

Product Summary

$V_{(BR)CES}$	$V_{CE(SAT)MAX}$	$I_C(100^{\circ}C)$
650V	1.75V@15V	30A

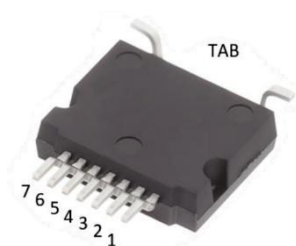
Feature

- Low switching losses
- Positive temperature coefficient
- High ruggedness, temperature stable

Application

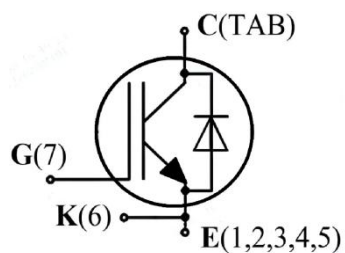
- AC and DC servo drive amplifier
- Uninterruptible power supply
- Motion/servo control

Package



T2PAK

Circuit diagram



Marking



Absolute maximum ratings (Tc=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Collector Current	I_C	60	A
Collector Current($T_C = 100^\circ\text{C}$)	$I_C(100^\circ\text{C})$	30	A
Diode Continuous Forward Current	I_F	60	A
Diode Continuous Forward Current($T_C = 100^\circ\text{C}$)	$I_F(100^\circ\text{C})$	30	A
Continuous Gate- Emitter Voltage	V_{GES}	± 20	V
Transient Gate-Emitter Voltage ($t_p \leq 10\mu\text{s}, D < 0.010$)	V_{GES}	± 30	V
Turn off safe operating area $V_{CE} \leq 650\text{V}, T_J \leq 150^\circ\text{C}$	-	90	A
Pulsed Collector Current, $V_{GE} = 15\text{V}, t_p$ limited by T_{Jmax}	I_{CM}	90	A
Diode Pulsed Current, t_p limited by T_{Jmax}	I_{Fplus}	90	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	187	W
Thermal Resistance, Junction to case for IGBT	$R_{\theta JC}$	0.8	$^\circ\text{C/W}$
Thermal Resistance, Junction to case for Diode	$R_{\theta JC}$	1.05	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	40	$^\circ\text{C/W}$
Junction Temperature Range	T_J	$-40 \sim +175$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^\circ\text{C}$
Soldering Temperature, wave soldering 1.6mm(0.063in.) from case for 10s	-	260	$^\circ\text{C}$

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	$V_{(BR)CES}$	$V_{GE} = 0\text{V}, I_C = 250\mu\text{A}$	650			V
Collector-Emitter Leakage Current	I_{CES}	$V_{GE} = 0\text{V}, V_{CE} = 650\text{V}$			0.25	mA
Collector-Emitter Leakage Current	I_{CES}	$V_{GE} = 0\text{V}, V_{CE} = 650\text{V}, T_J = 150^\circ\text{C}$			4.00	
Gate to Emitter Leakage Current	I_{GES}	$V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}$			100	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{V}, I_C = 30\text{A}$		1.45	1.75	V
		$V_{GE} = 15\text{V}, I_C = 30\text{A}, T_J = 125^\circ\text{C}$		1.65		
		$V_{GE} = 15\text{V}, I_C = 30\text{A}, T_J = 150^\circ\text{C}$		1.75		
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 1\text{mA}$	4.5	5.1	5.8	V
Dynamic characteristics						
Input Capacitance	C_{ies}	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		2030		pF
Reverse Transfer Capacitance	C_{res}			20		
Total Gate Charge	Q_g	$V_{CC} = 400\text{V}, I_C = 30\text{A}, V_{GE} = 15\text{V}$		0.14		μC
Short Circuit Collector Current	I_{SC}	$V_{GE} = 15\text{V}, t_{sc} \leq 5\mu\text{s}, V_{CC} = 400\text{V}, T_J \leq 150^\circ\text{C}$		185		A
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 400\text{V}, I_C = 30\text{A}, V_{GE} = -5\text{V} \sim 15\text{V}, R_g = 20\Omega$		53		nS
Turn-on rise time	t_r			58		
Turn-off delay time	$t_{d(off)}$			139		
Turn-off fall time	t_f			115		
Turn-On Switching Loss	E_{on}			0.91		mJ
Turn-Off Switching Loss	E_{off}			0.72		

Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, I_C=30A,$ $V_{GE}=-5V\sim 15V, R_g=20\Omega,$ $T_j=125^\circ C$		49		nS
Turn-on rise time	t_r			59		
Turn-off delay time	$t_{d(off)}$			154		
Turn-off fall time	t_f			163		
Turn-On Switching Loss	E_{on}			0.99		mJ
Turn-Off Switching Loss	E_{off}			0.93		
Turn-on delay time	$t_{d(on)}$	$V_{CC}=400V, I_C=30A,$ $V_{GE}=-5V\sim 15V, R_g=20\Omega,$ $T_j=150^\circ C$		47		nS
Turn-on rise time	t_r			60		
Turn-off delay time	$t_{d(off)}$			161		
Turn-off fall time	t_f			183		
Turn-On Switching Loss	E_{on}			1.03		mJ
Turn-Off Switching Loss	E_{off}			1.02		

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	$I_F=30A$		1.50	2.00	V
		$I_F=30A, T_j=125^\circ C$		1.40		
		$I_F=30A, T_j=150^\circ C$		1.35		
Diode Peak Reverse Recovery Current	I_{rr}	$I_F=30A, V_R=400V,$ $di/dt=-450A/\mu s$		14		A
Reverse Recovery Charge	Q_{rr}			0.58		uC
Reverse Recovery Time	T_{rr}			74		nS
Reverse Recovery Energy	E_{rec}			0.09		mJ
Diode Peak Reverse Recovery Current	I_{rr}	$I_F=30A, V_R=400V,$ $di/dt=-450A/\mu s, T_j=125^\circ C$		19		A
Reverse Recovery Charge	Q_{rr}			1.16		uC
Reverse Recovery Time	T_{rr}			106		nS
Reverse Recovery Energy	E_{rec}			0.22		mJ
Diode Peak Reverse Recovery Current	I_{rr}	$I_F=30A, V_R=400V,$ $di/dt=-450A/\mu s, T_j=150^\circ C$		21		A
Reverse Recovery Charge	Q_{rr}			1.41		uC
Reverse Recovery Time	T_{rr}			120		nS
Reverse Recovery Energy	E_{rec}			0.27		mJ

Typical Electrical and Thermal Characteristics

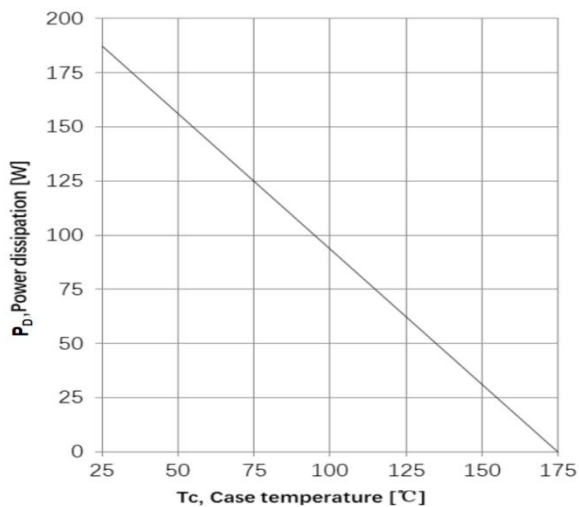


Fig1. Power dissipation as a function of case temperature ($T_j < 175^\circ\text{C}$)

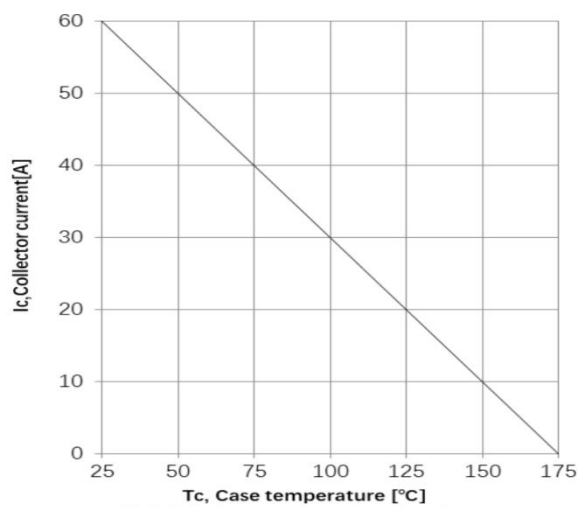


Fig2. Collector current as a function of case temperature ($V_{ge} > 15\text{V}$, $T_j < 175^\circ\text{C}$)

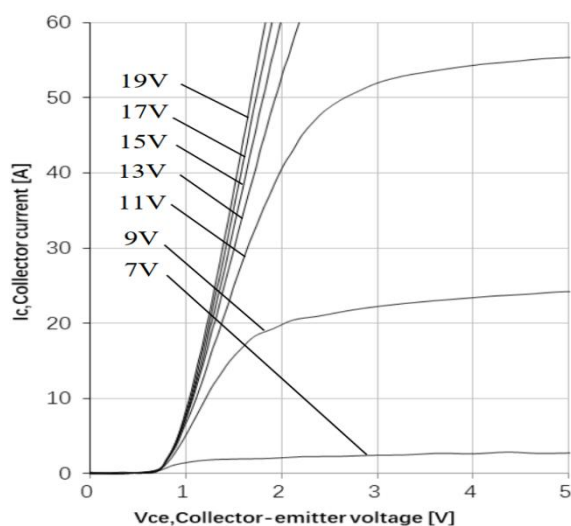


Fig3. Typical output characteristic ($T_j = 25^\circ\text{C}$)

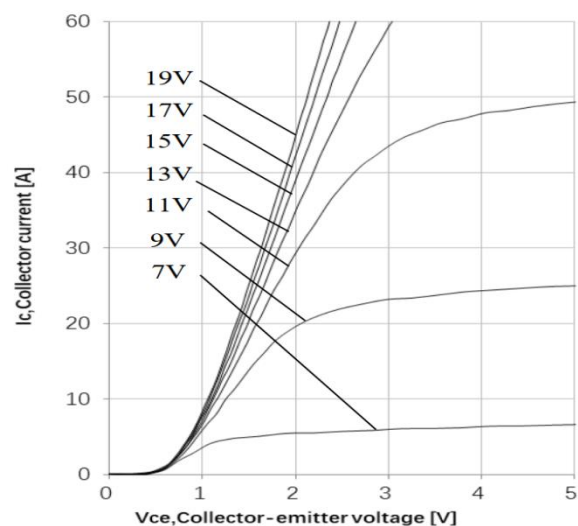


Fig4. Typical output characteristic ($T_j = 150^\circ\text{C}$)

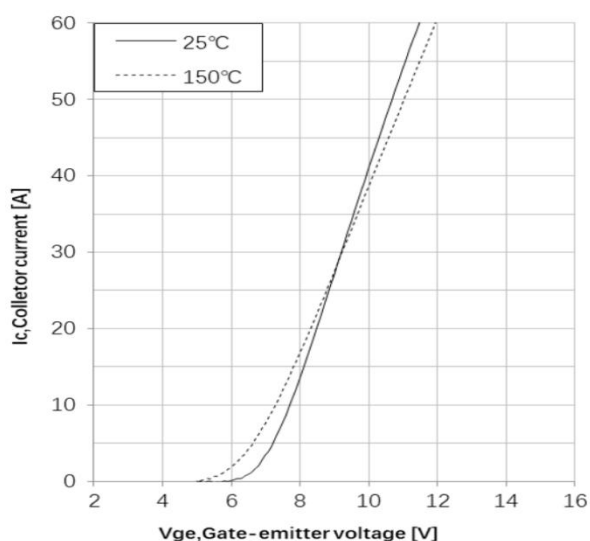


Fig5. Typical transfer characteristic ($V_{ce} = 20\text{V}$)

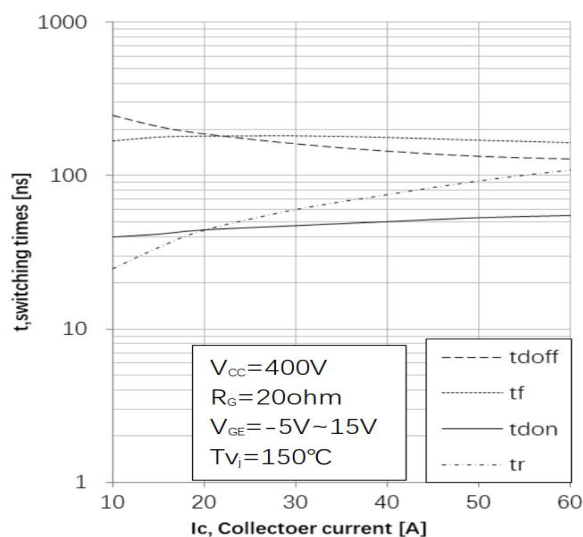


Fig6. Typical switching times as a function of collector current

Typical Electrical and Thermal Characteristics

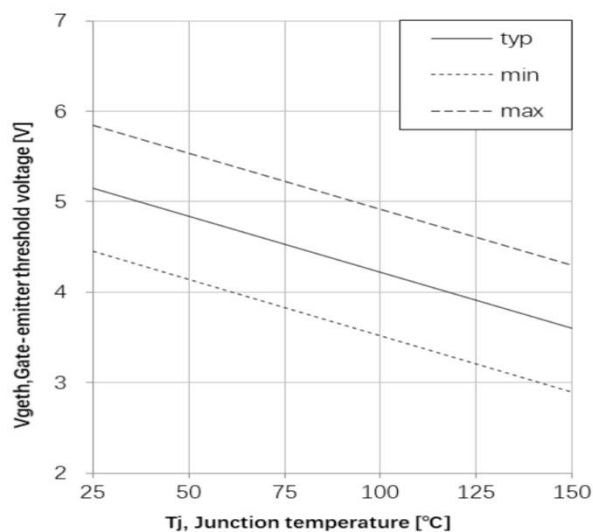


Fig7. Gate-emitter threshold voltage as a function of junction temperature ($I_c=1mA$)

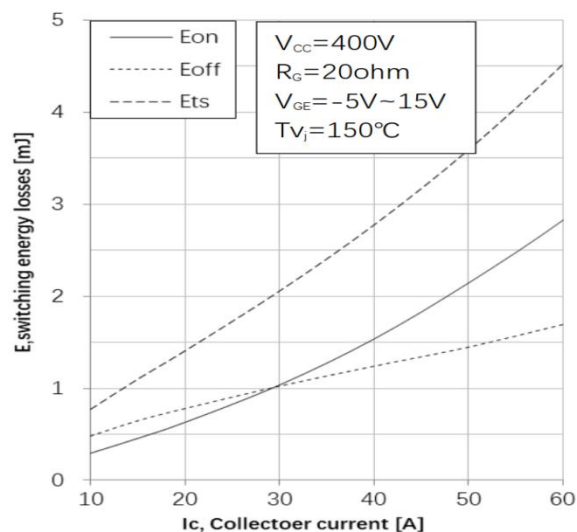


Fig8. Typical switching energy losses as a function of collector current

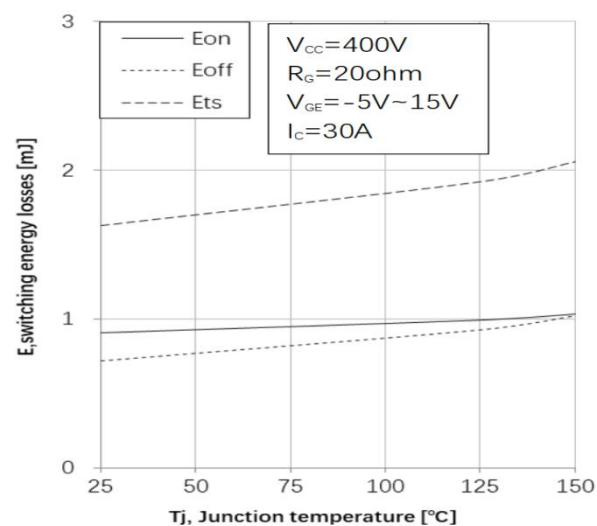


Fig9. Typical switching energy losses as a function of junction temperature

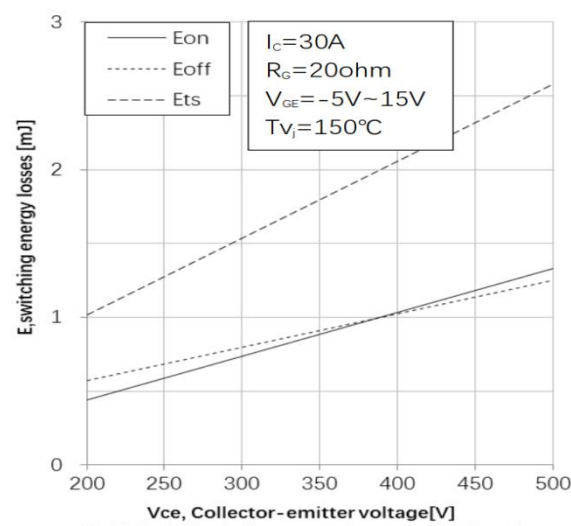


Fig10. Typical switching energy losses as a function of collector-emitter voltage

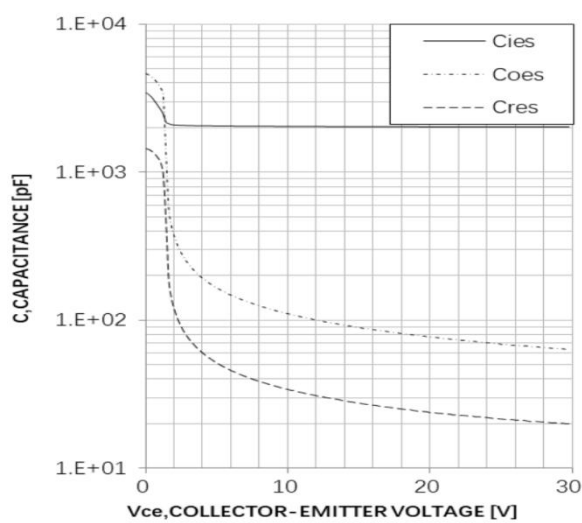


Fig11. Typical capacitance as a function of collector-emitter voltage

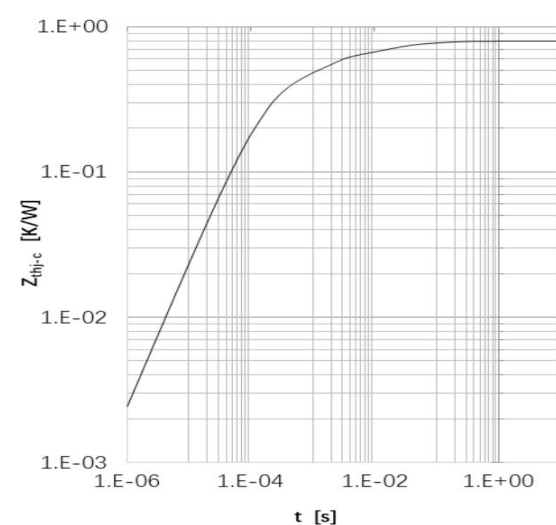


Fig12. IGBT Transient Thermal Impedance

Typical Electrical and Thermal Characteristics

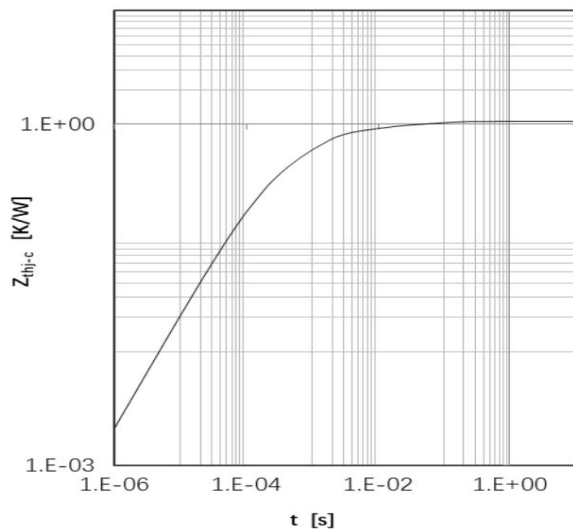


Fig 13. Diode Transient Thermal Impedance

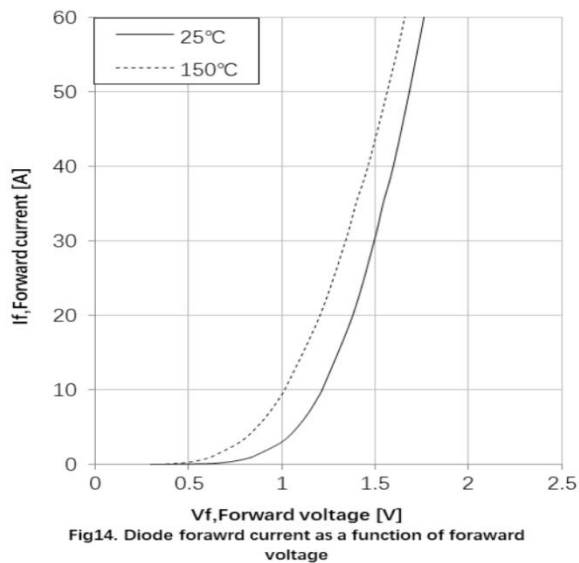
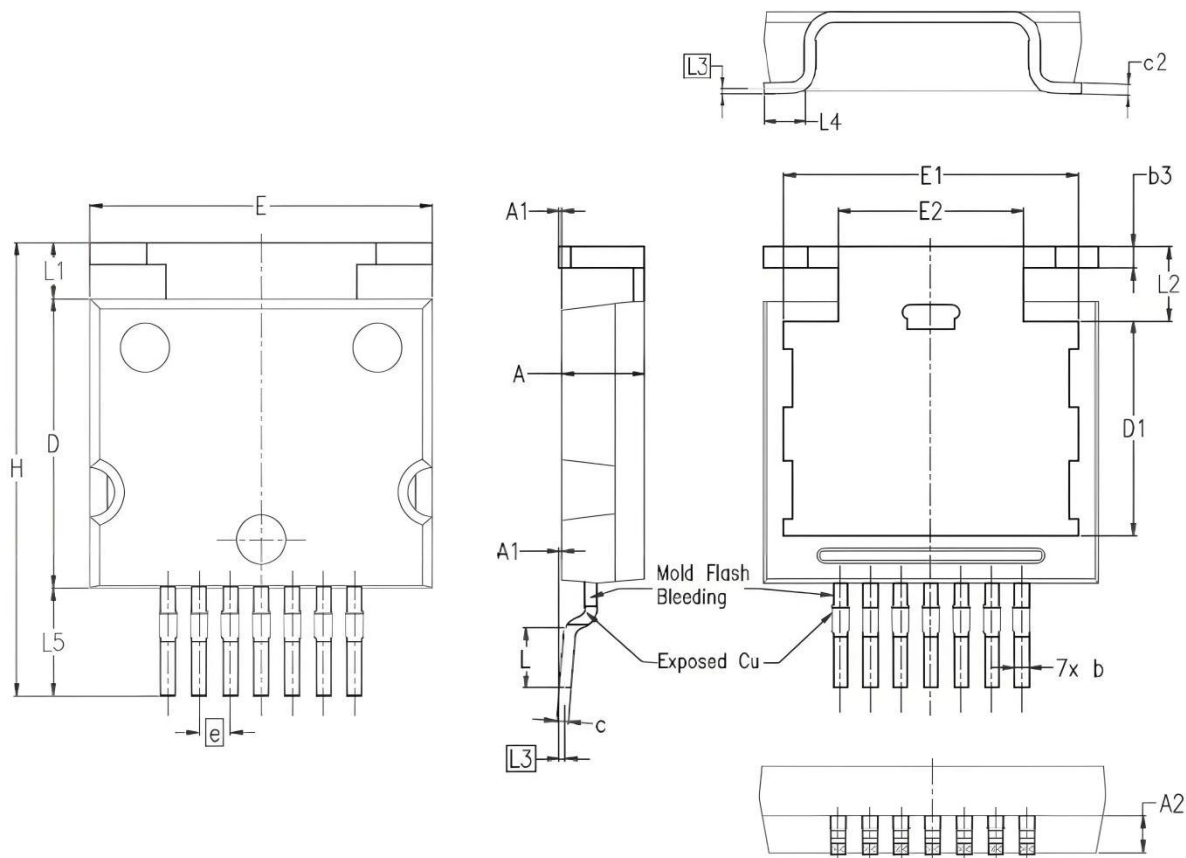


Fig14. Diode forward current as a function of forward voltage

T2PAK Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	3.30	3.70	0.13	0.15
A1	-	0.25	-	0.01
A2	1.30	1.70	0.05	0.07
b	0.50	0.70	0.02	0.03
b3	0.80	1.00	0.03	0.04
c	0.40	0.60	0.02	0.02
c2	0.40	0.60	0.02	0.02
D	11.70	11.90	0.46	0.47
D1	8.80	9.20	0.35	0.36
E	13.60	14.40	0.54	0.57
E1	12.00	12.80	0.47	0.50
E2	7.60	8.00	0.30	0.31
e	1.27 BSC.		0.05 BSC.	
H	17.70	19.30	0.70	0.76
L	1.90	3.10	0.07	0.12
L1	2.30 REF.		0.09 REF.	
L2	2.85	3.35	0.11	0.13
L3	0.25 BSC.		0.01 BSC.	
L4	1.25	2.45	0.05	0.10
L5	4.40 REF.		0.17 REF.	