

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)TYP}$	$I_C(100^{\circ}C)$
650V	1.5V@15V	10A

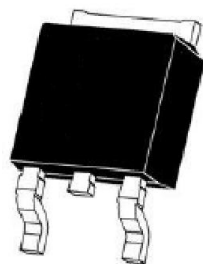
Feature

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

Application

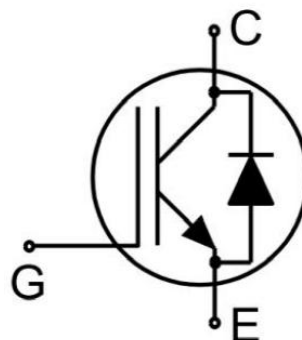
- PFC
- Motor driver
- Boost
- UPS

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	20	A
Collector Current ($T_c = 100^{\circ}\text{C}$)	$I_{c(100^{\circ}\text{C})}$	10	A
Pulsed Collector Current	I_{CM}	30	A
Diode Continuous Forward Current ($T_c = 25^{\circ}\text{C}$)	I_F	20	A
Diode Continuous Forward Current ($T_c = 100^{\circ}\text{C}$)	$I_{F(100^{\circ}\text{C})}$	10	A
Diode Maximum Current	I_{FM}	30	A
Short circuit withstand time	t_{sc}	7	μs
Power Dissipation ($T_c = 25^{\circ}\text{C}$)	P_D	121	W
Thermal Resistance Junction to case for IGBT	$R_{\theta JC}$	1.24	$^{\circ}\text{C/W}$
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	4.1	5.1	6.1	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =10A, T _{vj} =25°C		1.5	1.85	V
		V _{GE} =15V, I _C =10A, T _{vj} =125°C		1.79		
		V _{GE} =15V, I _C =10A ,T _{vj} =175°C		1.92		
Dynamic characteristics						
Input Capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f =1MHz		835		pF
Output Capacitance	C _{oes}			35		
Reverse Transfer Capacitance	C _{res}			22		
Total Gate Charge	Q _g	V _{CC} =520V, V _{GE} =15V, I _C =10A		45		nC
Gate-emitter charge	Q _{ge}			8		
Gate-collector charge	Q _{gc}			22		
Turn-on delay time	t _{d(on)}	V _{CE} =400V, V _{GE} =15V, I _C =10A R _G =5Ω, Inductive Load		10		nS
Turn-on rise time	t _r			8		
Turn-off delay time	t _{d(off)}			36		
Turn-off fall time	t _f			84		
Turn-on Switching Energy	E _{on}			0.08		mJ
Turn-off Switching Energy	E _{off}			0.20		
Total switching energy	E _{ts}			0.28		

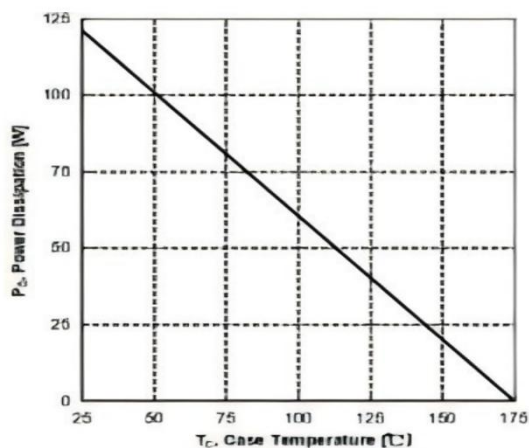
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Turn-on delay time	$t_{d(on)}$	$V_{CE} = 400V, V_{GE} = 15V, I_C = 10A$ $R_G = 5\Omega$, Inductive Load $T_{vj} = 175^\circ C$		11		nS
Turn-on rise time	t_r			12		
Turn-off delay time	$t_{d(off)}$			46		
Turn-off fall time	t_f			77		
Turn-on Switching Energy	E_{on}			0.12		mJ
Turn-off Switching Energy	E_{off}			0.38		
Total switching energy	E_{ts}			0.50		

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

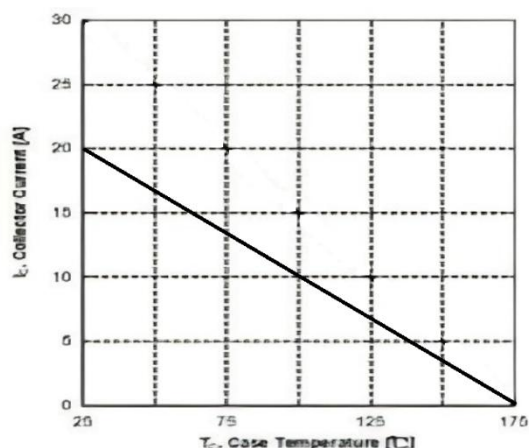
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_F	$V_{GE} = 0V, I_F = 10A$		1.6	2	V
		$V_{GE} = 0V, I_F = 10A, T_{vj} = 125^\circ C$		1.35		
		$V_{GE} = 0V, I_F = 10A, T_{vj} = 175^\circ C$		1.29		
Reverse Recovery Current	I_{rrm}	$V_R = 400V, I_F = 10A$ $di_F/dt = -200A/\mu s$		4.2		A
Reverse Recovery Charge	Q_{rr}			65		nC
Diode reverse recovery time	T_{rr}			38		ns
Reverse Recovery Current	I_{rrm}	$V_R = 400V, I_F = 10A$ $di_F/dt = -200A/\mu s, T_{vj} = 175^\circ C$		6.1		A
Reverse Recovery Charge	Q_{rr}			84		nC
Diode reverse recovery time	T_{rr}			57		ns

Typical Characteristics

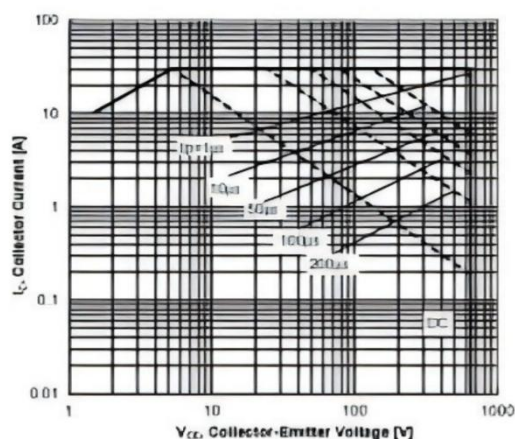
TYP. Power Dissipation



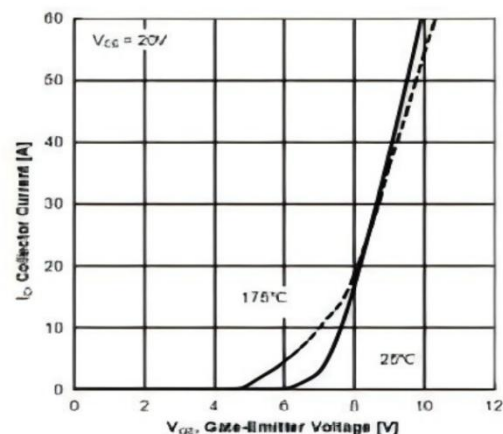
TYP. Collector Current vs. Case Temperature



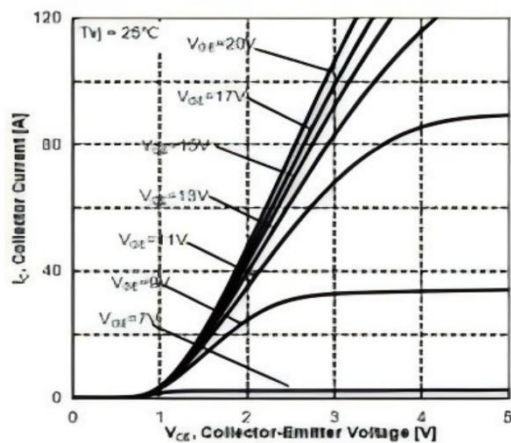
TYP. Safe Operation Area



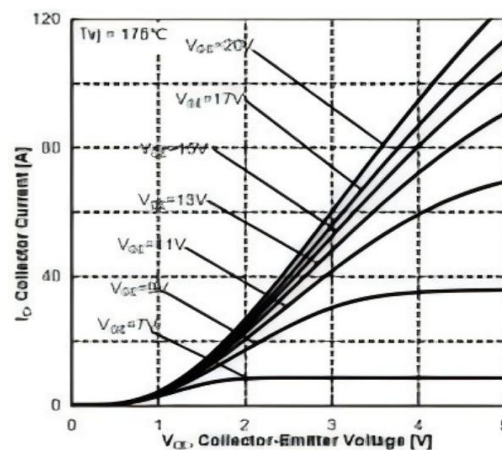
TYP. Transfer Characteristics



TYP. Output Characteristics

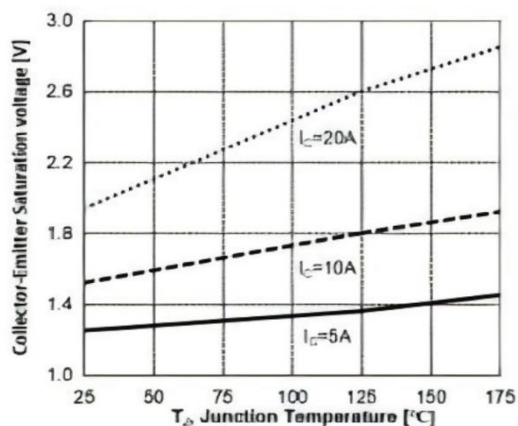


TYP. Output Characteristics

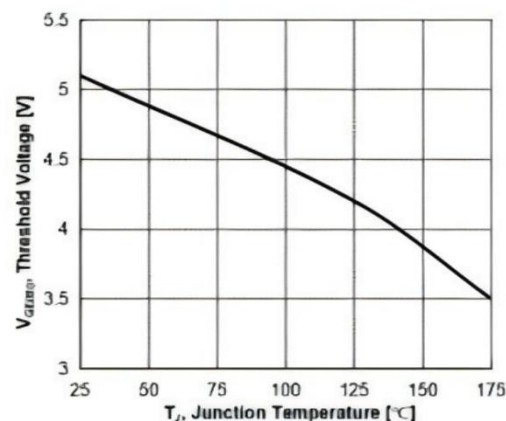


Typical Characteristics

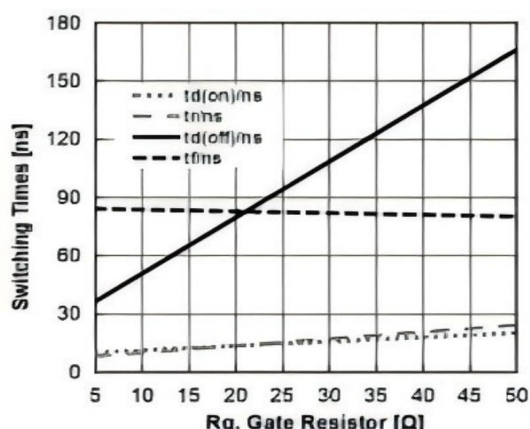
TYP. Collector -Emitter Saturation Voltage vs. Junction Temperature



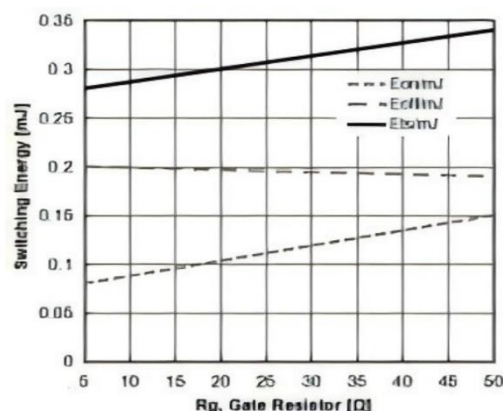
TYP. Gate-Emitter Threshold Voltage vs. Junction Temperature



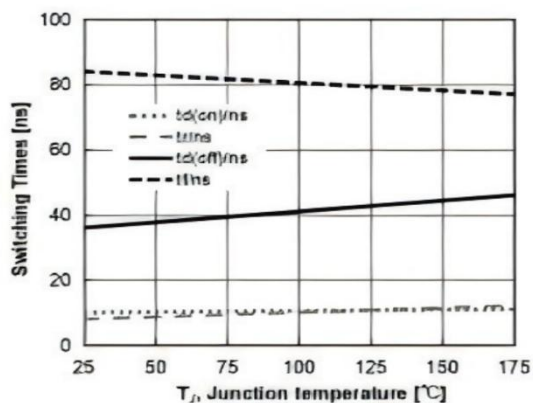
TYP. Switching Times vs. Gate Resistor
($T_J=25^{\circ}C$, $V_{CE}=400V$, $V_{GE}=15V$, $I_C=10A$)



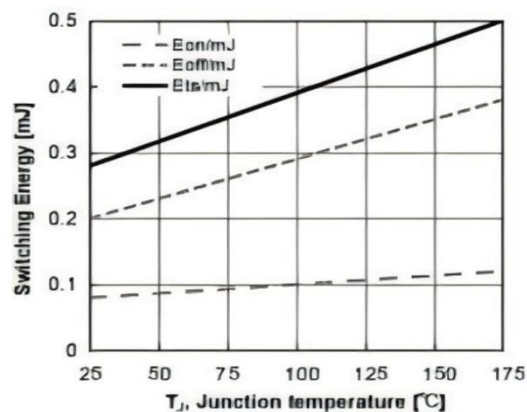
TYP. Switching Energy vs. Gate Resistor
($T_J=25^{\circ}C$, $V_{CE}=400V$, $V_{GE}=15V$, $I_C=10A$)



TYP. Switching Times vs. Junction Temperature
($R_g=5\Omega$, $V_{CE}=400V$, $V_{GE}=15V$, $I_C=10A$)

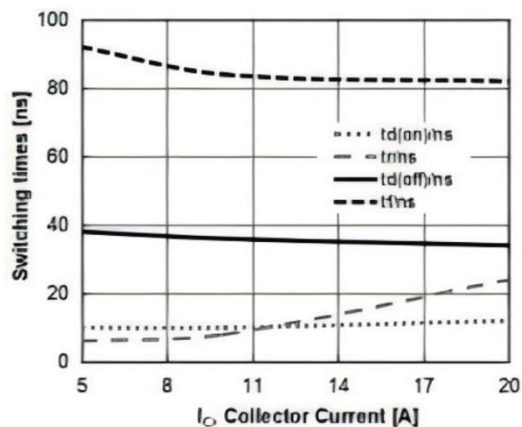


TYP. Switching Energy vs. Junction Temperature
($R_g=5\Omega$, $V_{CE}=400V$, $V_{GE}=15V$, $I_C=10A$)

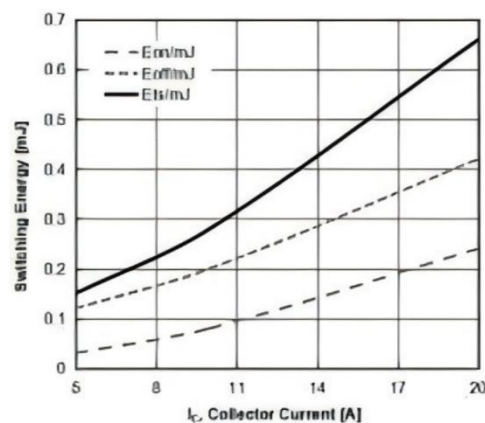


Typical Characteristics

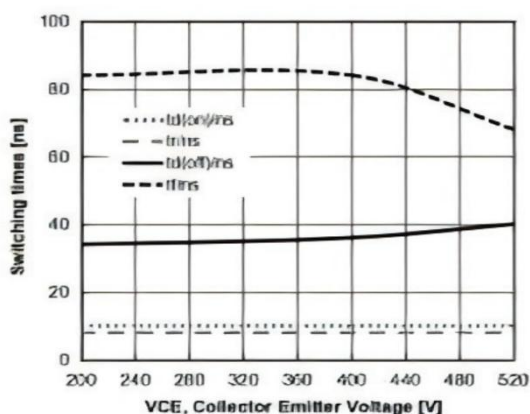
TYP. Switching Times vs. Collector Current
($T_J=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_g=5\Omega$)



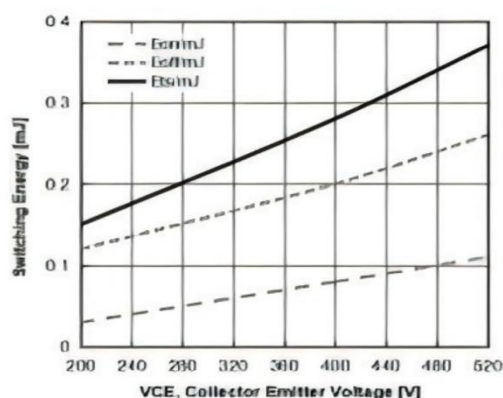
TYP. Switching Energy vs. Collector Current
($T_J=25^{\circ}\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_g=5\Omega$)



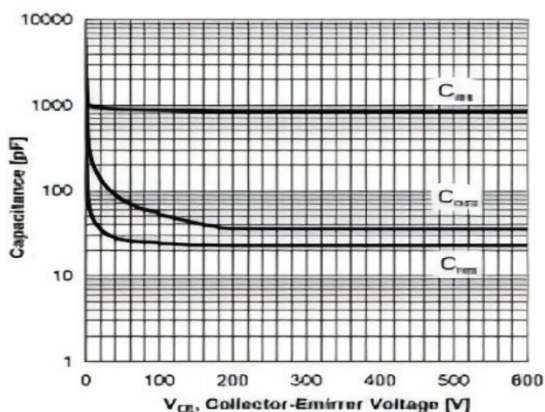
TYP. Switching Times vs. V_{CE}
($T_J=25^{\circ}\text{C}$, $I_C=10\text{A}$, $V_{GE}=15\text{V}$, $R_g=5\Omega$)



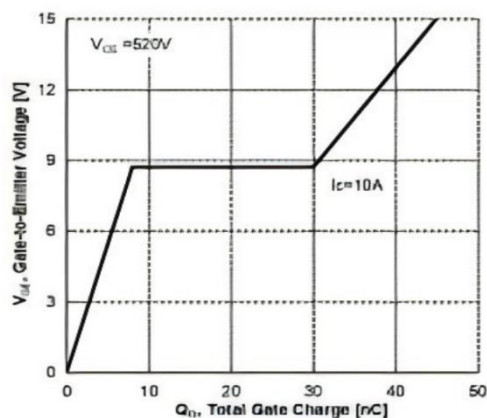
TYP. Switching Energy vs. V_{CE}
($T_J=25^{\circ}\text{C}$, $I_C=10\text{A}$, $V_{GE}=15\text{V}$, $R_g=5\Omega$)



TYP. Capacitance vs. Collector-Emitter Voltage

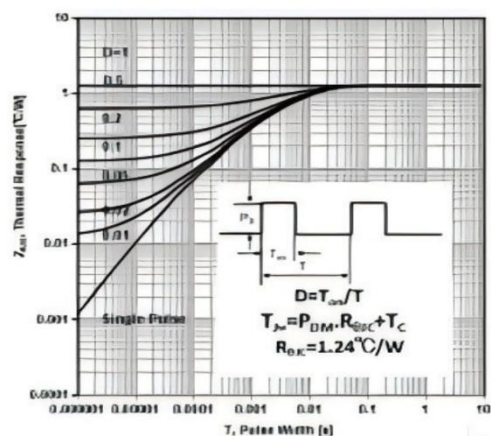


TYP. Gate Charge

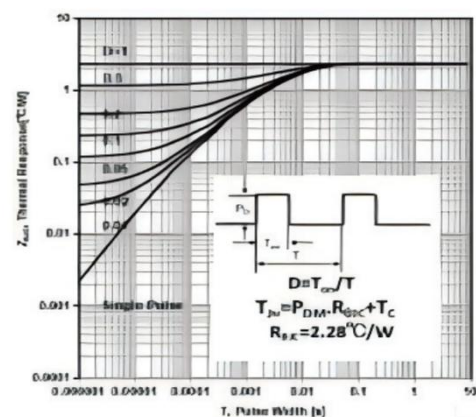


Typical Characteristics

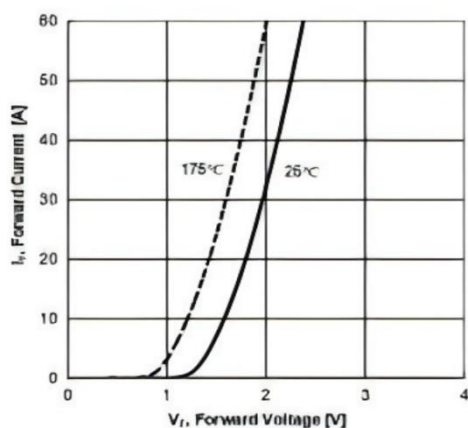
TYP. IGBT Transient Thermal Impedance vs. Pulse Width



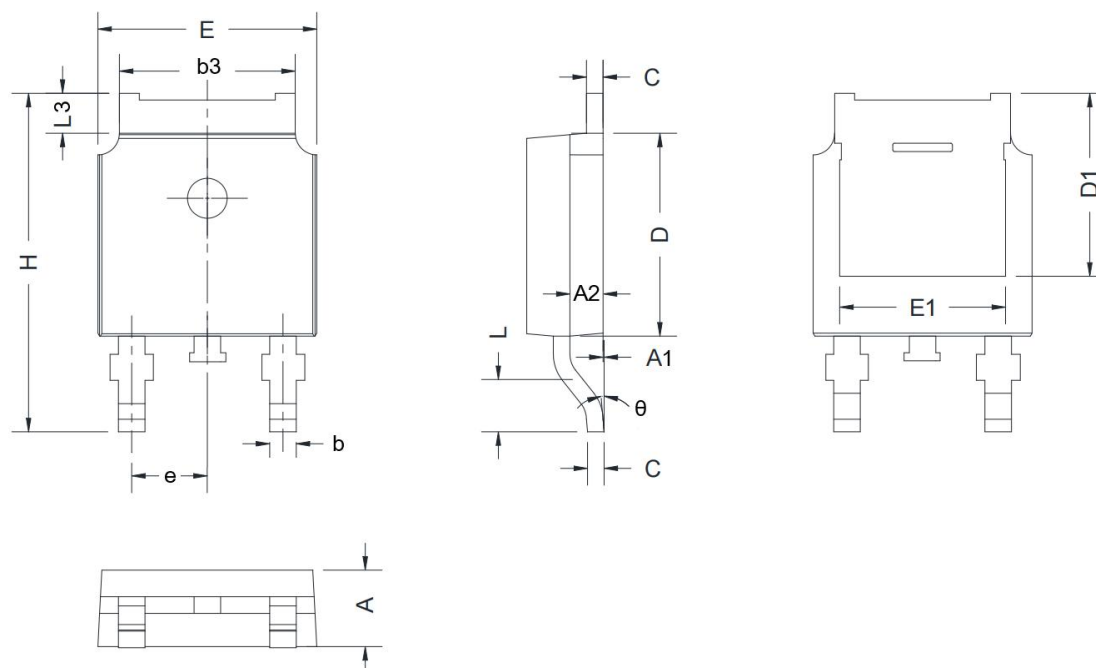
TYP. Diode Transient Thermal Impedance vs. Pulse Width



TYP. Typical 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°