

## ZXT1M322

### MPPS™ Miniature Package Power Solutions 12V PNP LOW SATURATION SWITCHING TRANSISTOR

#### SUMMARY

$V_{CE0} = -12V$ ;  $R_{SAT} = 60m\Omega$ ;  $I_C = -4A$

#### DESCRIPTION

Packaged in the innovative 2mm x 2mm MLP (Micro Leaded Package) outline, this new 4<sup>th</sup> generation low saturation transistor offers extremely low on state losses making it ideal for use in DC-DC circuits and various driving and power management functions.

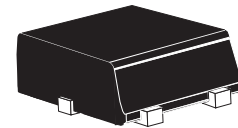
Additionally users will also gain several other **key benefits**:

**Performance capability equivalent to much larger packages**

**Improved circuit efficiency & power levels**

**PCB area and device placement savings**

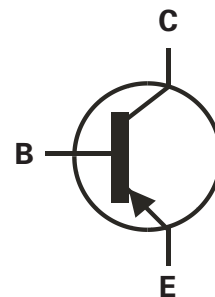
**Lower package height (nom 0.9mm)**



2mm x 2mm MLP  
(single die)

#### FEATURES

- Low Equivalent On Resistance
- Extremely Low Saturation Voltage (-140mV@ -1A)
- $h_{FE}$  specified up to -10A
- $I_C = -4A$  Continuous Collector Current
- 2mm x 2mm MLP



#### APPLICATIONS

- DC - DC Converters (FET Driving)
- Charging Circuits
- Power switches
- Motor control

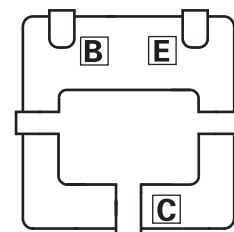
#### ORDERING INFORMATION

DEVICE	REEL	TAPE WIDTH	QUANTITY PER REEL
ZXT1M322TA	7''	8mm	3000
ZXT1M322TC	13''	8mm	10000

#### DEVICE MARKING

S1

#### PINOUT



2mm x 2mm Single MLP  
underside view

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### ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	LIMIT	UNIT
Collector-Base Voltage	$V_{CBO}$	-20	V
Collector-Emitter Voltage	$V_{CEO}$	-12	V
Emitter-Base Voltage	$V_{EBO}$	-7.5	V
Peak Pulse Current	$I_{CM}$	-12	A
Continuous Collector Current (a)	$I_C$	-4	A
Base Current	$I_B$	-1000	mA
Power Dissipation at $T_A=25^\circ\text{C}$ (a) Linear Derating Factor	$P_D$	1.5 12	W mW/ $^\circ\text{C}$
Power Dissipation at $T_A=25^\circ\text{C}$ (b) Linear Derating Factor	$P_D$	2.45 19.6	W mW/ $^\circ\text{C}$
Power Dissipation at $T_A=25^\circ\text{C}$ (d) Linear Derating Factor	$P_D$	1 8	W mW/ $^\circ\text{C}$
Power Dissipation at $T_A=25^\circ\text{C}$ (e) Linear Derating Factor	$P_D$	3 24	W mW/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_j; T_{stg}$	-55 to +150	$^\circ\text{C}$

### THERMAL RESISTANCE

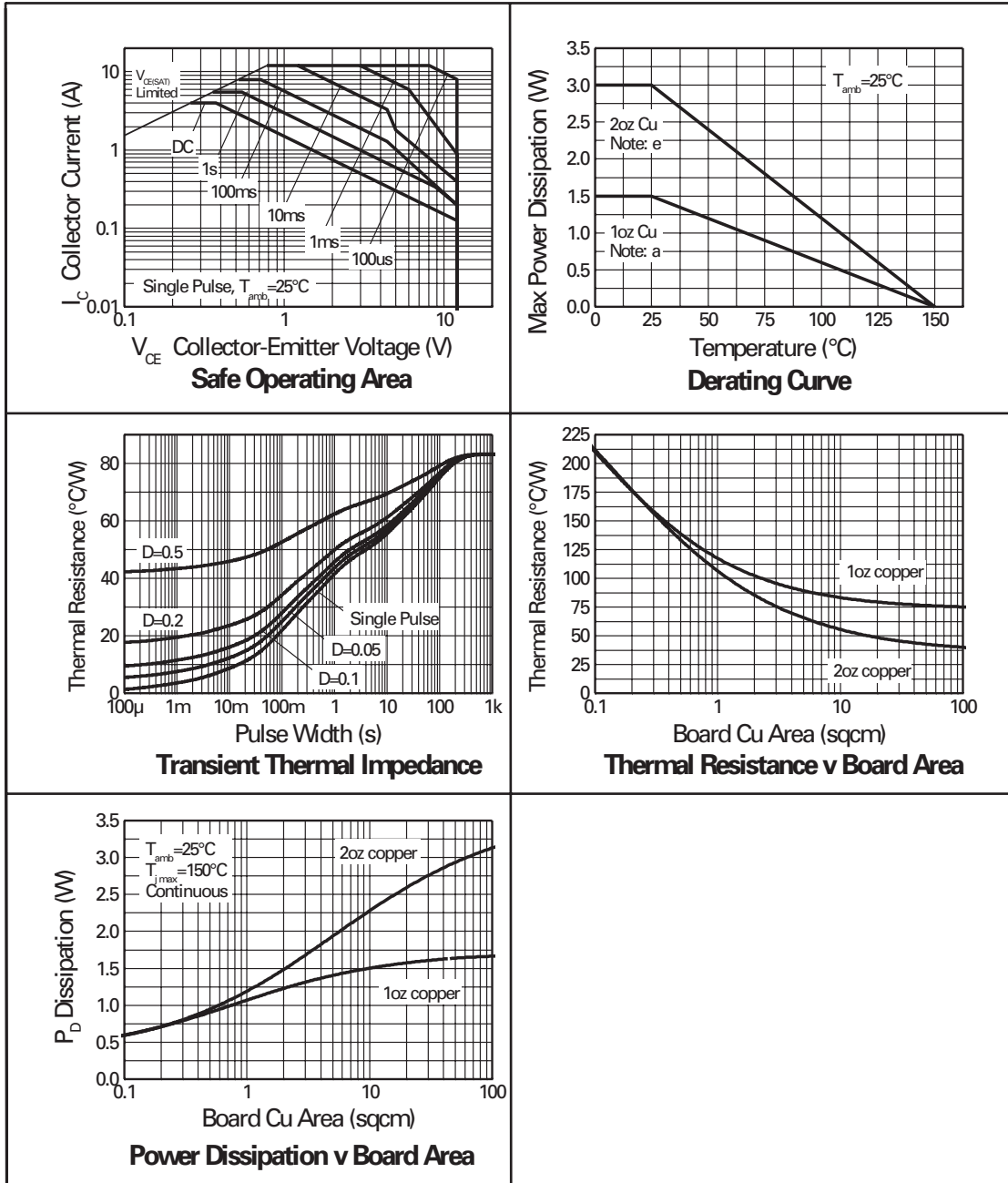
PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a)	$R_{\theta JA}$	83	$^\circ\text{C}/\text{W}$
Junction to Ambient (b)	$R_{\theta JA}$	51	$^\circ\text{C}/\text{W}$
Junction to Ambient (d)	$R_{\theta JA}$	125	$^\circ\text{C}/\text{W}$
Junction to Ambient (e)	$R_{\theta JA}$	42	$^\circ\text{C}/\text{W}$

#### NOTES

- (a) For a single device surface mounted on 10sq cm1oz copper on FR4 PCB in still air conditions **with all exposed pads attached**.
- (b) For a single device surface mounted on 10sq cm1oz copper on FR4 PCB in still air conditions measured at  $t \leq 5$  secs **with all exposed pads attached**.
- (c) Repetitive rating - pulse width limited by max junction temperature. refer to Transient Thermal Impedance graph.
- (d) For a single device surface mounted on 10sq cm1oz copper on FR4 PCB in still air conditions **with minimal lead connections only**.
- (e) For a single device surface mounted on 65sq cm2oz copper on FR4 PCB in still air conditions **with all exposed pads attached**.
- (f) The minimum copper dimensions required for mounting are no smaller than the exposed metal pads on the base of the device, as shown in the package dimensions data. The thermal resistance for a device mounted on 1.5mm thick FR4 board using minimum copper of 1oz weight is  $R_{th}=300^\circ\text{C}/\text{W}$  giving a power rating of  $P_{tot}=420\text{mW}$ .

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CHARACTERISTICS



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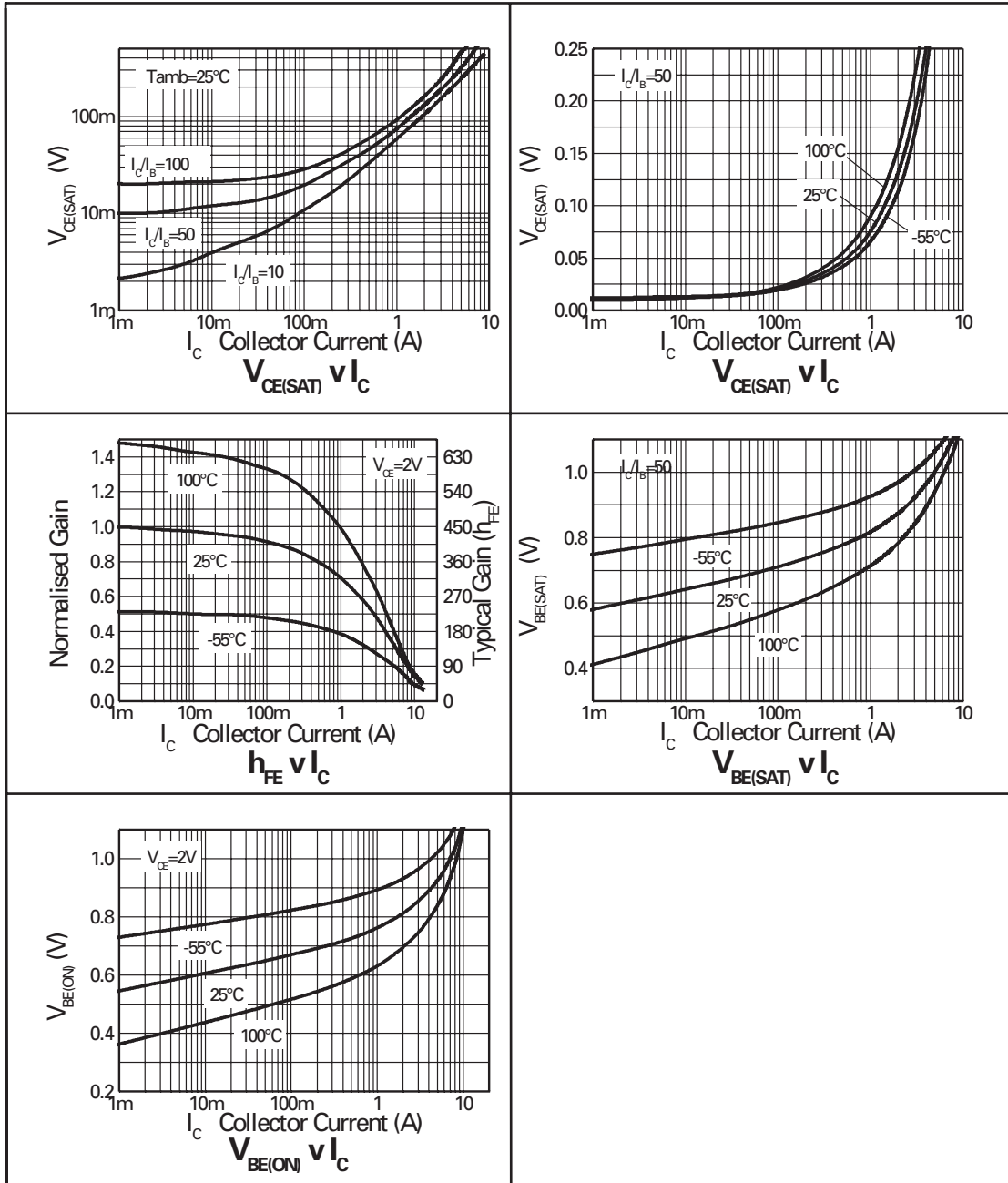
**ELECTRICAL CHARACTERISTICS** (at  $T_{amb} = 25^{\circ}\text{C}$  unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-20	-35		V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-12	-25		V	$I_C = -10\text{mA}^*$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-7.5	-8.5		V	$I_E = -100\mu\text{A}$
Collector Cut-Off Current	$I_{CBO}$			-25	nA	$V_{CB} = -16\text{V}$
Emitter Cut-Off Current	$I_{EBO}$			-25	nA	$V_{EB} = -6\text{V}$
Collector Emitter Cut-Off Current	$I_{CES}$			-25	nA	$V_{CES} = -10\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-10	-17	mV	$I_C = -0.1\text{A}, I_B = -10\text{mA}^*$
			-100	-140	mV	$I_C = -1\text{A}, I_B = -10\text{mA}^*$
			-100	-150	mV	$I_C = -1.5\text{A}, I_B = -50\text{mA}^*$
			-195	-300	mV	$I_C = -3\text{A}, I_B = -50\text{mA}^*$
			-240	-300	mV	$I_C = -4\text{A}, I_B = -150\text{mA}^*$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		-0.97	-1.05	V	$I_C = -4\text{A}, I_B = -150\text{mA}^*$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		-0.87	-0.95	V	$I_C = -4\text{A}, V_{CE} = -2\text{V}^*$
Static Forward Current Transfer Ratio	$h_{FE}$	300	475			$I_C = -10\text{mA}, V_{CE} = -2\text{V}^*$
		300	450			$I_C = -0.1\text{A}, V_{CE} = -2\text{V}^*$
		180	275			$I_C = -2.5\text{A}, V_{CE} = -2\text{V}^*$
		60	100			$I_C = -8\text{A}, V_{CE} = -2\text{V}^*$
		45	70			$I_C = -10\text{A}, V_{CE} = -2\text{V}^*$
Transition Frequency	$f_T$	100	110		MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}$ $f = 100\text{MHz}$
Output Capacitance	$C_{obo}$		21	30	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Turn-On Time	$t_{(on)}$		70		ns	$V_{CC} = -6\text{V}, I_C = -2\text{A}$ $I_{B1} = I_{B2} = -50\text{mA}$
Turn-Off Time	$t_{(off)}$		130		ns	

\*Measured under pulsed conditions. Pulse width=300 $\mu\text{s}$ . Duty cycle  $\leq 2\%$

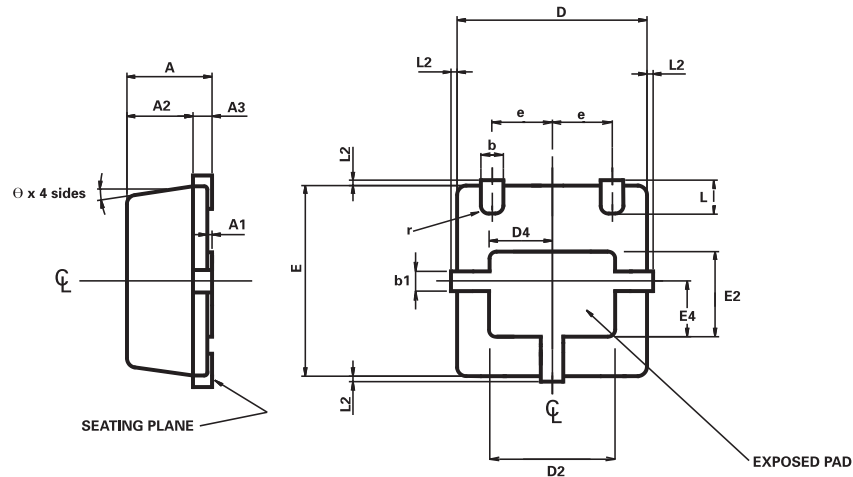
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CHARACTERISTICS



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### MLP322 PACKAGE OUTLINE (2mm x 2mm Micro Leaded Package)



CONTROLLING DIMENSIONS IN MILLIMETRES  
APPROX. CONVERTED DIMENSIONS IN INCHES

#### PACKAGE DIMENSIONS

DIM	MILLIMETRES		INCHES		DIM	MILLIMETRES		INCHES	
	MIN.	MAX.	MIN.	MAX.		MIN.	MAX.	MIN.	MAX.
A	0.80	1.00	0.0315	0.0393	e	0.65 REF		0.0255 REF	
A1	0.00	0.05	0.00	0.002	E	2.00 BSC		0.0787 BSC	
A2	0.65	0.75	0.0255	0.0295	E2	0.79	0.99	0.031	0.039
A3	0.15	0.25	0.0059	0.0098	E4	0.48	0.68	0.0188	0.0267
b	0.18	0.28	0.0070	0.0110	L	0.20	0.45	0.0078	0.0177
b1	0.17	0.30	0.0066	0.0118	L2	0.125 MAX.		0.005 REF	
D	2.00 BSC		0.0787 BSC		r	0.075 BSC		0.0029 BSC	
D2	1.22	1.42	0.0480	0.0559	Θ	0°	12°	0°	12°
D4	0.56	0.76	0.0220	0.0299					

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