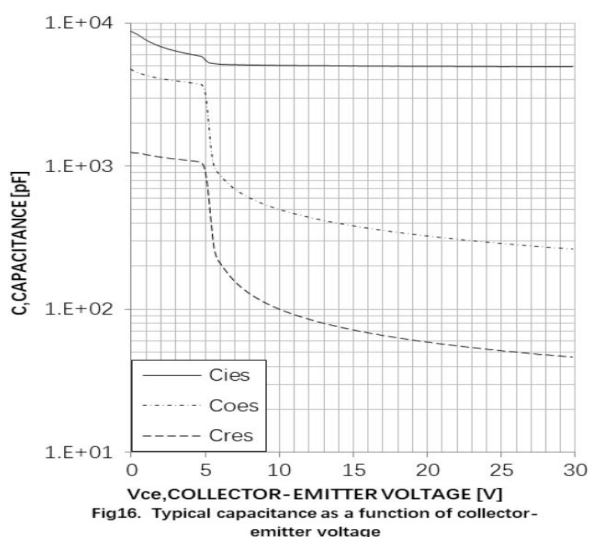
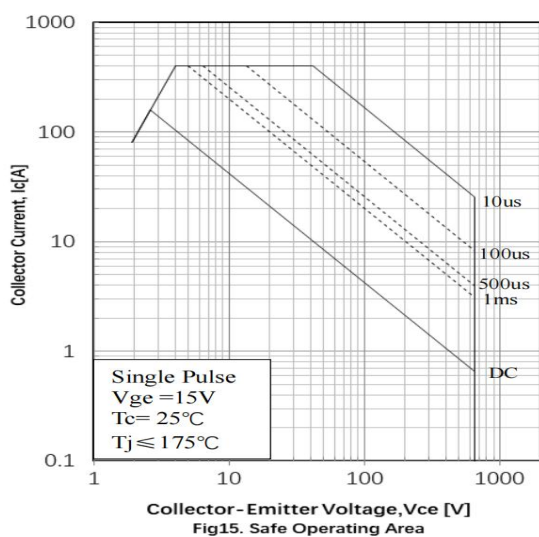
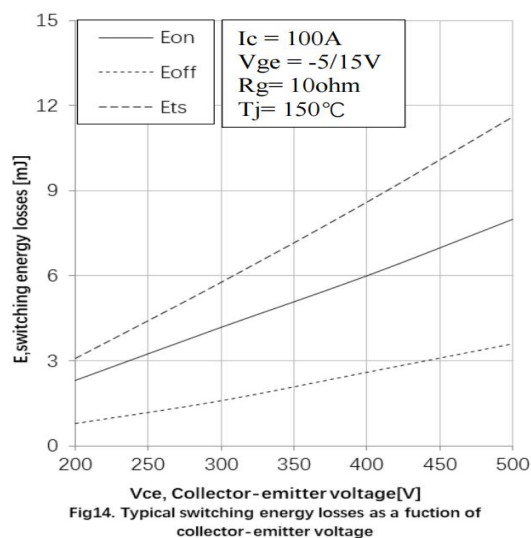
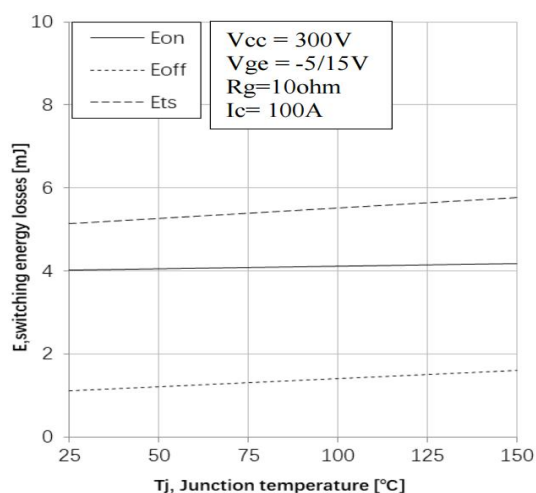


Fig6. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{ge} = 15\text{V}$)

Typical Characteristics



Typical Characteristics



Typical Characteristics

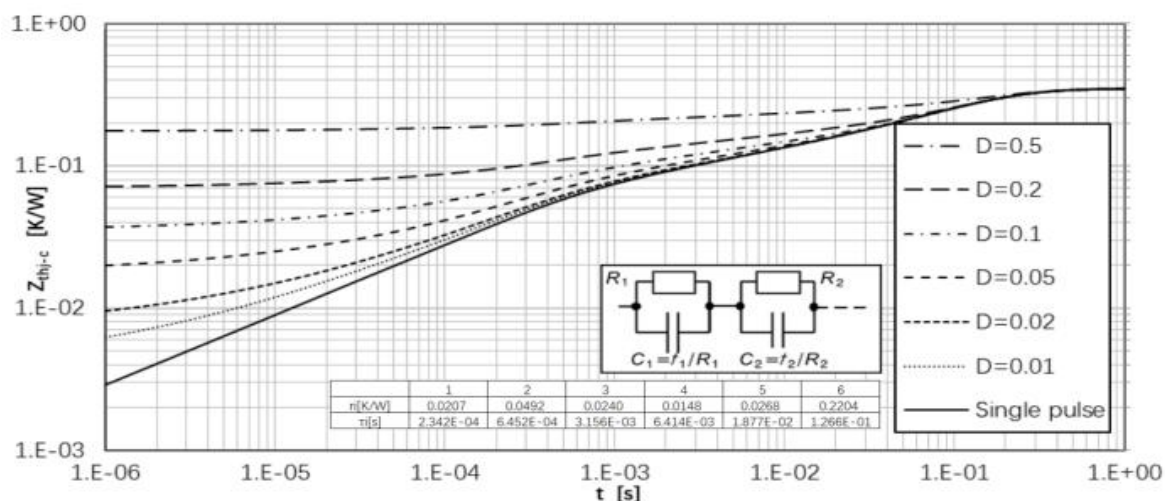


Fig 19. IGBT Transient Thermal Impedance

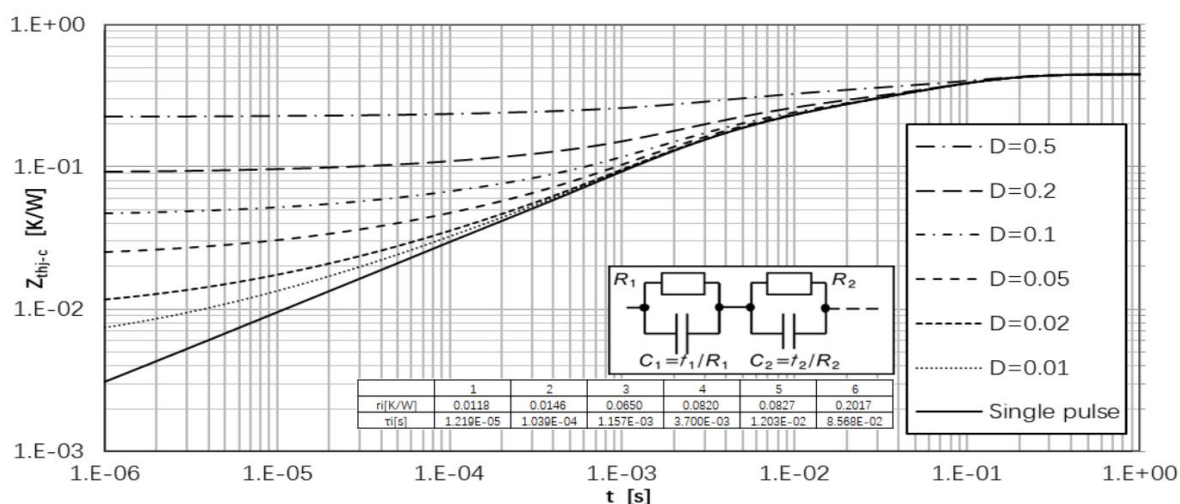
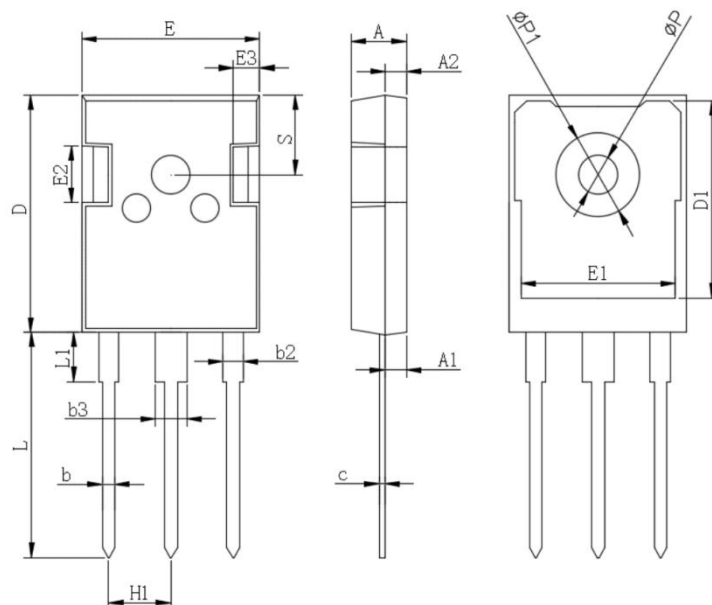


Fig 20. Diode Transient Thermal Impedance

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	