

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
650V	1.6V@15V	20A

Feature

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

Application

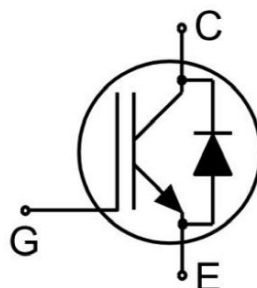
- Home appliances
- Motor drives
- General inverter

Package



TO-263AB

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	40	A
Collector Current ($T_C = 100^\circ\text{C}$)	$I_C(100^\circ\text{C})$	20	A
Pulsed Collector Current, t_p limited by T_{vjmax}	I_{CM}	80	A
Diode Continuous Forward Current ($T_C = 100^\circ\text{C}$)	$I_F(100^\circ\text{C})$	20	A
Diode Maximum Current, t_p limited by T_{vjmax}	I_{FM}	80	A
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	150	W
Short circuit withstand time	t_{sc}	10	us
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1.8	$^\circ\text{C/W}$
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	1	$^\circ\text{C/W}$
Operating 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	5.2	5.7	6.2	V	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =20A		1.6		V	
		V _{GE} =15V, I _C =20A ,T _{vj} =175°C		2			
Dynamic characteristics							
Input Capacitance	C _{ies}	V _{CE} =30V, V _{GE} =0V, f =1MHz		1700		pF	
Output Capacitance	C _{oes}			72			
Reverse Transfer Capacitance	C _{res}			13			
Total Gate Charge	Q _g	V _{CC} =520V, V _{GE} =15V, I _C =20A		71		nC	
Turn-on delay time	t _{d(on)}	V _{CC} =400V, V _{GE} =0/15V I _C =20A, R _G =10Ω Inductive Load		21		nS	
Turn-on rise time	t _r			23			
Turn-off delay time	t _{d(off)}			120			
Turn-off fall time	t _f			63			
Turn-on Switching Energy	E _{on}			0.37		mJ	
Turn-off Switching Energy	E _{off}			0.46			
Total switching energy	E _{is}			0.83			
Turn-on delay time	t _{d(on)}		V _{CC} =400V, V _{GE} =0/15V I _C =20A, R _G =10Ω Inductive Load T _{vj} =175°C		21		nS
Turn-on rise time	t _r				23		
Turn-off delay time	t _{d(off)}			141			
Turn-off fall time	t _f			108			
Turn-on Switching Energy	E _{on}			0.59		mJ	
Turn-off Switching Energy	E _{off}			0.67			
Total switching energy	E _{is}			1.26			

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	$I_F = 20\text{A}$		1.6		V
		$I_F = 20\text{A}, T_{vj} = 175^{\circ}\text{C}$		1.2		
Reverse Recovery Current	I_{rrm}	$V_R = 400\text{V}, I_F = 20\text{A}$ $di_F/dt = -500\text{A/us}$		12		A
Reverse Recovery Charge	Q_{rr}			472		nC
Diode reverse recovery time	t_{rr}			62		ns
Reverse Recovery Current	I_{rrm}	$V_R = 400\text{V}, I_F = 20\text{A}$ $di_F/dt = -500\text{A/us}, T_{vj} = 175^{\circ}\text{C}$		19		A
Reverse Recovery Charge	Q_{rr}			1130		nC
Diode reverse recovery time	t_{rr}			90		ns

Typical Characteristics

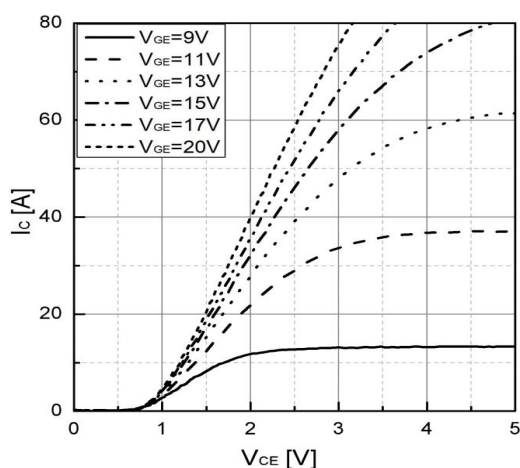


Fig 1. Typical output characteristic ($T_{vj}=25^{\circ}\text{C}$)

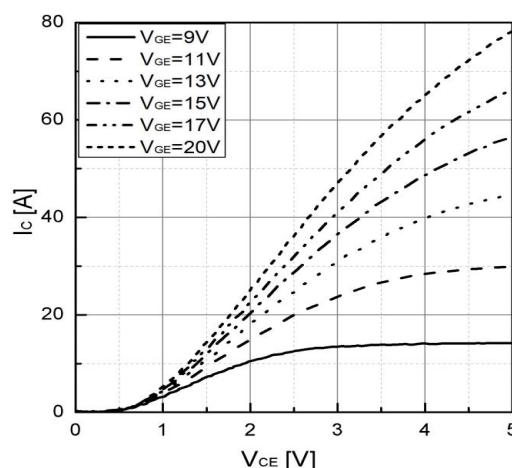


Fig 2. Typical output characteristic ($T_{vj}=175^{\circ}\text{C}$)

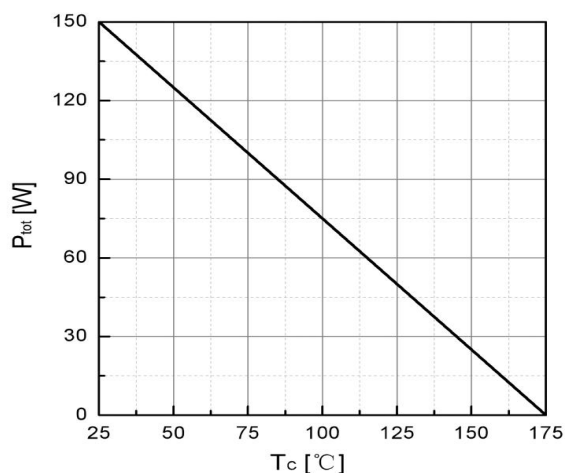


Fig 3. Power dissipation as a function of T_C

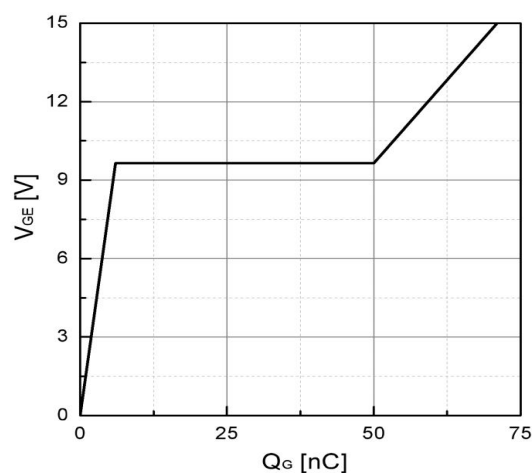


Fig 4. Typical Gate charge

Typical Characteristics

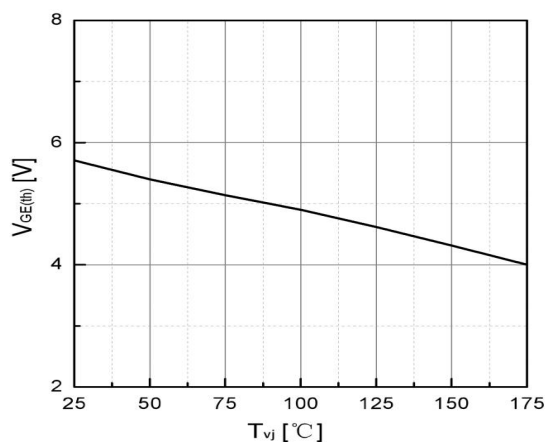


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj} ($I_C=1mA$)

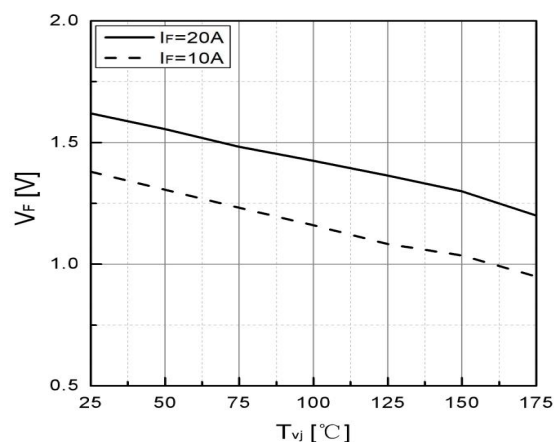


Fig 6. Typical V_F as a function of T_{vj}

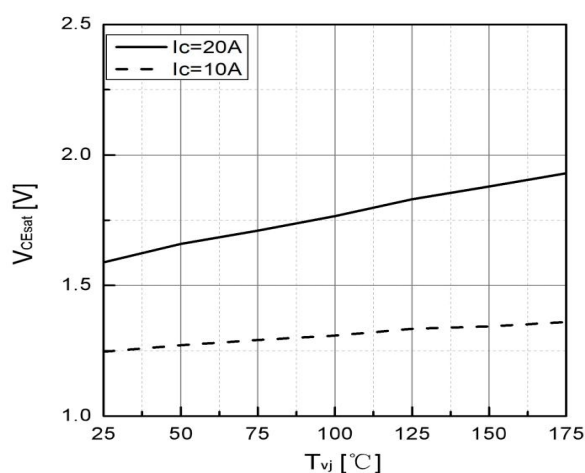


Fig 7. Typical $V_{CE(sat)}$ as a function of T_{vj}

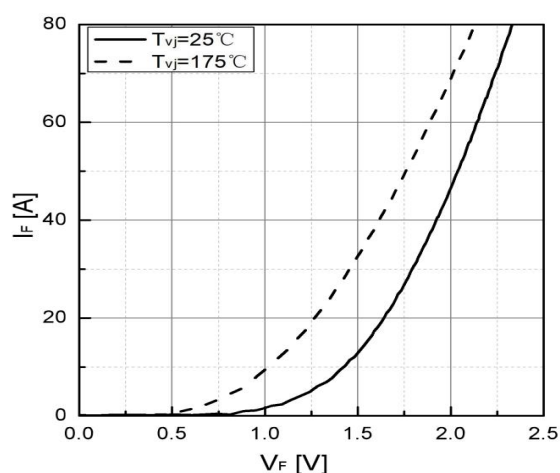


Fig 8. Typical I_F as a function of V_F

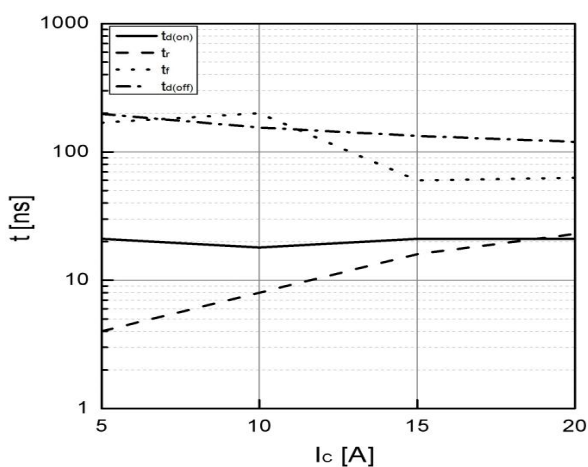


Fig 9. Typical switching time as a function of I_C

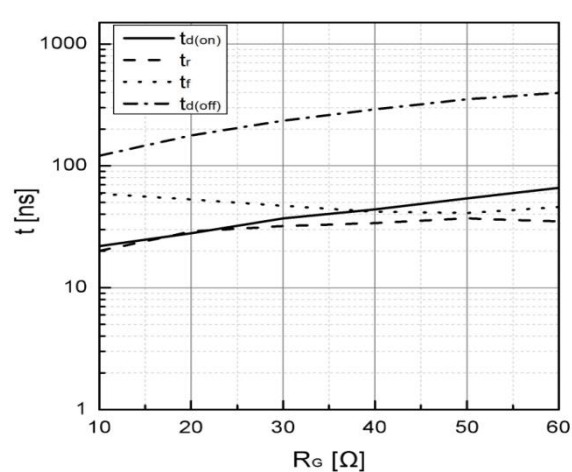


Fig 10. Typical switching times as a function of R_G

Typical Characteristics

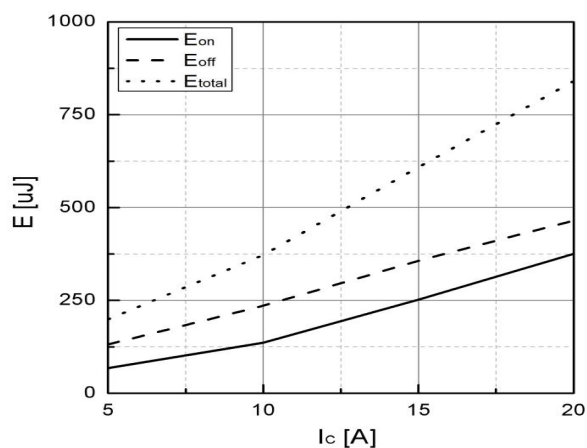


Fig 11. Typical switching energy losses as a function of I_C

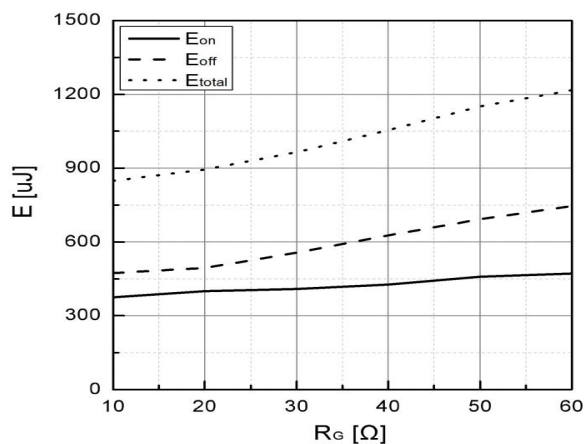


Fig 12. Typical switching energy losses as a function of R_G

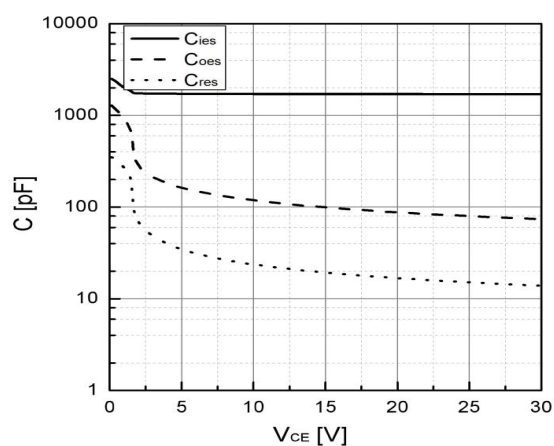
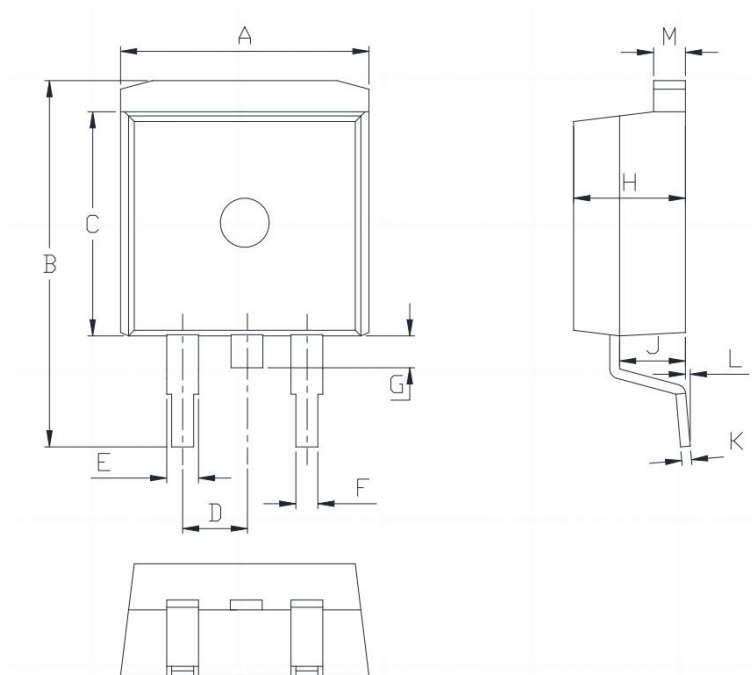


Fig 13. Typical capacitance as a function of V_{CE}
($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

TO-263AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	9.900	10.200	0.390	0.402
B	14.700	15.800	0.579	0.622
C	9.400	9.600	0.370	0.378
D	2.540 BSC.		0.100 BSC.	
E	1.200	1.400	0.047	0.055
F	0.750	0.850	0.030	0.033
G	-	1.750	-	0.069
H	4.400	4.700	0.173	0.185
J	2.300	2.700	0.091	0.106
K	0.380	0.550	0.015	0.022
L	0.000	0.250	0.000	0.010
M	1.250	1.350	0.049	0.053