

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
650V	1.4V@15V	6A

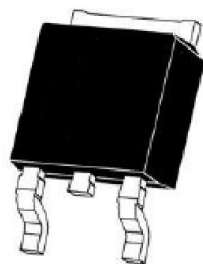
Feature

- Positive temperature coefficient
- Fast Switching
- Low $V_{CE(sat)}$
- Reliable and Rugged

Application

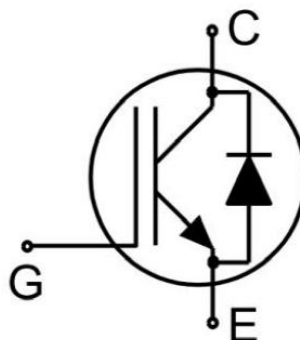
- Motor drives, Home Appliance Applications
- Fan, Pumps, Vacuum Cleaner
- Other Hard Switching Applications

Package



TO-252AB

Circuit diagram



Marking



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

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Gate- Emitter Voltage	V_{GES}	± 30	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	I_{CM}	18	A
Diode Continuous Forward Current ($T_C = 25^{\circ}\text{C}$)	I_F	12	A
Diode Continuous Forward Current ($T_C = 100^{\circ}\text{C}$)	$I_F(100^{\circ}\text{C})$	6	A
Diode Maximum Current	I_{FM}	18	A
Short circuit withstand time	t_{sc}	6	μs
Power Dissipation ($T_C = 25^{\circ}\text{C}$)	P_D	120	W
Thermal Resistance Junction to case for IGBT	$R_{\theta JC}$	1.85	$^{\circ}\text{C}/\text{W}$
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 _{CE} =650V, V _{GE} =0V			10	μA
Gate to Emitter Leakage Current	I _{GES}	V _{CE} =0V, V _{GE} =±20V			±200	nA
Gate Threshold Voltage	V _{GE(th)}	V _{CE} =V _{GE} , I _C =1mA	3.2	4.2	5.2	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =6A, T _{vj} =25°C		1.4	1.75	V
		V _{GE} =15V, I _C =6A, T _{vj} =125°C		1.56		
		V _{GE} =15V, I _C =6A ,T _{vj} =175°C		1.68		
Dynamic characteristics						
Input Capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f =1MHz		389		pF
Output Capacitance	C _{oes}			22		
Reverse Transfer Capacitance	C _{res}			11		
Total Gate Charge	Q _g	V _{CC} =520V, V _{GE} =15V, I _C =6A		25		nC
Gate-emitter charge	Q _{ge}			3		
Gate-collector charge	Q _{gc}			11		
Turn-on delay time	t _{d(on)}	V _{CE} =400V, V _{GE} =15V, I _C =6A R _G =5Ω, Inductive Load		10		nS
Turn-on rise time	t _r			5		
Turn-off delay time	t _{d(off)}			40		
Turn-off fall time	t _f			187		
Turn-on Switching Energy	E _{on}			0.05		mJ
Turn-off Switching Energy	E _{off}			0.20		
Total switching energy	E _{is}			0.25		

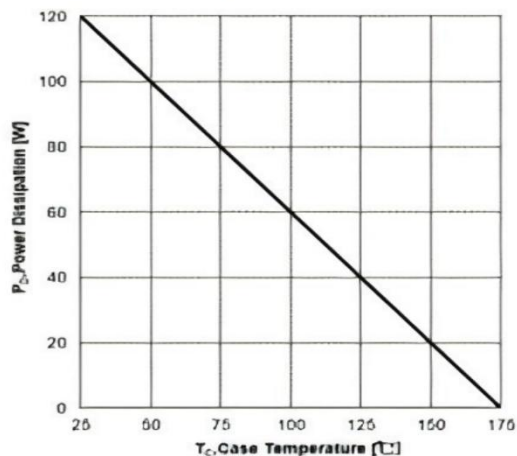
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Turn-on delay time	$t_{d(on)}$	$V_{CE} = 400V, V_{GE} = 15V, I_C = 6A$ $R_G = 5\Omega$, Inductive Load $T_{vj} = 175^\circ C$		12		nS
Turn-on rise time	t_r			15		
Turn-off delay time	$t_{d(off)}$			58		
Turn-off fall time	t_f			203		
Turn-on Switching Energy	E_{on}			0.08		mJ
Turn-off Switching Energy	E_{off}			0.37		
Total switching energy	E_{ts}			0.45		

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

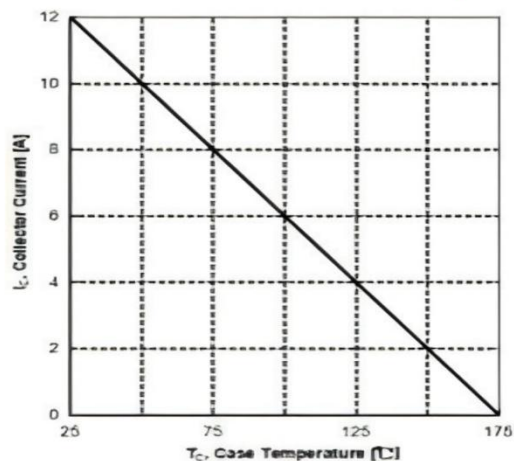
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$V_{GE} = 0V, I_F = 6A$		1.32	1.72	V
		$V_{GE} = 0V, I_F = 6A, T_{vj} = 125^\circ C$		1.25		
		$V_{GE} = 0V, I_F = 6A, T_{vj} = 175^\circ C$		1.2		
Reverse Recovery Current	I_{rrm}	$V_R = 400V, I_F = 6A$ $di_F/dt = -200A/\mu s$		7.2		A
Reverse Recovery Charge	Q_{rr}			0.41		nC
Diode reverse recovery time	T_{rr}			47		ns
Reverse Recovery Current	I_{rrm}	$V_R = 400V, I_F = 6A$ $di_F/dt = -200A/\mu s, T_{vj} = 175^\circ C$		9.2		A
Reverse Recovery Charge	Q_{rr}			0.98		nC
Diode reverse recovery time	T_{rr}			64		ns

Typical Characteristics

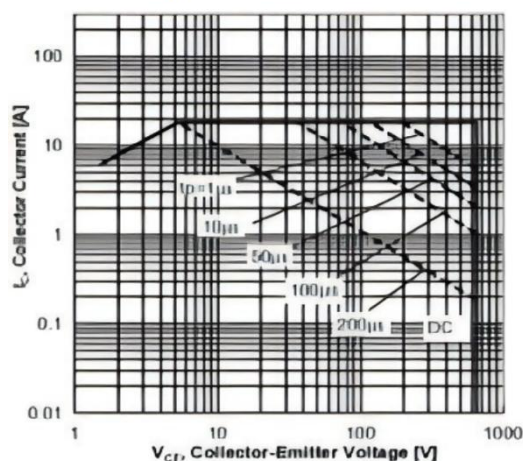
TYP. Power Dissipation



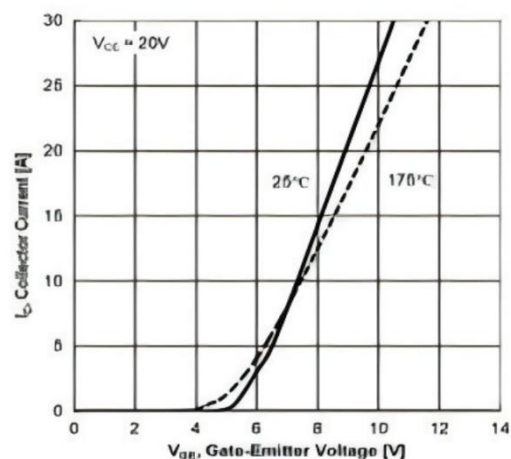
TYP. Collector Current vs. Case Temperature



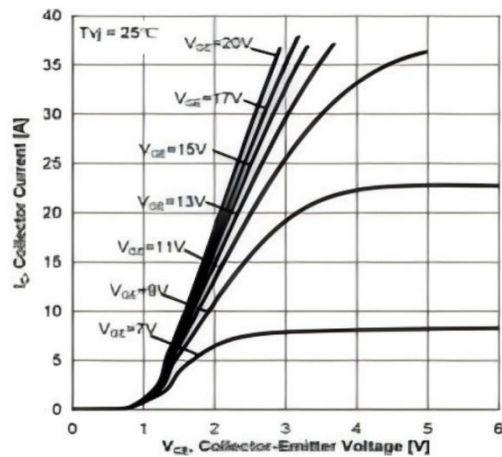
TYP. Safe Operation Area



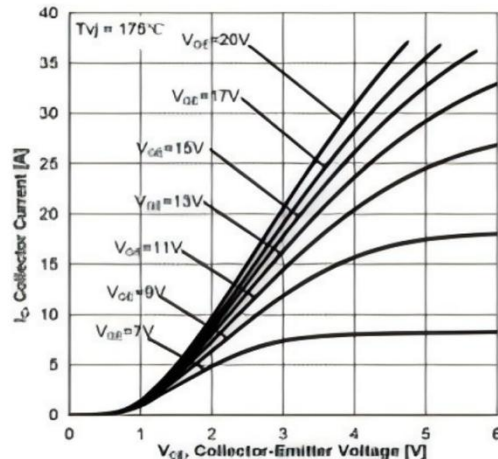
TYP. Transfer Characteristics



TYP. Output Characteristics

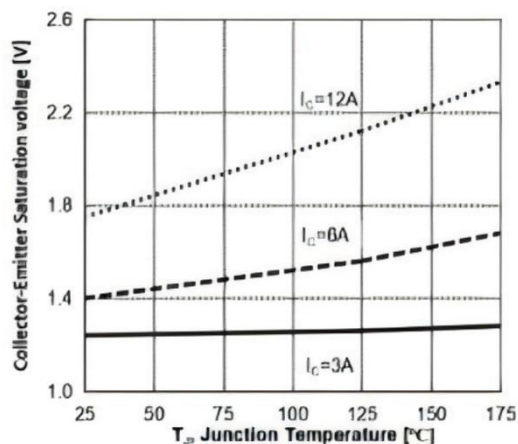


TYP. Output Characteristics

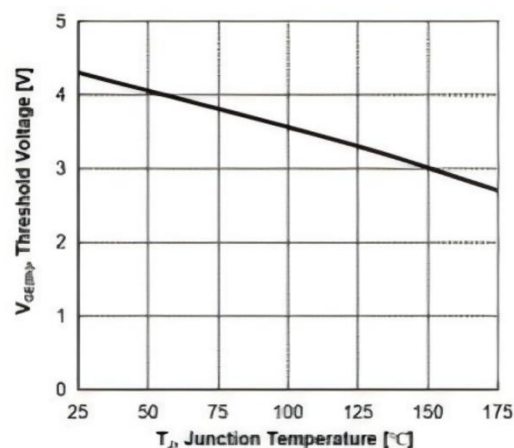


Typical Characteristics

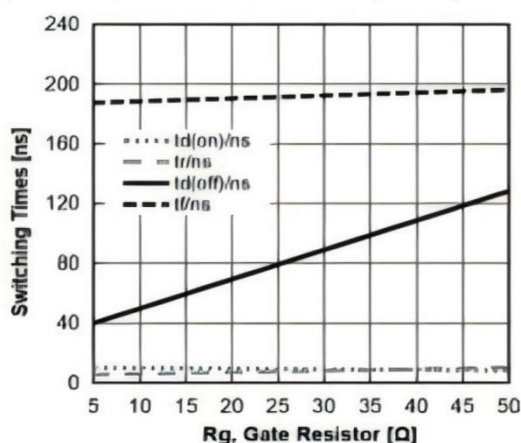
TYP. Collector -Emitter Saturation Voltage vs. Junction Temperature



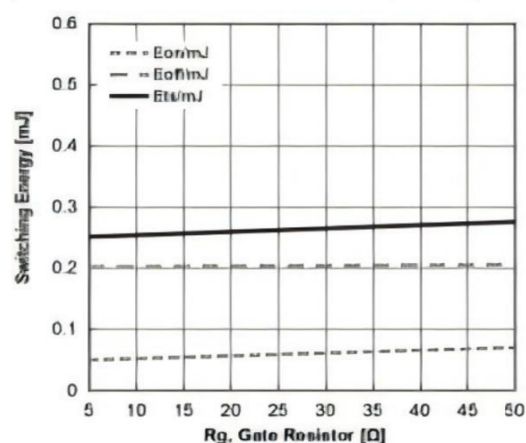
TYP. Gate-Emitter Threshold Voltage vs. Junction Temperature



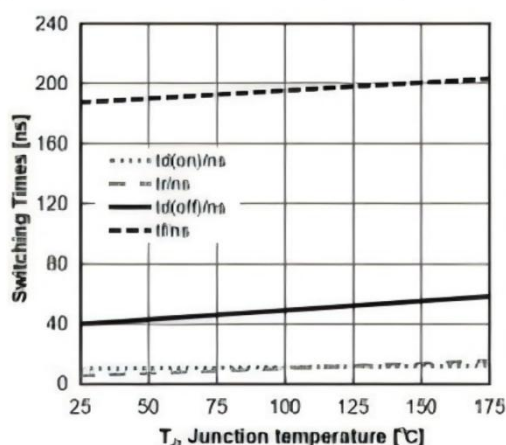
TYP. Switching Times vs. Gate Resistor
(Tj=25°C, Vce=400V, Vge=15V, Ic=6A)



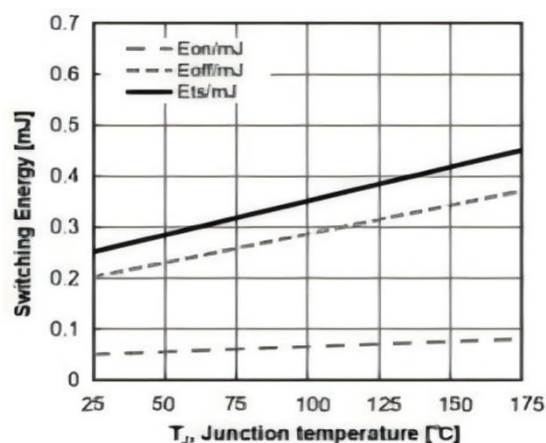
TYP. Switching Energy vs. Gate Resistor
(Tj=25°C, Vce=400V, Vge=15V, Ic=6A)



TYP. Switching Times vs. Junction Temperature
(Rg=5Ω, Vce=400V, Vge=15V, Ic=6A)

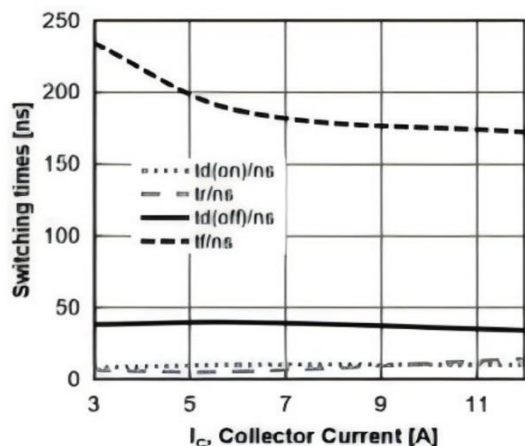


TYP. Switching Energy vs. Junction Temperature
(Rg=5Ω, Vce=400V, Vge=15V, Ic=6A)

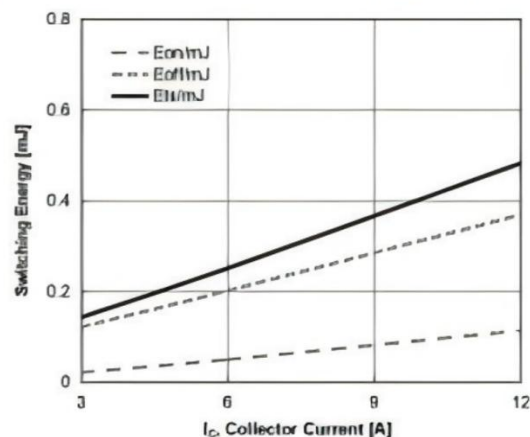


Typical Characteristics

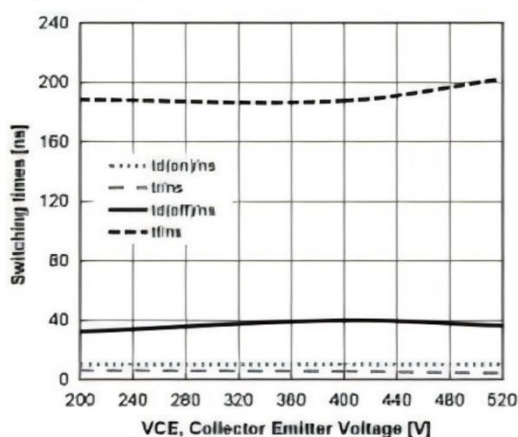
TYP. Switching Times vs. Collector Current
($T_J=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_g=5\Omega$)



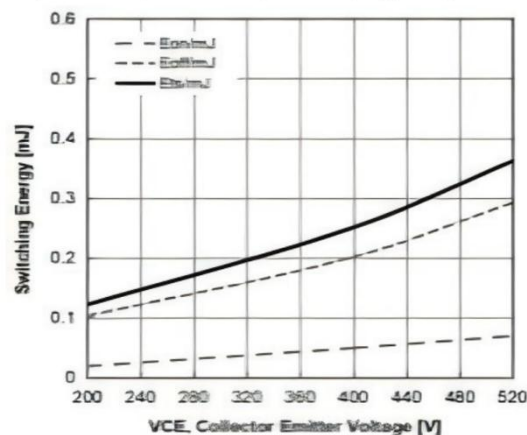
TYP. Switching Energy vs. Collector Current
($T_J=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_g=5\Omega$)



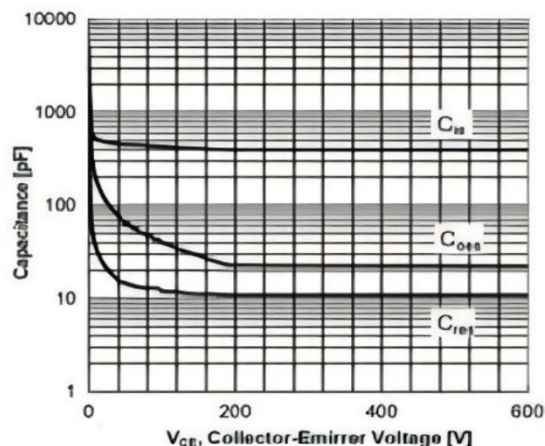
TYP. Switching Times vs. V_{CE}
($T_J=25^{\circ}\text{C}$, $I_C=6\text{A}$, $V_{GE}=15\text{V}$, $R_g=5\Omega$)



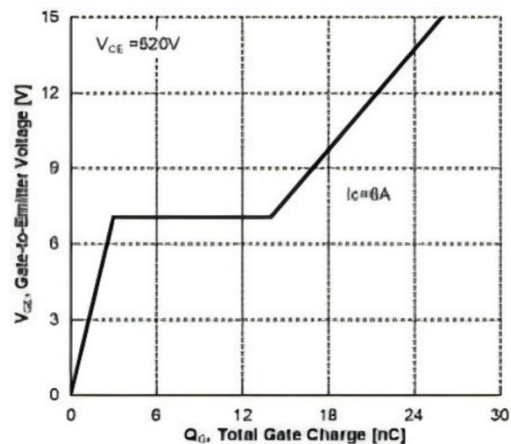
TYP. Switching Energy vs. V_{CE}
($T_J=25^{\circ}\text{C}$, $V_{GE}=15\text{V}$, $I_C=6\text{A}$, $R_g=5\Omega$)



TYP. Capacitance vs. Collector-Emitter Voltage

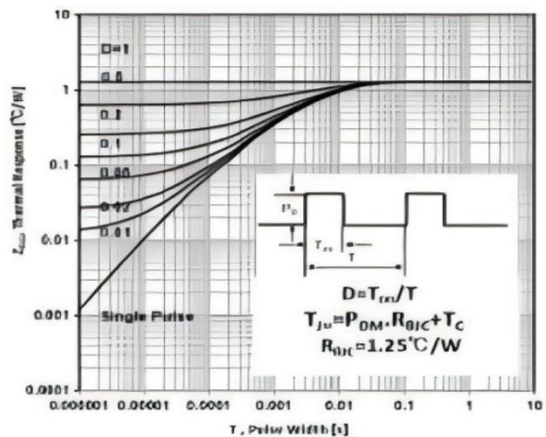


TYP. Gate Charge

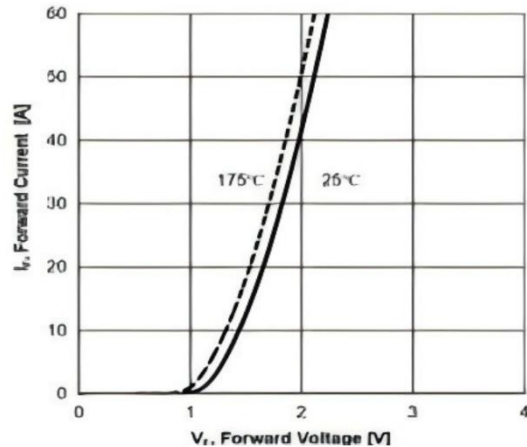


Typical Characteristics

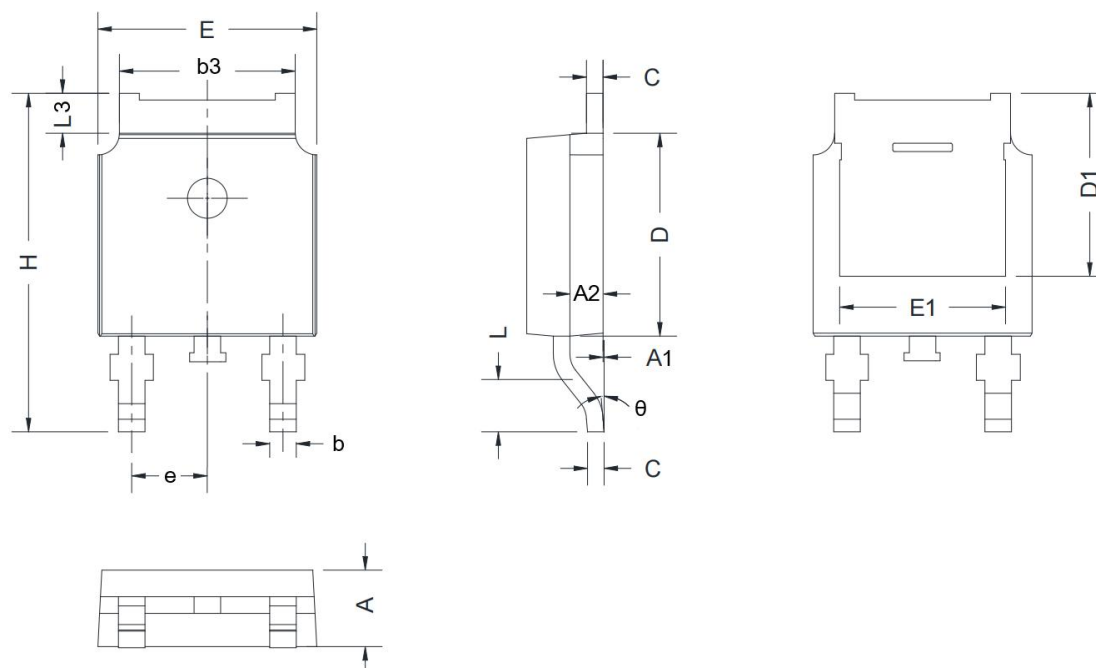
TYP. IGBT Transient Thermal Impedance vs. Pulse Width



TYP. Diode Forward Current vs. Forward Voltage



TO-252AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.120	0.000	0.005
A2	0.970	1.170	0.038	0.046
b	0.680	0.900	0.027	0.035
b3	5.200	5.460	0.205	0.215
C	0.430	0.610	0.017	0.024
D	5.980	6.220	0.235	0.245
D1	5.300 REF.		0.209 REF.	
E	6.400	6.730	0.252	0.265
E1	4.630	-	0.182	-
e	2.286 BSC.		0.090 BSC.	
H	9.400	10.500	0.370	0.413
L	1.380	1.750	0.054	0.069
L3	0.880	1.280	0.035	0.050
θ	0°	8°	0°	8°