

## ZXTDE4M832

### MPPS™ Miniature Package Power Solutions DUAL 80V NPN & 70V PNP LOW SATURATION TRANSISTOR COMBINATION

#### SUMMARY

NPN Transistor —  $V_{CEO} = 80V$ ;  $R_{SAT} = 68m\Omega$ ;  $I_C = 3.5A$

PNP Transistor —  $V_{CEO} = -70V$ ;  $R_{SAT} = 117m\Omega$ ;  $I_C = -2.5A$

#### DESCRIPTION

Packaged in the new innovative 3mm x 2mm MLP (Micro Leaded Package), these low saturation NPN / PNP combination dual transistors offer lower on state losses making them ideal for use in DC-DC circuits and various driving and power-management functions.

Users will also gain several other **key benefits**:

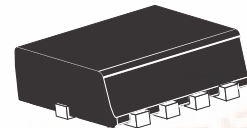
**Performance capability equivalent to much larger packages**

**Improved circuit efficiency & power levels**

**PCB area and device placement savings**

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

**Reduced component count**



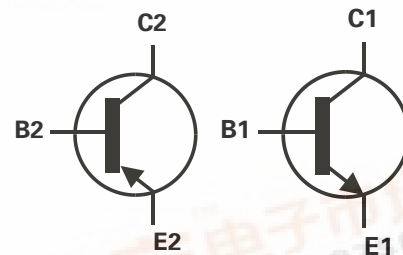
3mm x 2mm Dual Die MLP

#### FEATURES

- Low Equivalent On Resistance
- Extremely Low Saturation Voltage (-185mV max @ 1A--NPN)
- $H_{FE}$  specified up to -5A
- $I_C = -3.5A$  Continuous Collector Current
- 3mm x 2mm MLP

#### APPLICATIONS

- DC - DC Converters
- Charging circuits
- Power switches
- Motor control



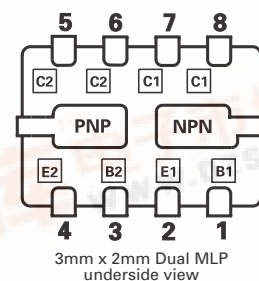
#### ORDERING INFORMATION

DEVICE	REEL	TAPE WIDTH	QUANTITY PER REEL
ZXTDE4M832TA	7"	8mm	3000
ZXTDE4M832TC	13"	8mm	10000

#### DEVICE MARKING

DE4

#### PINOUT



3mm x 2mm Dual MLP underside view

# ZXTDE4M832

## ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	NPN	PNP	UNIT
Collector-Base Voltage	$V_{CBO}$	100	-70	V
Collector-Emitter Voltage	$V_{CEO}$	80	-70	V
Emitter-Base Voltage	$V_{EBO}$	7.5	-7.5	V
Peak Pulse Current	$I_{CM}$	5	-3	A
Continuous Collector Current (a)(f)	$I_C$	3.5	-2.5	A
Base Current	$I_B$	1000		mA
Power Dissipation at TA=25°C (a)(f) Linear Derating Factor	$P_D$	1.5 12		W mW/°C
Power Dissipation at TA=25°C (b)(f) Linear Derating Factor	$P_D$	2.45 19.6		W mW/°C
Power Dissipation at TA=25°C (c)(f) Linear Derating Factor	$P_D$	1 8		W mW/°C
Power Dissipation at TA=25°C (d)(f) Linear Derating Factor	$P_D$	1.13 9		W mW/°C
Power Dissipation at TA=25°C (d)(g) Linear Derating Factor	$P_D$	1.7 13.6		W mW/°C
Power Dissipation at TA=25°C (e)(g) Linear Derating Factor	$P_D$	3 24		W mW/°C
Storage Temperature Range	$T_{stg}$	-55 to +150		°C
Junction Temperature	$T_j$	150		°C

## THERMAL RESISTANCE

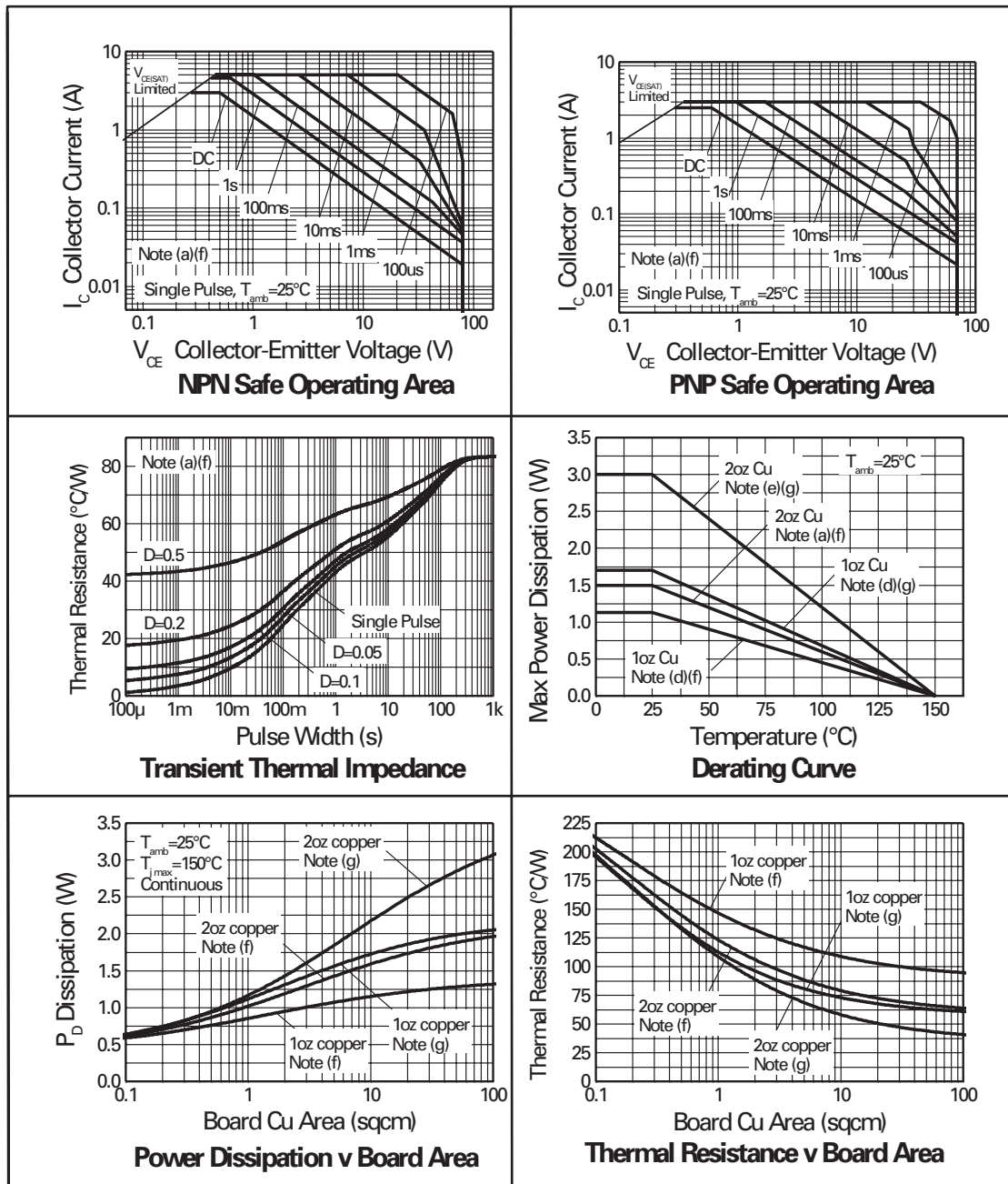
PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a)(f)	$R_{\theta JA}$	83.3	°C/W
Junction to Ambient (b)(f)	$R_{\theta JA}$	51	°C/W
Junction to Ambient (c)(f)	$R_{\theta JA}$	125	°C/W
Junction to Ambient (d)(f)	$R_{\theta JA}$	111	°C/W
Junction to Ambient (d)(g)	$R_{\theta JA}$	73.5	°C/W
Junction to Ambient (e)(g)	$R_{\theta JA}$	41.7	°C/W

### Notes

- (a) For a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (b) Measured at t<5 secs for a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (c) For a dual device surface mounted on 8 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with minimal lead connections only**.
- (d) For a dual device surface mounted on 10 sq cm single sided 1oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (e) For a dual device surface mounted on 85 sq cm single sided 2oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**. The copper area is split down the centre line into two separate areas with one half connected to each half of the dual device.
- (f) For a dual device with one active die.
- (g) For dual device with 2 active die running at equal power.
- (h) Repetitive rating - pulse width limited by max junction temperature. Refer to Transient Thermal Impedance graph.
- (i) 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 dual device mounted on 1.5mm thick FR4 board using minimum copper 1 oz weight, 1mm wide tracks and one half of the device active is  $R_{th} = 250^{\circ}\text{C/W}$  giving a power rating of  $P_{tot} = 500\text{mW}$ .

# ZXTDE4M832

## TYPICAL CHARACTERISTICS



# ZXTDE4M832

## NPN TRANSISTOR

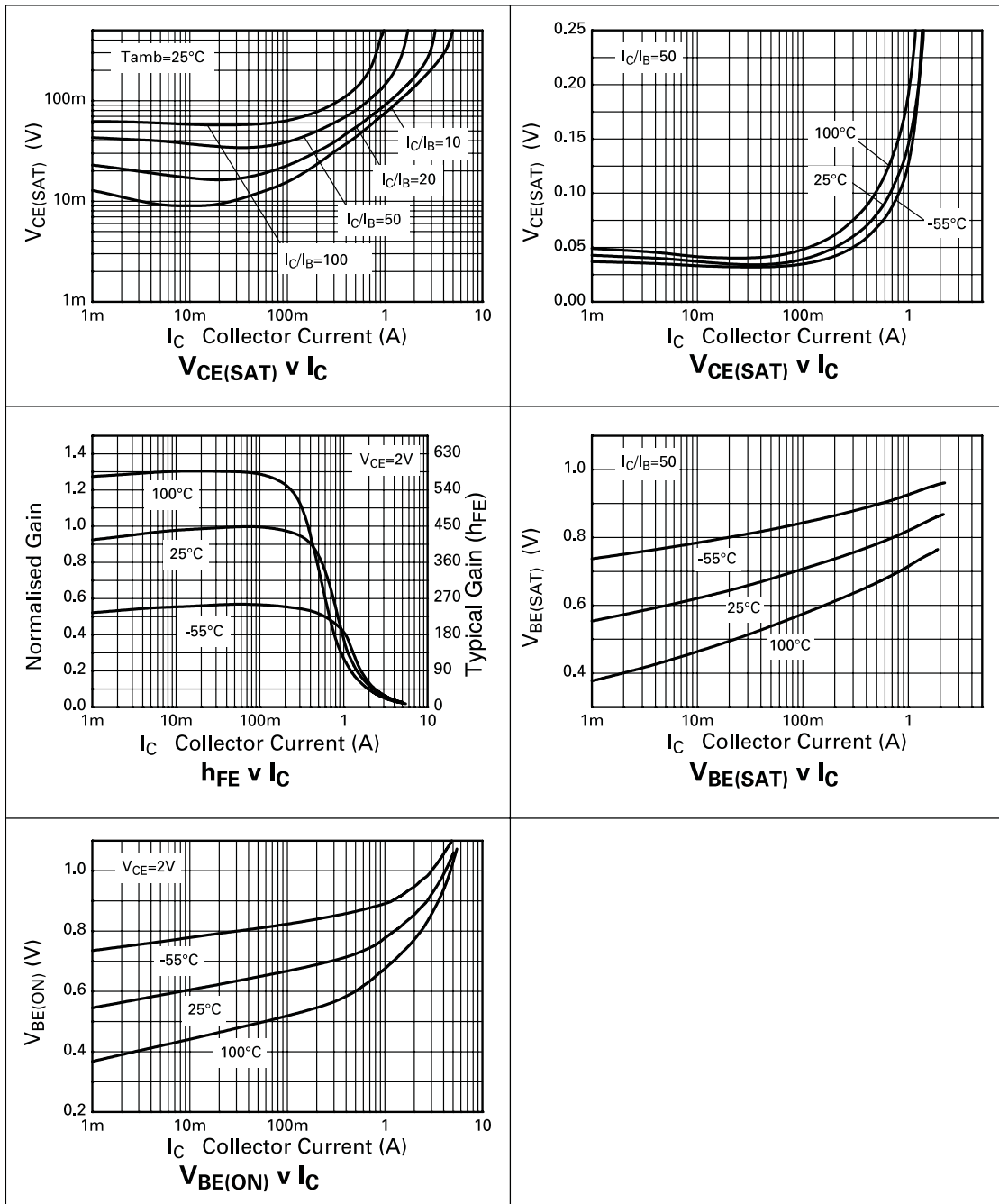
**ELECTRICAL CHARACTERISTICS** (at  $T_{amb} = 25^{\circ}\text{C}$  unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	100	180		V	$I_C=100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	80	110		V	$I_C=10\text{mA}^*$
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	7.5	8.2		V	$I_E=100\mu\text{A}$
Collector Cut-Off Current	$I_{CBO}$			25	nA	$V_{CB}=80\text{V}$
Emitter Cut-Off Current	$I_{EBO}$			25	nA	$V_{EB}=6\text{V}$
Collector Emitter Cut-Off Current	$I_{CES}$			25	nA	$V_{CE}=65\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		15 45 145 160 240	20 60 185 200 325	mV mV mV mV mV	$I_C=0.1\text{A}, I_B=10\text{mA}^*$ $I_C=0.5\text{A}, I_B=50\text{mA}^*$ $I_C=1\text{A}, I_B=20\text{mA}$ $I_C=1.5\text{A}, I_B=50\text{mA}$ $I_C=3.5\text{A}, I_B=300\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		1.09	1.175	V	$I_C=3.5\text{A}, I_B=300\text{mA}^*$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.96	1.05	V	$I_C=3.5\text{A}, V_{CE}=2\text{V}^*$
Static Forward Current Transfer Ratio	$h_{FE}$	200 300 110 60 20	450 450 170 90 30 10	900		$I_C=10\text{mA}, V_{CE}=2\text{V}^*$ $I_C=200\text{mA}, V_{CE}=2\text{V}^*$ $I_C=1\text{A}, V_{CE}=2\text{V}^*$ $I_C=1.5\text{A}, V_{CE}=2\text{V}^*$ $I_C=3\text{A}, V_{CE}=2\text{V}^*$ $I_C=5\text{A}, V_{CE}=2\text{V}^*$
Transition Frequency	$f_T$	100	160		MHz	$I_C=50\text{mA}, V_{CE}=10\text{V}$ $f=100\text{MHz}$
Output Capacitance	$C_{obo}$		11.5	18	pF	$V_{CB}=10\text{V}, f=1\text{MHz}$
Turn-On Time	$t_{(on)}$		86		ns	$V_{CC}=10\text{V}, I_C=1\text{A}$
Turn-Off Time	$t_{(off)}$		1128		ns	$I_{B1}=I_{B2}=25\text{mA}$

\*Measured under pulsed conditions.

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## NPN TYPICAL CHARACTERISTICS



# ZXTDE4M832

## PNP TRANSISTOR

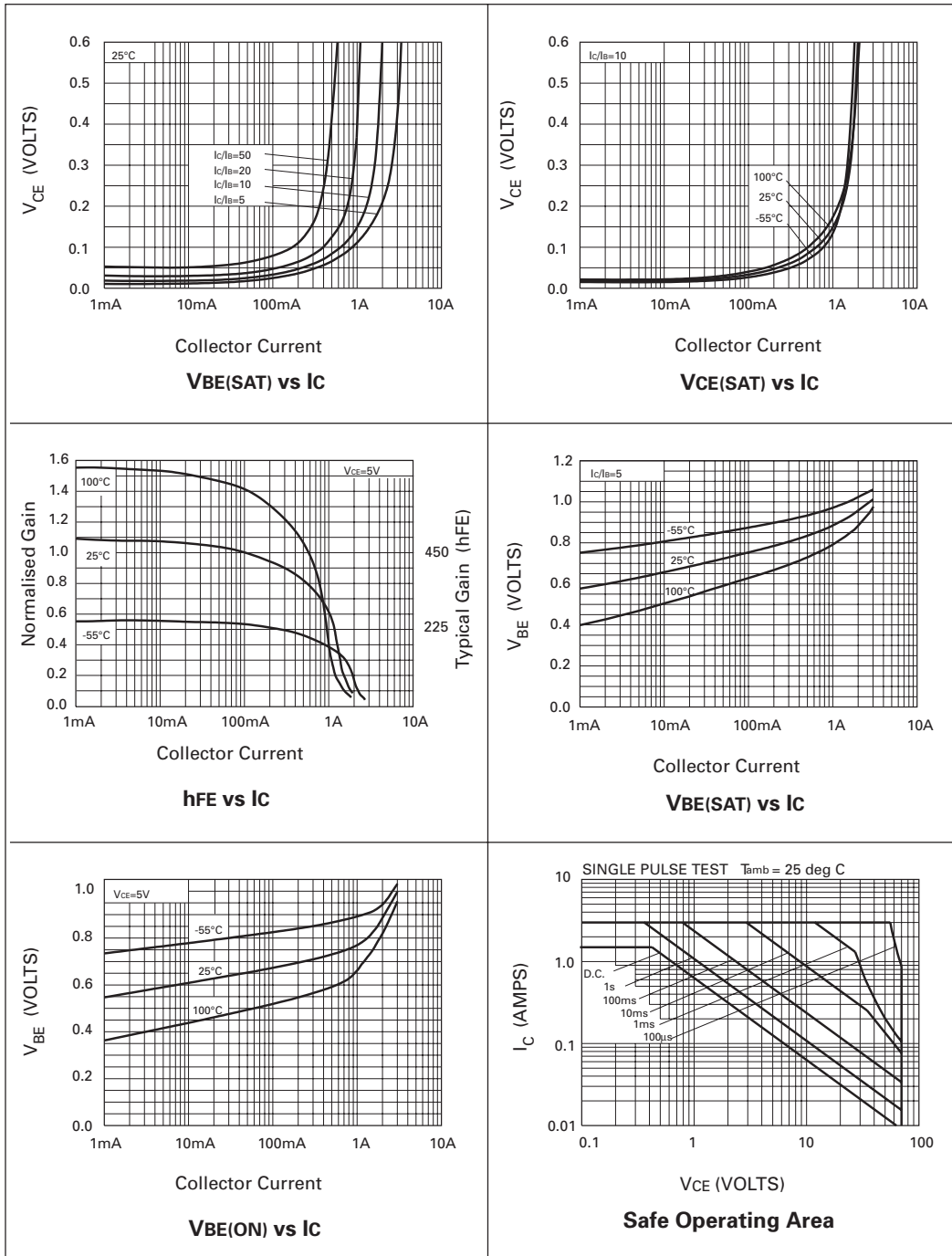
**ELECTRICAL CHARACTERISTICS** (at  $T_{amb} = 25^{\circ}\text{C}$  unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-70	-150		V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	-70	-125		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	$V_{CB} = -55\text{V}$
Emitter Cut-Off Current	$I_{EBO}$			-25	nA	$V_{EB} = -6\text{V}$
Collector Emitter Cut-Off Current	$I_{CES}$			-25	nA	$V_{CE} = -55\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		-35 -135 -140 -175	-50 -200 -220 -260	mV mV mV mV	$I_C = -0.1\text{A}, I_B = -10\text{mA}^*$ $I_C = -0.5\text{A}, I_B = -20\text{mA}^*$ $I_C = -1.0\text{A}, I_B = -100\text{mA}^*$ $I_C = -1.5\text{A}, I_B = -200\text{mA}^*$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.94	1.05	V	$I_C = -1.5\text{A}, I_B = -200\text{mA}^*$
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.78	1.00	V	$I_C = -1.5\text{A}, V_{CE} = -5\text{V}^*$
Static Forward Current Transfer Ratio	$h_{FE}$	300 300 175 40	470 450 275 60 10			$I_C = -10\text{mA}, V_{CE} = -5\text{V}^*$ $I_C = -100\text{mA}, V_{CE} = -5\text{V}^*$ $I_C = -1\text{A}, V_{CE} = -5\text{V}^*$ $I_C = -1.5\text{A}, V_{CE} = -5\text{V}^*$ $I_C = -3\text{A}, V_{CE} = -5\text{V}^*$
Transition Frequency	$f_T$	150	180		MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}$ $f = 100\text{MHz}$
Output Capacitance	$C_{obo}$		14	20	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Turn-On Time	$t_{(on)}$		40		ns	$V_{CC} = -50\text{V}, I_C = -1\text{A}$
Turn-Off Time	$t_{(off)}$		700		ns	$I_{B1} = I_{B2} = -50\text{mA}$

\*Measured under pulsed conditions.

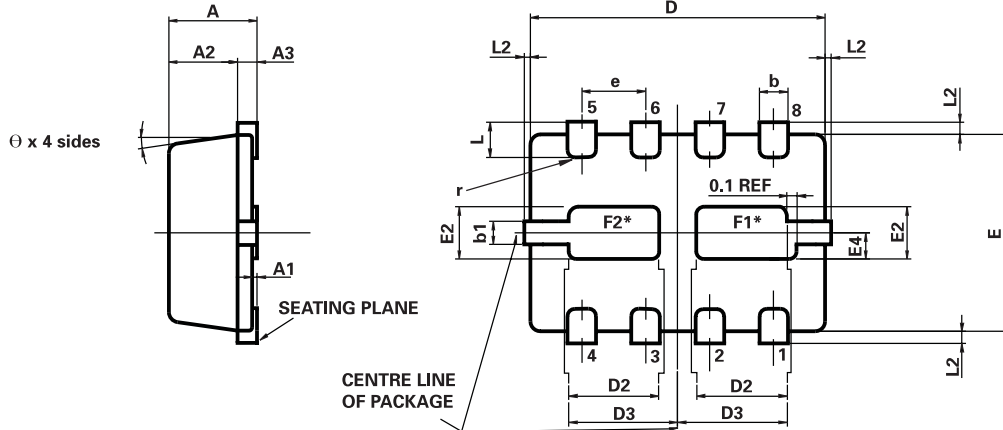
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## PNP TYPICAL CHARACTERISTICS



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## MLP832 PACKAGE OUTLINE (3mm x 2mm Micro Leaded Package)



\*Exposed Flags. Solder connection to improve thermal dissipation is optional.  
 F1 at collector 1 potential  
 F2 at collector 2 potential

CONTROLLING DIMENSIONS IN MILLIMETRES  
 APPROX. CONVERTED DIMENSIONS IN INCHES

### MLP832 PACKAGE DIMENSIONS

DIM	MILLIMETRES		INCHES		DIM	MILLIMETRES		INCHES	
	MIN.	MAX.	MIN.	MAX.		MIN.	MAX.	MIN.	MAX.
A	0.80	1.00	0.031	0.039	e	0.65 REF		0.0256 BSC	
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	0.43	0.63	0.017	0.0249
A3	0.15	0.25	0.006	0.0098	E4	0.16	0.36	0.006	0.014
b	0.24	0.34	0.009	0.013	L	0.20	0.45	0.0078	0.0157
b1	0.17	0.30	0.0066	0.0118	L2	_____	0.125	0.00	0.005
D	3.00 BSC		0.118 BSC		r	0.075 BSC		0.0029 BSC	
D2	0.82	1.02	0.032	0.040	Θ	0°	12°	0°	12°
D3	1.01	1.21	0.0397	0.0476					

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