

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
650V	1.65V@15V	30A

Feature

- Low switching losses
- Maximum junction temperature 175°C
- Positive temperature coefficient
- High ruggedness, temperature stable
- High short circuit capability(5us)

Application

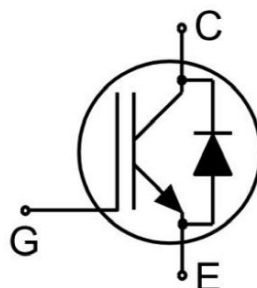
- AC and DC servo drive amplifier
- Uninterruptible power supply
- Motion/servo control

Package



TO-263AB

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	40	A
Collector Current, limited by T_{jmax} ($T_c=100^{\circ}\text{C}$)	$I_C(100^{\circ}\text{C})$	30	A
Pulsed Collector Current, t_p limited by T_{jmax} ($V_{GE}=15\text{V}$)	I_{CM}	60	A
Diode Continuous Forward Current, limited by T_{jmax}	I_F	40	A
Diode Continuous Forward Current, limited by T_{jmax} ($T_c=100^{\circ}\text{C}$)	$I_F(100^{\circ}\text{C})$	30	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	60	A
Turn off Safe Operating Area ($V_{CE} \leq 650\text{V}, T_J \leq 150^{\circ}\text{C}$)	-	60	A
Short Circuit Withstand Time ($V_{GE}=15\text{V}, V_{CC}=400\text{V}, V_{CEM} \leq 650\text{V}$)	T_{sc}	5	μs
Power Dissipation ($T_J=175^{\circ}\text{C}$)	P_D	136	W
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1.8	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	1.1	$^{\circ}\text{C}/\text{W}$
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)

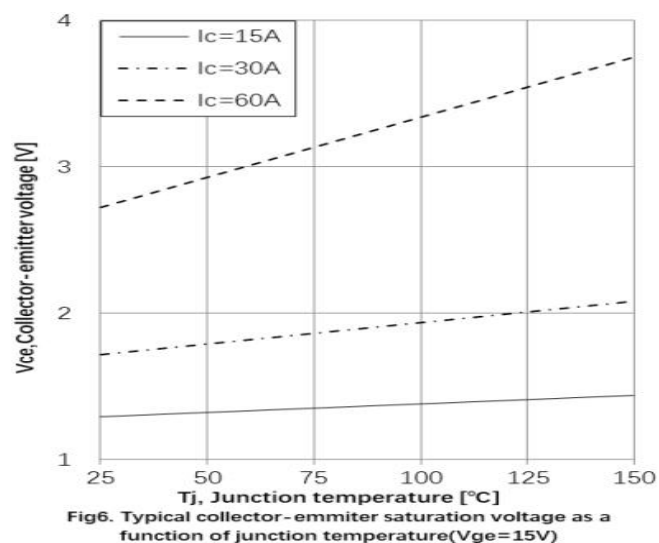
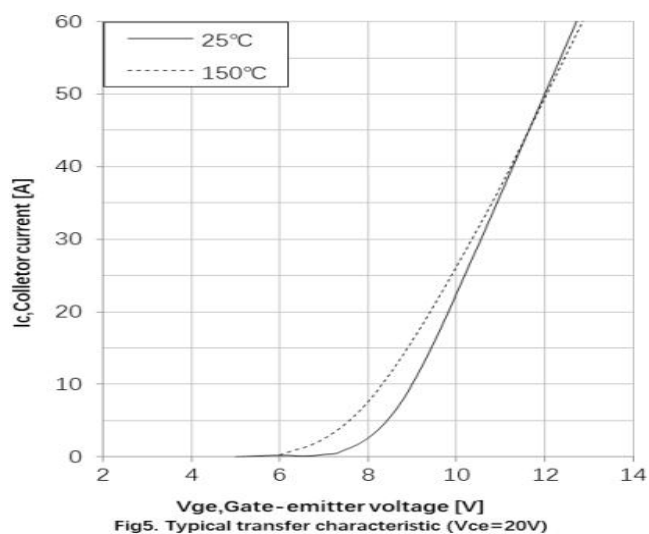
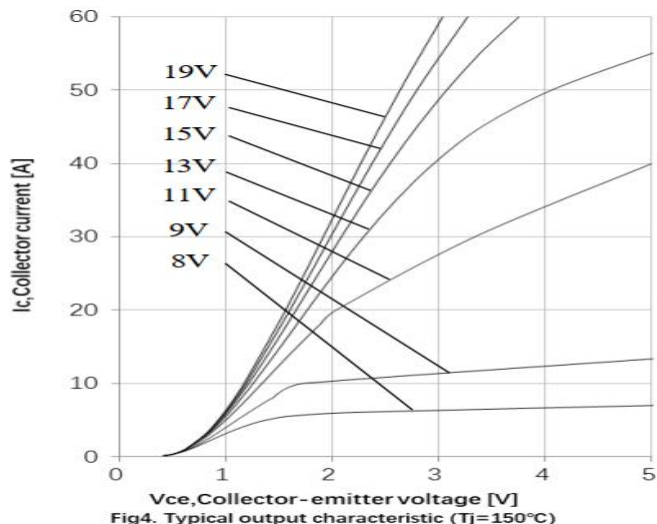
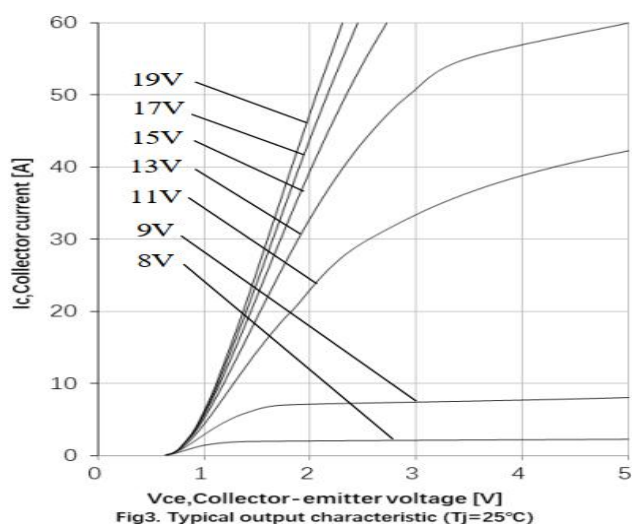
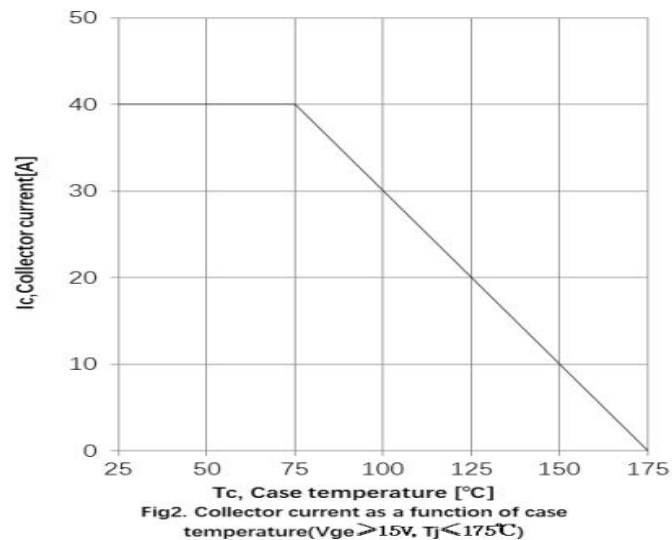
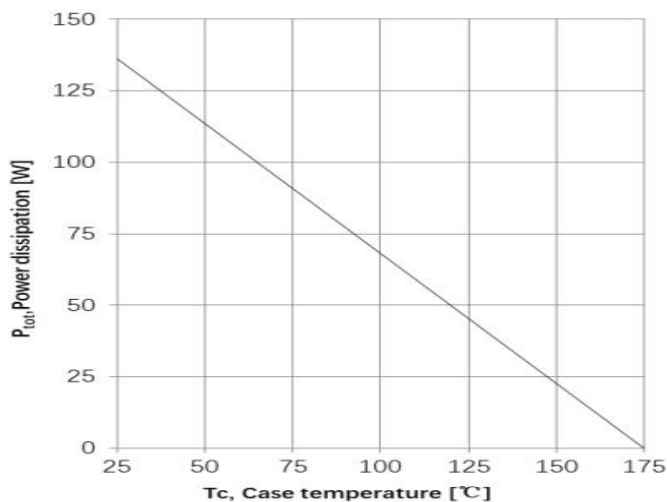
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=250\mu A$	650			V
Collector-Emitter Leakage Current	I_{CES}	$V_{GE}=0V, V_{CE}=650V$			0.25	mA
		$V_{GE}=0V, V_{CE}=650V, T_J=150^{\circ}C$			4	
Gate to Emitter Leakage Current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$			± 100	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1mA$	4.7	5.5	6.2	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=30A$		1.65	1.95	V
		$V_{GE}=15V, I_C=30A, T_J=125^{\circ}C$		2		
		$V_{GE}=15V, I_C=30A, T_J=150^{\circ}C$		2.1		
Dynamic characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		1.53		nF
Reverse Transfer Capacitance	C_{res}			0.04		
Total Gate Charge	Q_g	$V_{CC}=480V, V_{GE}=15V, I_C=30A$		0.16		μC
Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, V_{GE}=-5V\sim 15V$ $I_C=30A, R_G=20\Omega$		58		nS
Turn-on rise time	t_r			76		
Turn-off delay time	$t_{d(off)}$			93		
Turn-off fall time	t_f			88		
Turn-On Switching Loss	E_{on}			1.37		mJ
Turn-Off Switching Loss	E_{off}			0.63		

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Dynamic characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, V_{GE}=-5V\sim 15V$ $I_C=30A, R_G=20\Omega$ $T_J=125^\circ C$		56		nS
Turn-on rise time	t_r			77		
Turn-off delay time	$t_{d(off)}$			99		
Turn-off fall time	t_f			116		
Turn-On Switching Loss	E_{on}	$V_{CC}=400V, V_{GE}=-5V\sim 15V$ $I_C=30A, R_G=20\Omega$ $T_J=125^\circ C$		1.42		mJ
Turn-Off Switching Loss	E_{off}			0.79		
Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, V_{GE}=-5V\sim 15V$ $I_C=30A, R_G=20\Omega$ $T_J=150^\circ C$		54		nS
Turn-on rise time	t_r			77		
Turn-off delay time	$t_{d(off)}$			102		
Turn-off fall time	t_f			128		
Turn-On Switching Loss	E_{on}	$V_{CC}=400V, V_{GE}=-5V\sim 15V$ $I_C=30A, R_G=20\Omega$ $T_J=150^\circ C$		1.45		mJ
Turn-Off Switching Loss	E_{off}			0.85		

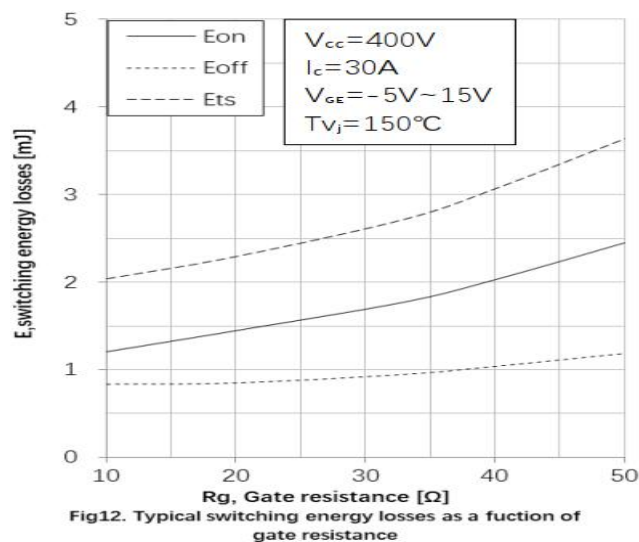
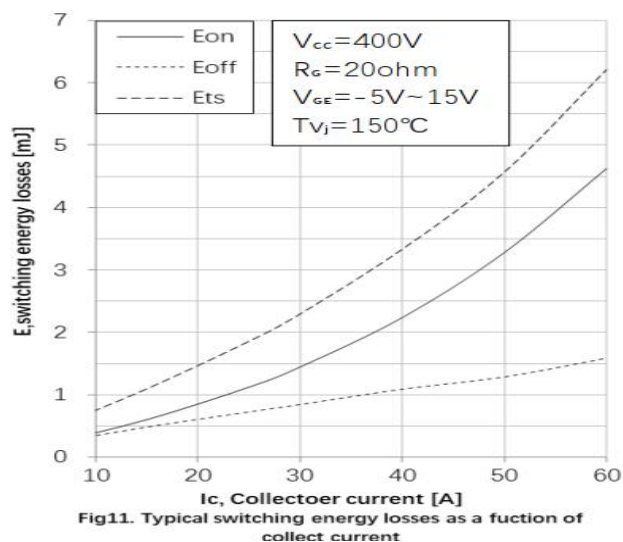
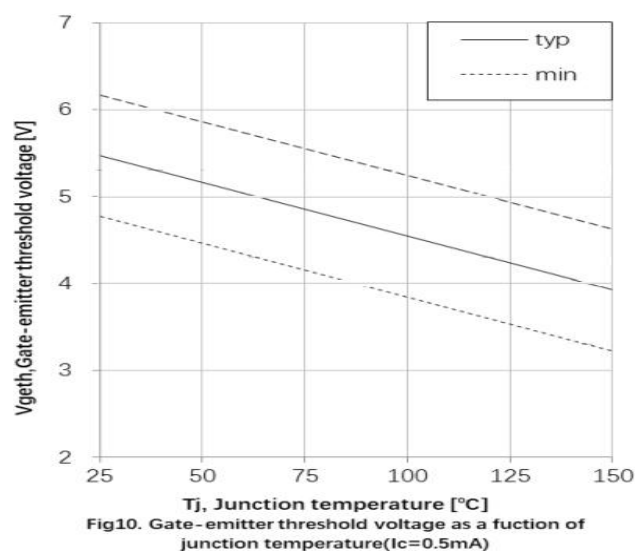
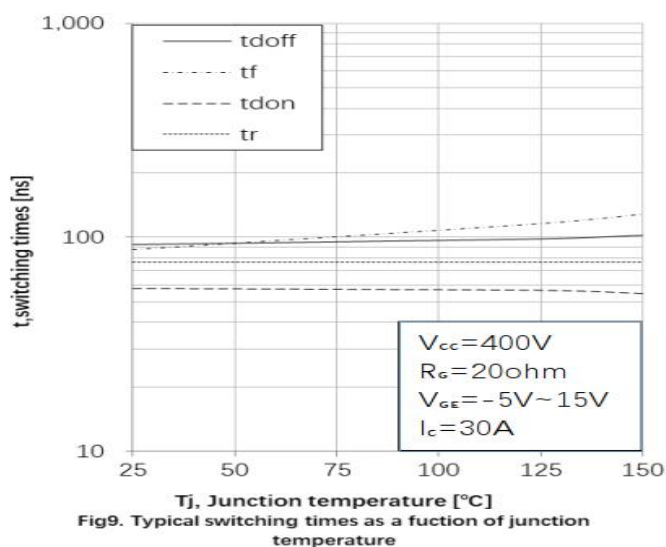
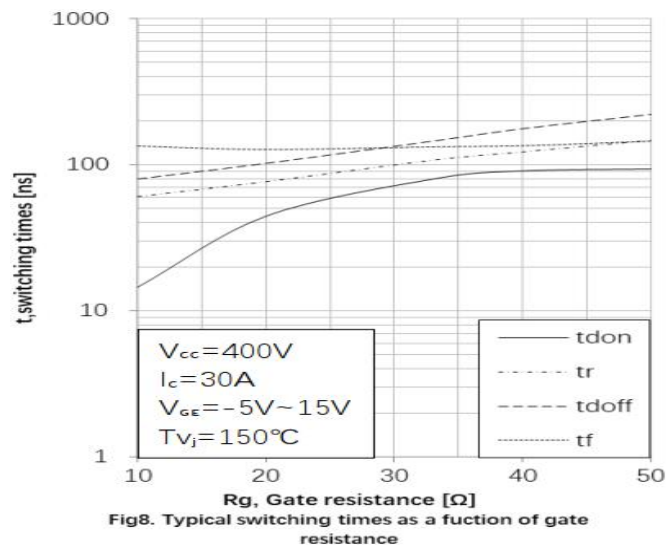
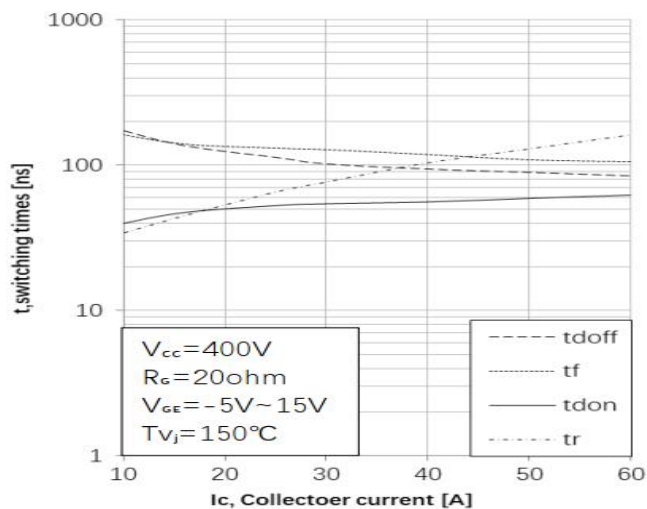
Electrical characteristics of the Diode ($T_J=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$I_F=30A$		1.6	2	V
		$I_F=30A, T_J=125^\circ C$		1.55		
		$I_F=30A, T_J=150^\circ C$		1.5		
Reverse Recovery Current	I_{rrm}	$V_R=400V, I_F=30A$ $di/dt=-320A/\mu s$		11		A
Reverse Recovery Charge	Q_{rr}			0.75		uC
Reverse Recovery Time	T_{rr}			114		nS
Reverse Recovery Energy	E_{rec}			0.14		mJ
Reverse Recovery Current	I_{rrm}	$V_R=400V, I_F=30A$ $di/dt=-320A/\mu s$ $T_J=125^\circ C$		14		A
Reverse Recovery Charge	Q_{rr}			1.14		uC
Reverse Recovery Time	T_{rr}			156		nS
Reverse Recovery Energy	E_{rec}			0.27		mJ
Reverse Recovery Current	I_{rrm}	$V_R=400V, I_F=30A$ $di/dt=-320A/\mu s$ $T_J=150^\circ C$		16		A
Reverse Recovery Charge	Q_{rr}			1.59		uC
Reverse Recovery Time	T_{rr}			177		nS
Reverse Recovery Energy	E_{rec}			0.34		mJ

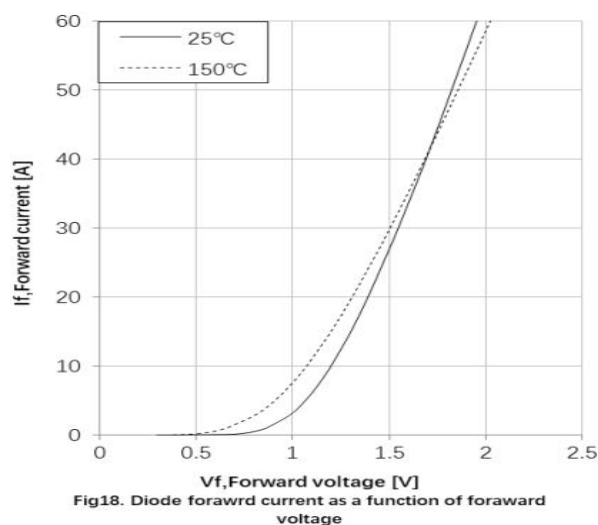
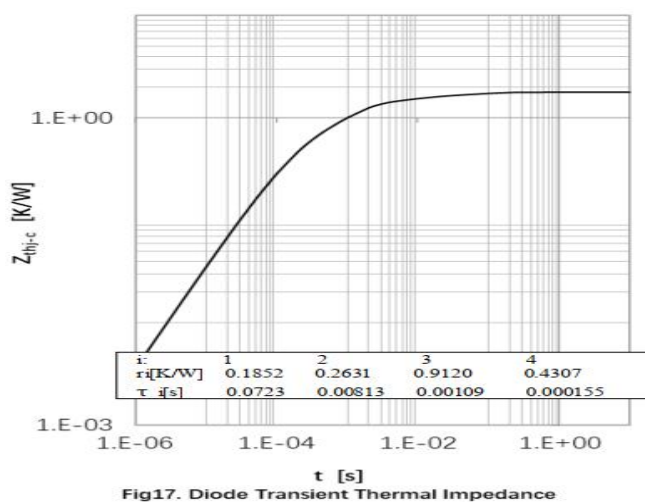
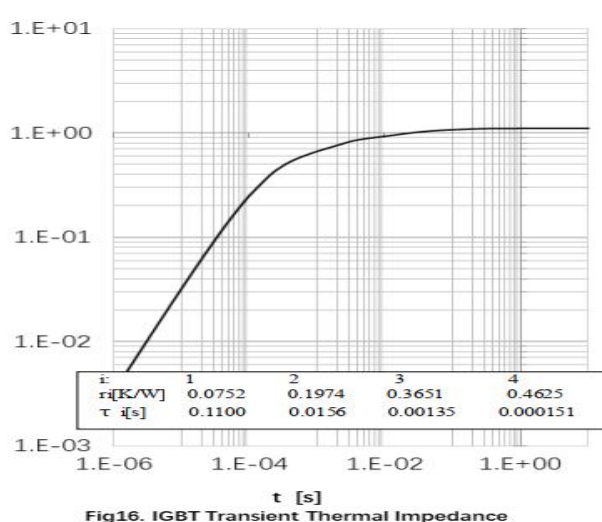
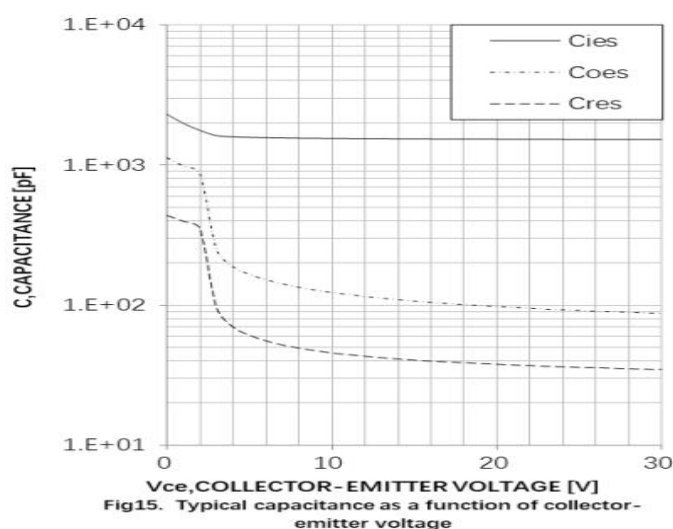
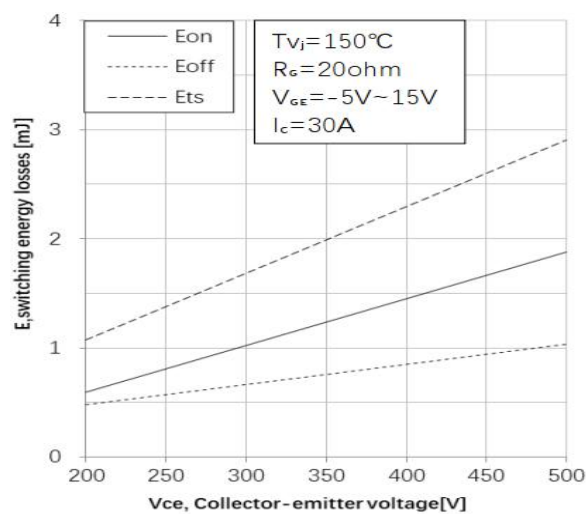
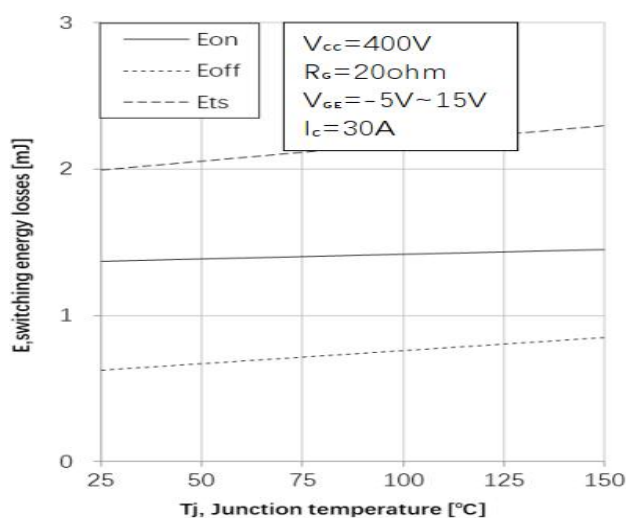
Typical Characteristics



Typical Characteristics



Typical Characteristics



Typical Characteristics

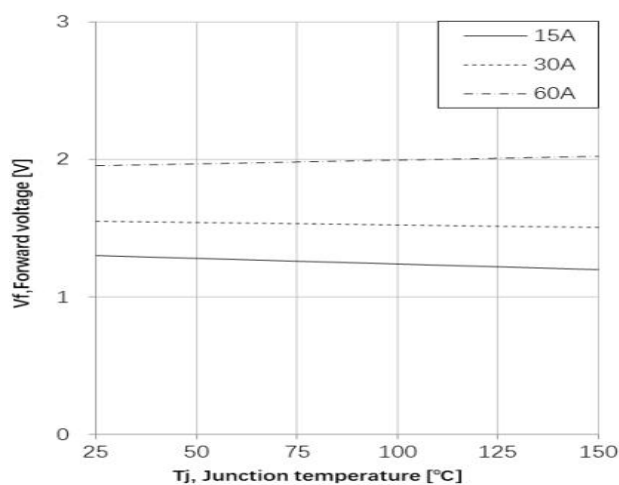
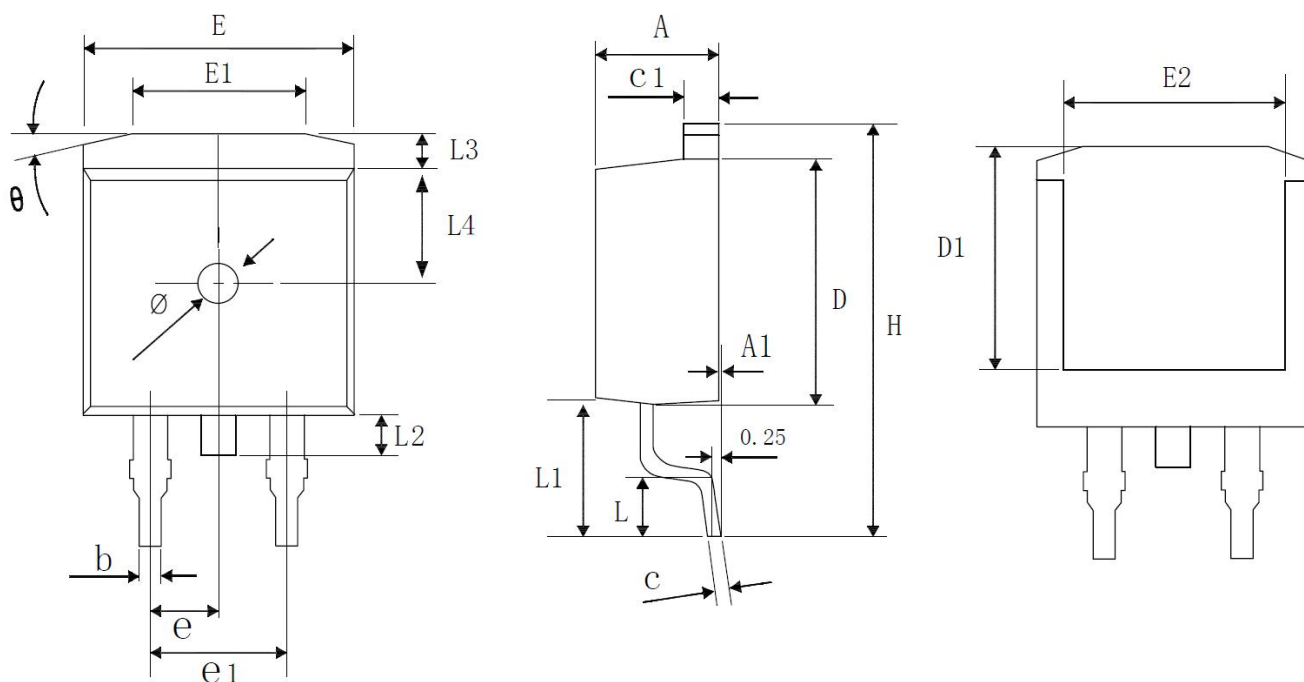


Fig19. Typical diode forward voltage as a function of junction temperature

TO-263AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.300	4.700	0.169	0.185
A1	0.000	0.250	0.000	0.010
b	0.700	0.900	0.028	0.035
c	0.400	0.600	0.016	0.024
c1	1.250	1.350	0.049	0.053
D	9.000	9.200	0.354	0.362
D1	8.000	8.200	0.315	0.323
H	14.900	15.500	0.587	0.610
E	9.800	10.200	0.386	0.402
E1	6.300	6.500	0.248	0.256
E2	7.900	8.100	0.311	0.319
e1	4.930	5.230	0.194	0.206
L	1.850	2.450	0.073	0.096
L1	4.450	4.850	0.175	0.191
L2	1.300	1.700	0.051	0.067
L3	1.150	1.350	0.045	0.053
L4	4.500	4.600	0.177	0.181
φ	1.500 REF.		0.059 REF.	
e	2.540 BSC.		2.54 BSC.	
θ	13° TYP.		13° TYP.	