

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
650V	1.8V@15V	10A

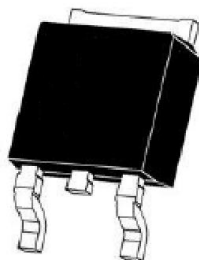
Feature

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

Application

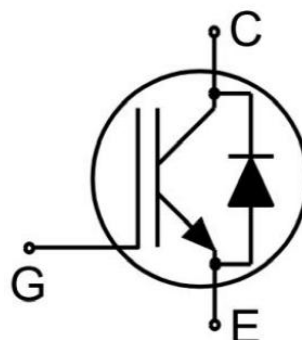
- Home appliances
- Motor drives

Package

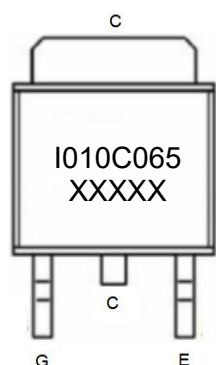


TO-252AB

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	20	A
Collector Current ($T_C = 100^\circ\text{C}$)	$I_C(100^\circ\text{C})$	10	A
Pulsed Collector Current, t_p limited by T_{vjmax}	I_{CM}	40	A
Diode Continuous Forward Current ($T_C = 100^\circ\text{C}$)	$I_F(100^\circ\text{C})$	10	A
Diode Maximum Current, t_p limited by T_{vjmax}	I_{FM}	40	A
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	75	W
Short circuit withstand time	t_{sc}	10	us
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	2.2	$^\circ\text{C/W}$
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	2.0	$^\circ\text{C/W}$
Junction Temperature Range	T_{vj}	$-40 \sim +175$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +175$	$^\circ\text{C}$

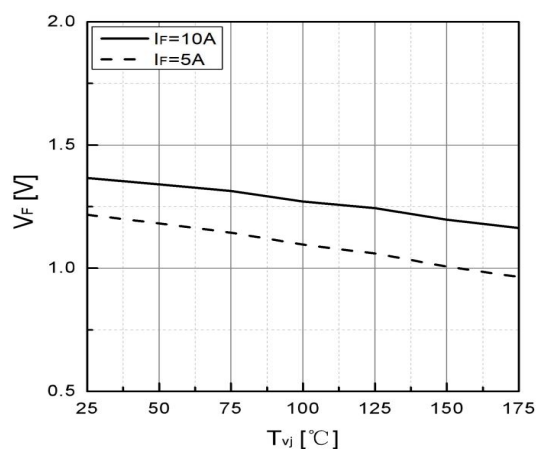
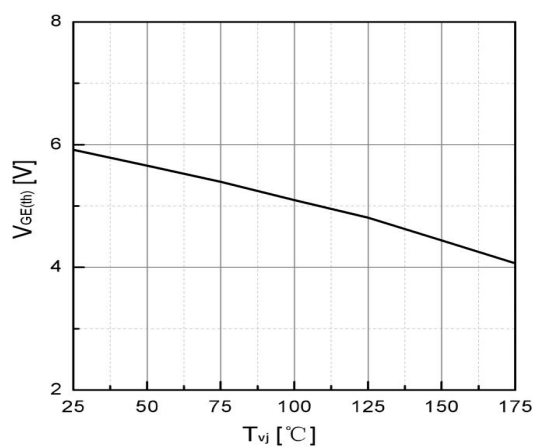
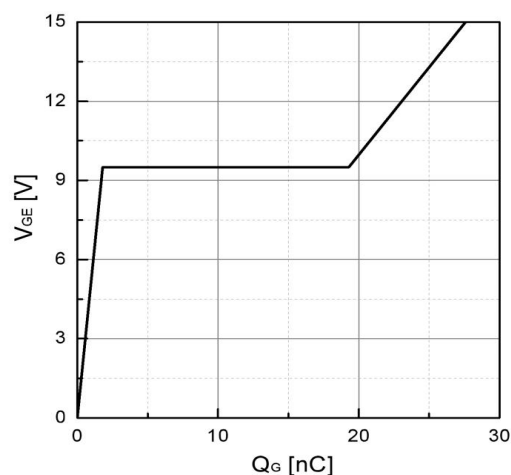
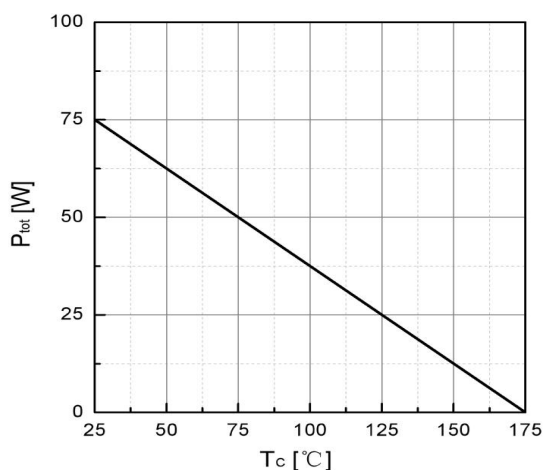
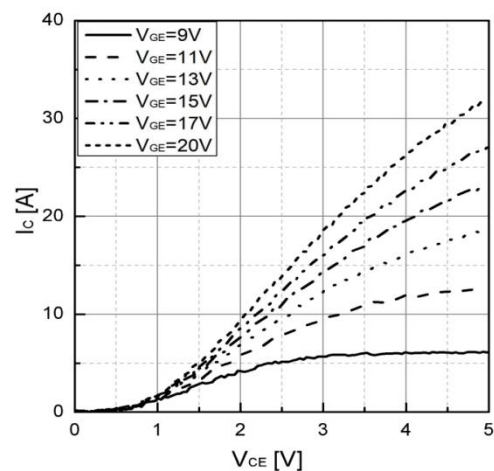
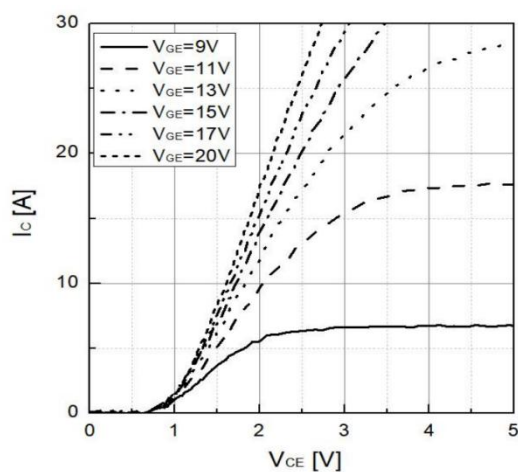
Electrical characteristics of IGBT ($T_{vj}=25^\circ\text{C}$ unless otherwise noted)

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			50	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	5.3	5.8	6.3	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =10A		1.8		V
		V _{GE} =15V, I _C =10A ,T _{vj} =175°C		2.3		
Dynamic characteristics						
Input Capacitance	C _{ies}	V _{CE} =30V,V _{GE} =0V, f =1MHz		670		pF
Output Capacitance	C _{oes}			37		
Reverse Transfer Capacitance	C _{res}			10		
Total Gate Charge	Q _g	V _{CC} =520V,V _{GE} =15V, I _C =10A		28		nC
Turn-on delay time	t _{d(on)}	V _{CC} =400V,V _{GE} =0/15V, I _C =10A,R _G =10Ω, Inductive Load		12		nS
Turn-on rise time	t _r			11		
Turn-off delay time	t _{d(off)}			74		
Turn-off fall time	t _f			71		
Turn-on Switching Energy	E _{on}			0.18		mJ
Turn-off Switching Energy	E _{off}			0.17		
Total switching energy	E _{is}			0.35		
Turn-on delay time	t _{d(on)}		V _{CC} =400V,V _{GE} =0/15V, I _C =10A,R _G =10Ω, Inductive Load T _{vj} =175°C		11	
Turn-on rise time	t _r			13		
Turn-off delay time	t _{d(off)}			114		
Turn-off fall time	t _f			87		
Turn-on Switching Energy	E _{on}			0.22		mJ
Turn-off Switching Energy	E _{off}			0.27		
Total switching energy	E _{is}			0.49		

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	$I_F = 10\text{A}$		1.4		V
		$I_F = 10\text{A}, T_{vj} = 175^{\circ}\text{C}$		1.2		
Reverse Recovery Current	I_{rrm}	$I_F = 10\text{A}, V_R = 400\text{V},$ $di_F/dt = -750\text{A}/\mu\text{s}$		12		A
Reverse Recovery Charge	Q_{rr}			411		nC
Diode reverse recovery time	t_{rr}			57		ns
Reverse Recovery Current	I_{rrm}	$I_F = 10\text{A}, V_R = 400\text{V},$ $di_F/dt = -750\text{A}/\mu\text{s}, T_{vj} = 175^{\circ}\text{C}$		13		A
Reverse Recovery Charge	Q_{rr}			737		nC
Diode reverse recovery time	t_{rr}			124		ns

Typical Characteristics



Typical Characteristics

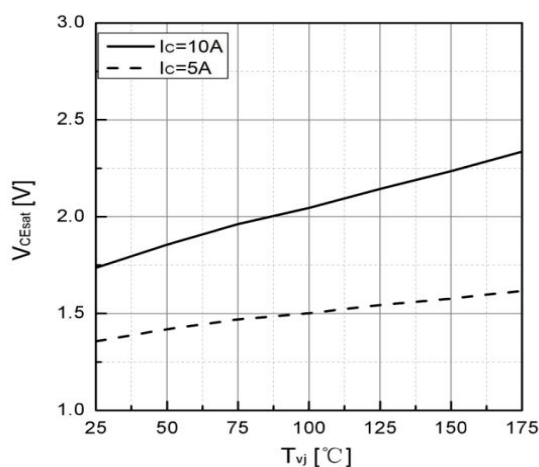


Fig 7. Typical V_{CEsat} as a function of T_{vj}

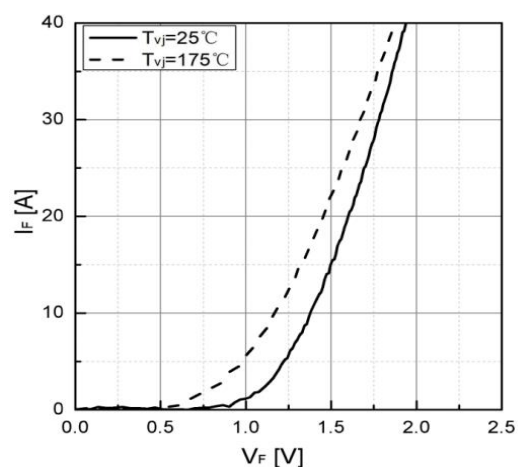


Fig 8. Typical I_F as a function of V_F

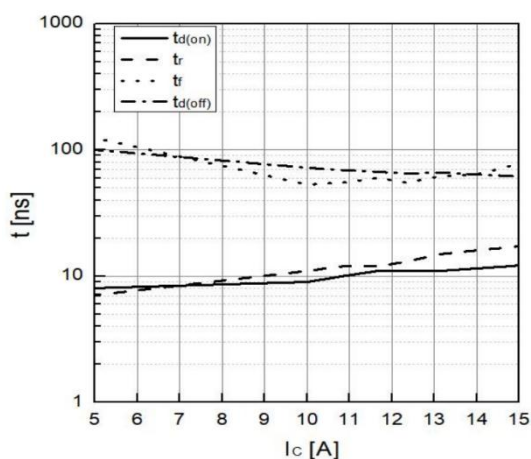


Fig 9. Typical switching time as a function of I_c

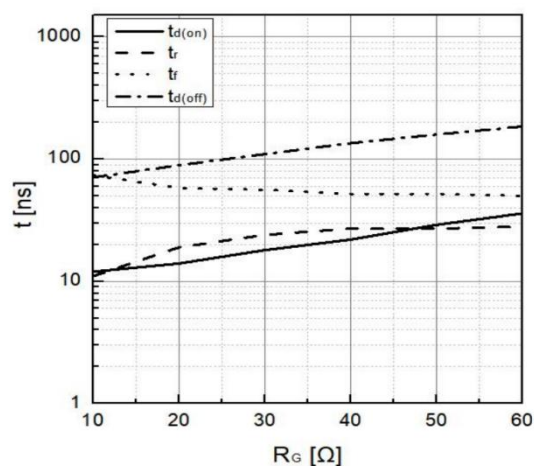


Fig 10. Typical switching times as a function of R_G

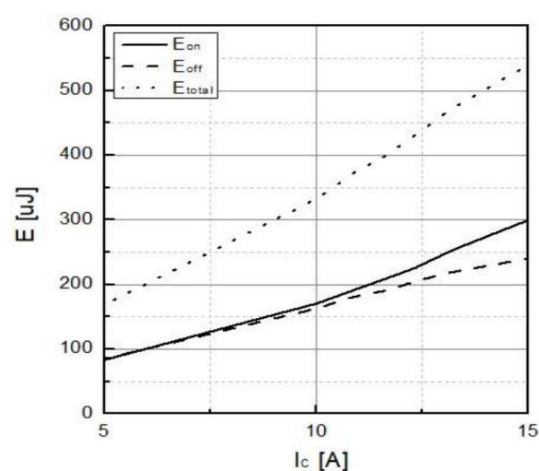


Fig 11. Typical switching energy losses as a function of I_c

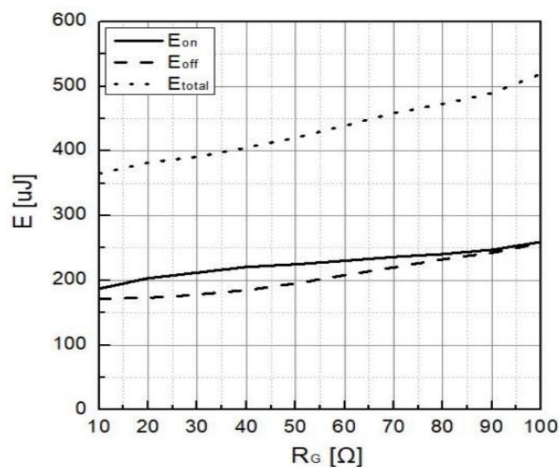


Fig 12. Typical switching energy losses as a function of R_G

Typical Characteristics

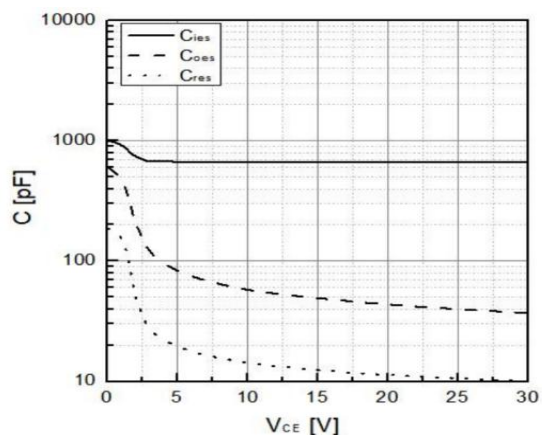
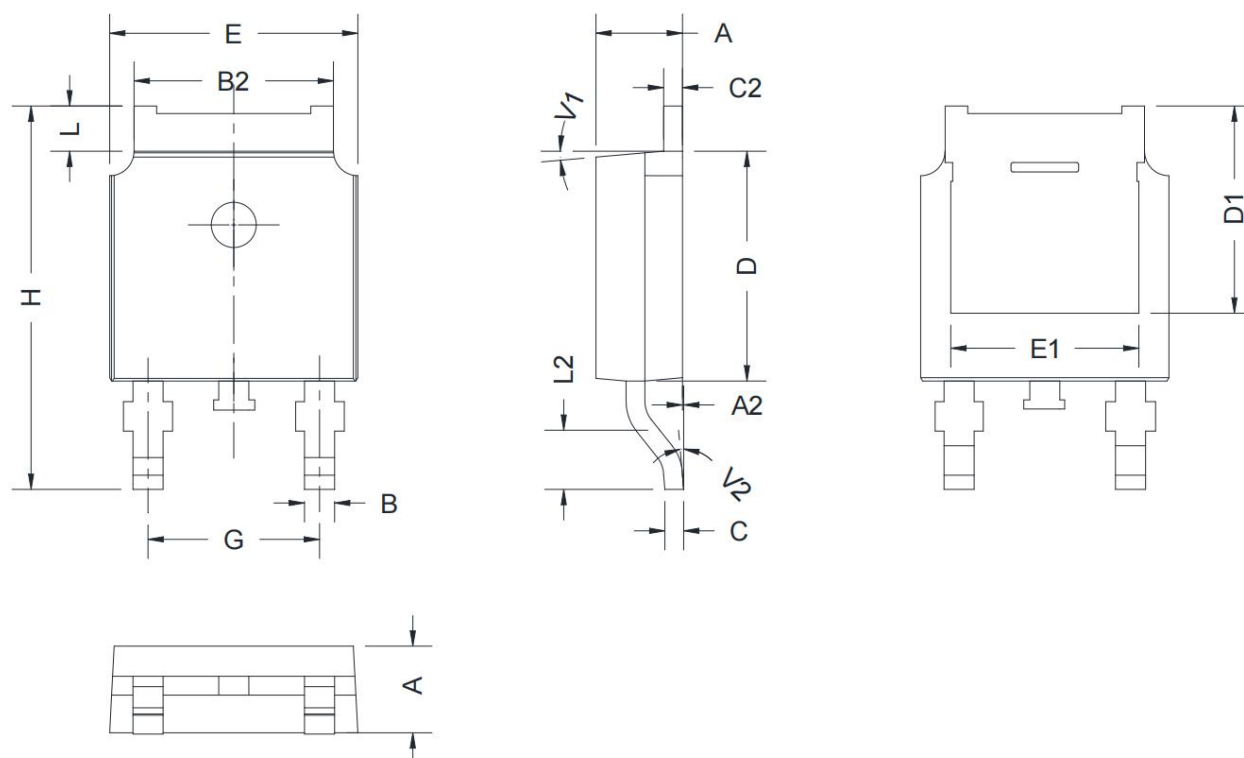


Fig 13. Typical capacitance as a function of V_{CE}
($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

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°