

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
650V	1.7V@15V	6A

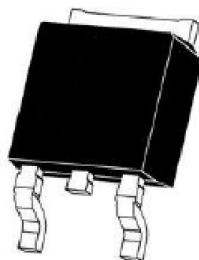
Feature

- High ruggedness performance
- Very tight parameter distribution
- Positive $V_{CE(sat)}$ temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation

Application

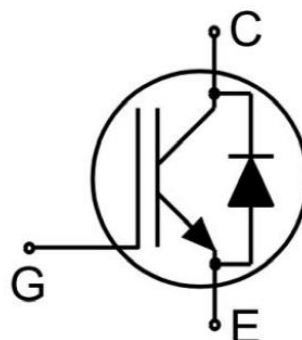
- Home appliances
- Motor drives
- Fan, Pumps, Vacuum cleaner

Package

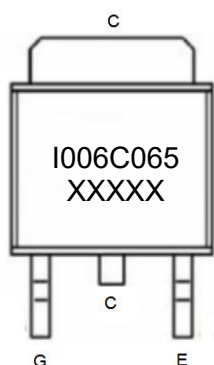


TO-252AB

Circuit diagram



Marking



Absolute maximum ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Gate- Emitter Voltage	V_{GES}	± 20	V
Collector Current ($T_C = 25^\circ\text{C}$)	I_C	12	A
Collector Current ($T_C = 100^\circ\text{C}$)	$I_C(100^\circ\text{C})$	6	A
Pulsed Collector Current, t_p limited by T_{vjmax}	I_{CM}	24	A
Diode Continuous Forward Current ($T_C = 100^\circ\text{C}$)	$I_F(100^\circ\text{C})$	6	A
Diode Maximum Current, t_p limited by T_{vjmax}	I_{FM}	24	A
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	136	W
Short circuit withstand time	t_{sc}	10	us
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	3.8	$^\circ\text{C/W}$
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	1.1	$^\circ\text{C/W}$
Junction Temperature Range	T_{vj}	$-40 \sim +175$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +175$	$^\circ\text{C}$

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Collector-Emitter Breakdown Voltage	V _{(BR)CES}	V _{GE} =0V, I _{CE} =250μA	650			V
Collector-Emitter Leakage Current	I _{CES}	V _{GE} =0V, V _{CE} =650V			10	μA
Gate to Emitter Leakage Current	I _{GES}	V _{GE} =±20V, V _{CE} =0V			±100	nA
Gate Threshold Voltage	V _{GE(th)}	V _{CE} =V _{GE} , I _C =1mA	5.7	6.2	6.7	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =6A, T _{vj} =25°C		1.7		V
		V _{GE} =15V, I _C =6A, T _{vj} =175°C		2.2		
Dynamic characteristics						
Input Capacitance	C _{ies}	V _{CE} =30V,V _{GE} =0V, f =1MHz		480		pF
Output Capacitance	C _{oes}			22		
Reverse Transfer Capacitance	C _{res}			8		
Total Gate Charge	Q _g	V _{CC} =520V,V _{GE} =15V, I _C =6A		19		nC
Turn-on delay time	t _{d(on)}	V _{CC} =400V,V _{GE} =0/15V, I _C =6A,R _G =10Ω, Inductive Load		10		nS
Turn-on rise time	t _r			8		
Turn-off delay time	t _{d(off)}			79		
Turn-off fall time	t _f			56		
Turn-on Switching Energy	E _{on}			0.11		mJ
Turn-off Switching Energy	E _{off}			0.10		
Total switching energy	E _{ts}			0.21		
Turn-on delay time	t _{d(on)}		V _{CC} =400V,V _{GE} =0/15V, I _C =6A,R _G =10Ω, Inductive Load T _{vj} =175°C		11	
Turn-on rise time	t _r			10		
Turn-off delay time	t _{d(off)}			108		
Turn-off fall time	t _f			89		
Turn-on Switching Energy	E _{on}			0.16		mJ
Turn-off Switching Energy	E _{off}			0.16		
Total switching energy	E _{ts}			0.32		

Electrical characteristics of Diode ($T_{vj}=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$I_F = 6\text{A}$		1.6		V
		$I_F = 6\text{A}, T_{vj} = 175^{\circ}\text{C}$		1.4		
Reverse Recovery Current	I_{rrm}	$I_F = 6\text{A}, V_R = 400\text{V}, di_F/dt = -500\text{A/us}$		10		A
Reverse Recovery Charge	Q_{rr}			306		nC
Diode reverse recovery time	t_{rr}			55		ns
Reverse Recovery Current	I_{rrm}	$I_F = 6\text{A}, V_R = 400\text{V}, di_F/dt = -500\text{A/us}, T_{vj} = 175^{\circ}\text{C}$		12		A
Reverse Recovery Charge	Q_{rr}			529		nC
Diode reverse recovery time	t_{rr}			98		ns

Typical Characteristics

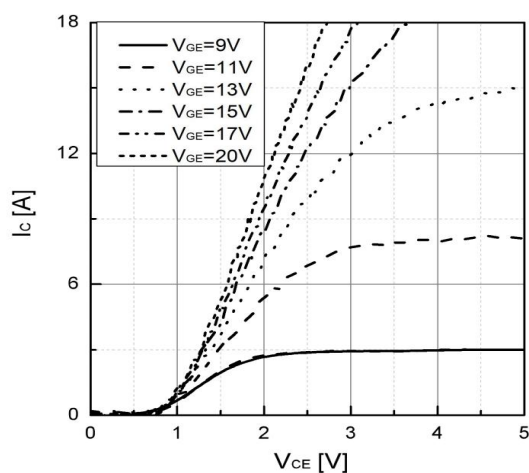


Fig 1. Typical output characteristic ($T_{vj}=25^{\circ}\text{C}$)

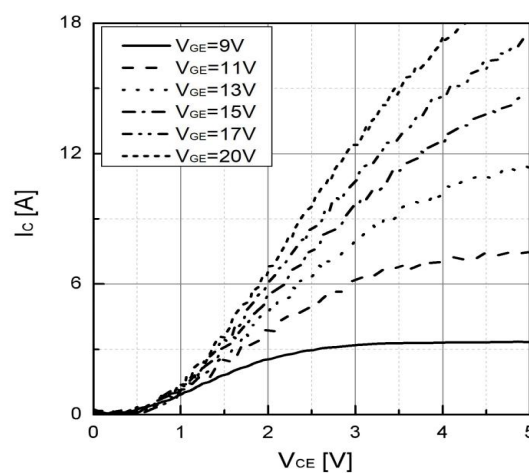


Fig 2. Typical output characteristic ($T_{vj}=175^{\circ}\text{C}$)

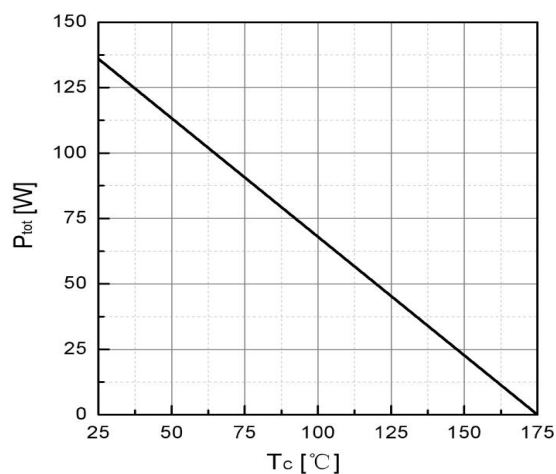


Fig 3. Power dissipation as a function of T_c

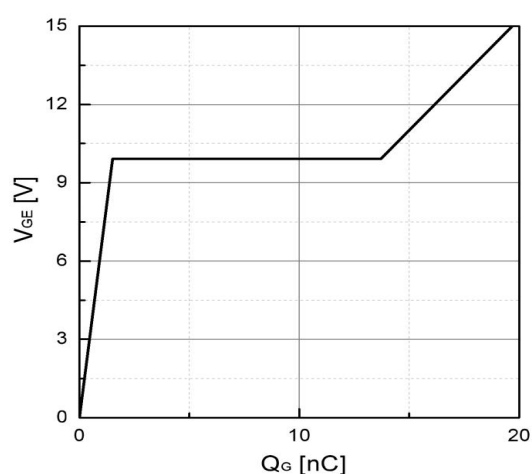


Fig 4. Typical Gate charge

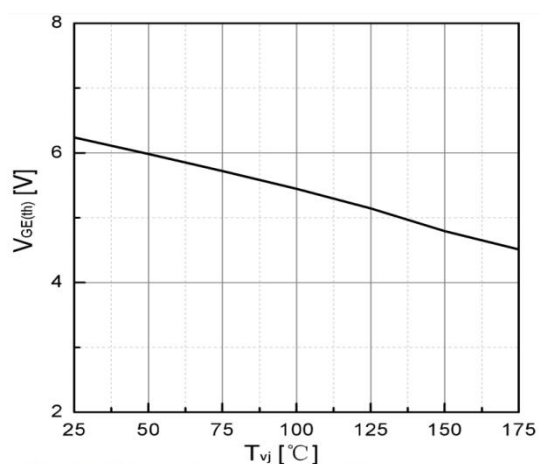


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} ($I_C=1\text{mA}$)

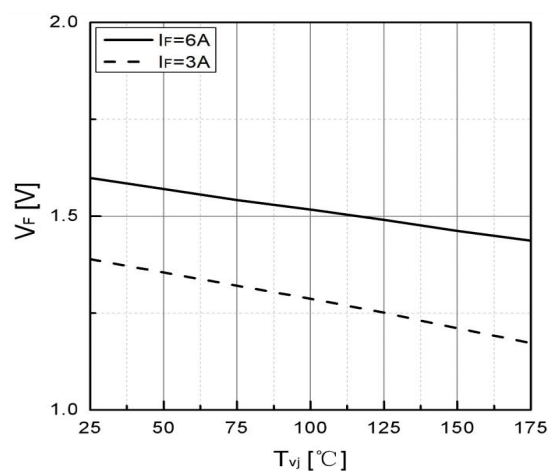


Fig 6. Typical V_F as a function of T_{vj}

Typical Characteristics

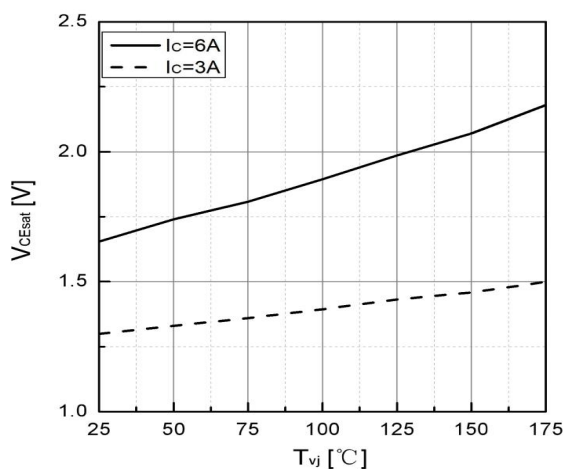


Fig 7. Typical V_{CEsat} as a function of T_{vj}

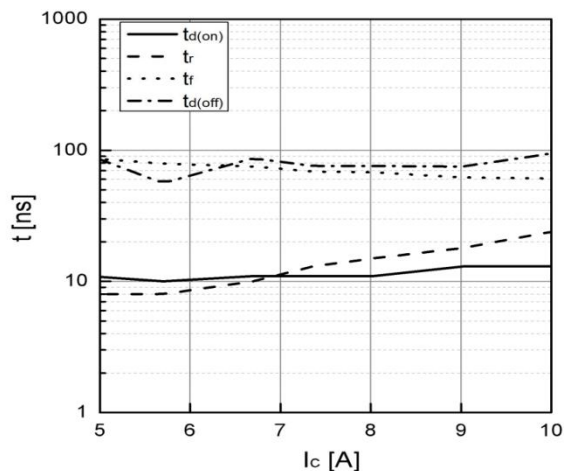


Fig 8. Typical switching time as a function of I_C

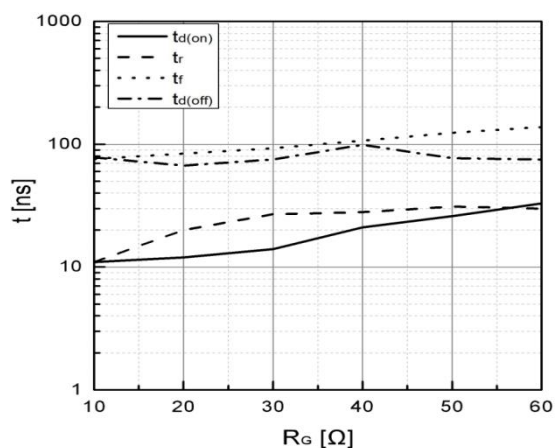


Fig 9. Typical switching times as a function of R_G

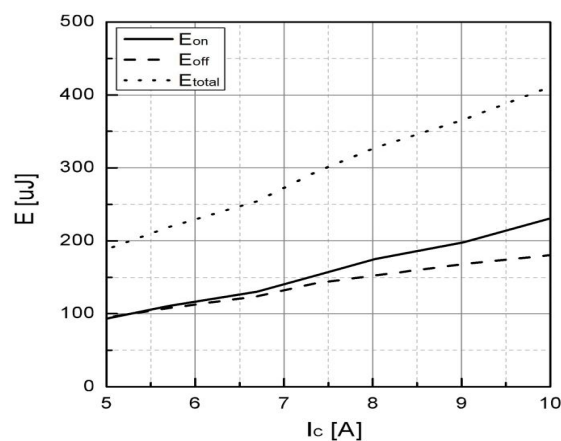


Fig 10. Typical switching energy losses as a function of I_C

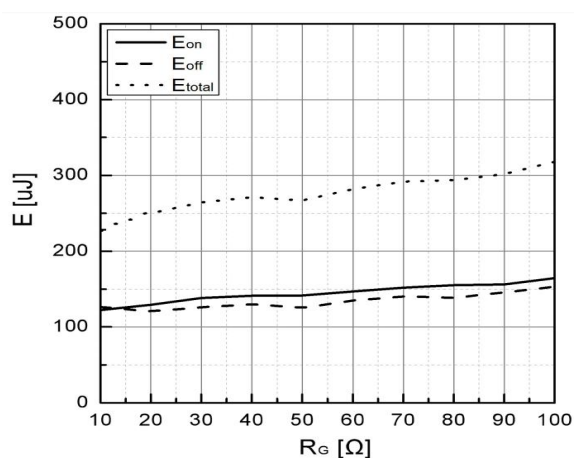


Fig 11. Typical switching energy losses as a function of R_G

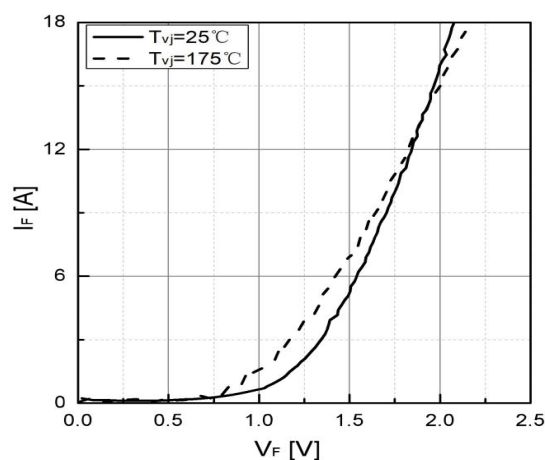


Fig 12. Typical I_F as a function of V_F

Typical Characteristics

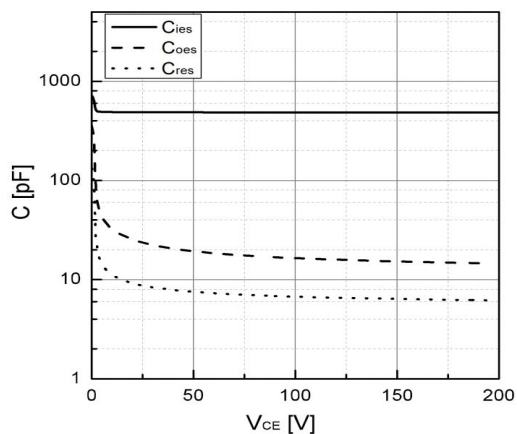


Fig 13. Typical capacitance as a function of V_{CE}
($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

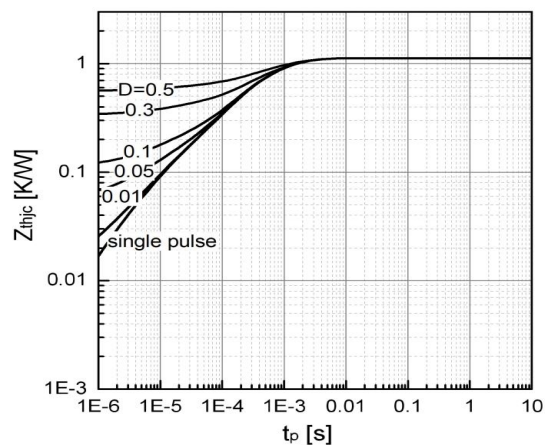
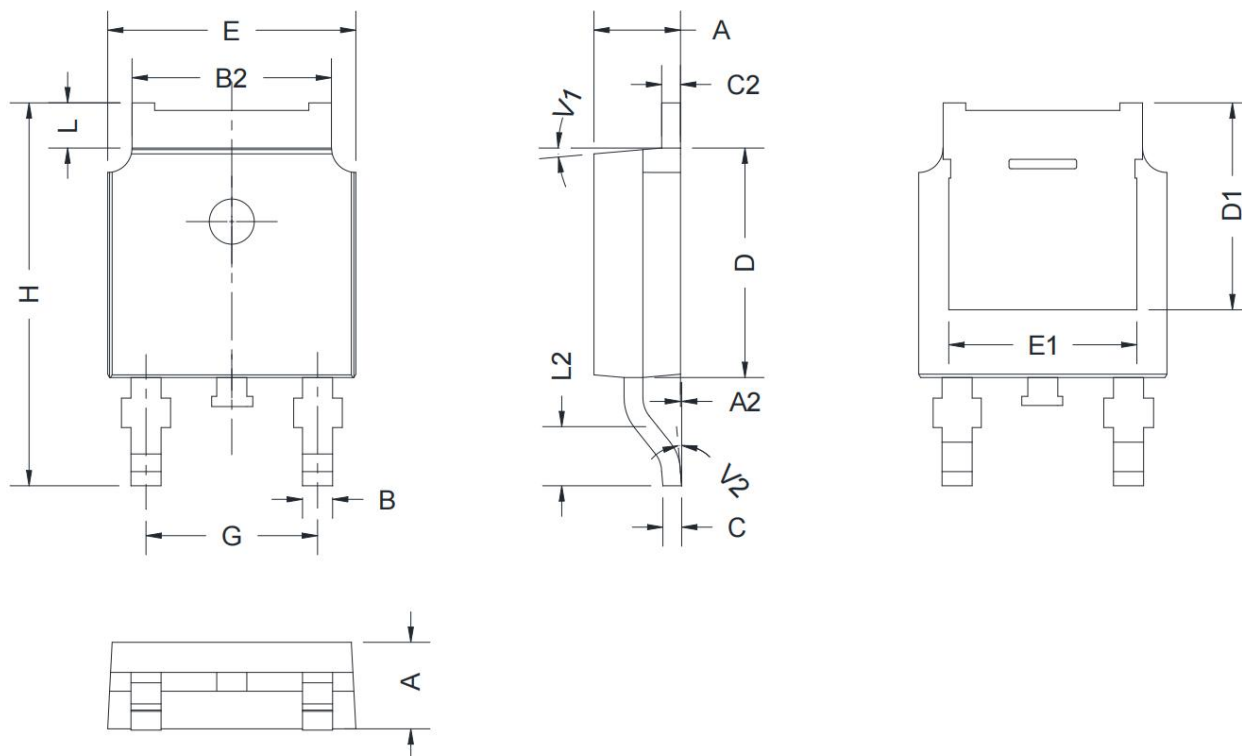


Fig 14. Transient thermal impedance of IGBT

TO-252AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.100	2.500	0.083	0.098
A2	0.000	0.100	0.000	0.004
B	0.660	0.860	0.026	0.034
B2	5.180	5.480	0.204	0.216
C	0.400	0.600	0.016	0.024
C2	0.440	0.580	0.017	0.023
D	5.900	6.300	0.232	0.248
D1	5.300 REF		0.209 REF	
E	6.400	6.800	0.252	0.268
E1	4.630	-	0.182	-
G	4.470	4.670	0.176	0.184
H	9.500	10.700	0.374	0.421
L	1.090	1.210	0.043	0.048
L2	1.350	1.650	0.053	0.065
V1	7° TYP		7° TYP	
V2	0°	6°	0°	6°