ZX3CDBS1M832

MPPS™ Miniature Package Power Solutions
20V NPN LOW SATURATION TRANSISTOR AND 40V, 1A SCHOTTKY DIODE COMBINATION DUAL

SUMMARY

NPN Transistor — V_{CEO} = 20V; R_{SAT} = 47mΩ; I_C = 4.5A

Schottky Diode — V_R = 40V; V_F = 500mV (@1A); I_C=1A

DESCRIPTION

Packaged in the new innovative 3mm x 2mm MLP this combination dual comprises an ultra low saturation NPN transistor and a 1A Schottky barrier diode. This excellent combination provides users with highly efficient performance in applications including DC-DC and charging circuits.

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

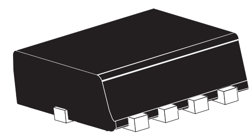
Performance capability equivalent to much larger packages

Improved circuit efficiency & power levels

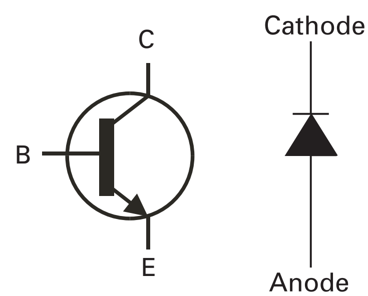
PCB area and device placement savings

Lower package height (0.9mm nom)

Reduced component count



3mm x 2mm Dual Die MLP



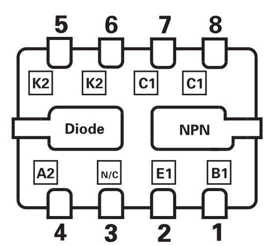
FEATURES

- Extremely Low Saturation Voltage **(150mV @1A)**
- H_{FE} characterised up to 6A
- I_C = 4.5A Continuous Collector Current
- **Extremely Low V_F, fast switching Schottky**
- 3mm x 2mm MLP

APPLICATIONS

- DC - DC Converters
- Mobile Phones
- Charging Circuits
- Motor control

PINOUT



3mm x 2mm Dual MLP
underside view

ORDERING INFORMATION

DEVICE	REEL	TAPE WIDTH	QUANTITY PER REEL
ZX3CDBS1M832TA	7′′	8mm	3000
ZX3CDBS1M832TC	13′′	8mm	10000

DEVICE MARKING

BS1

ZETEX SEMICONDUCTORS

ZX3CDBS1M832

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Transistor			
Collector-Base Voltage	V_{CBO}	40	V
Collector-Emitter Voltage	V_{CEO}	20	V
Emitter-Base Voltage	V_{EBO}	7.5	V
Peak Pulse Current	I_{CM}	12	A
Continuous Collector Current (a)(f)	I_C	4.5	A
Continuous Collector Current (b)(f)	I_C	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	°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 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 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.

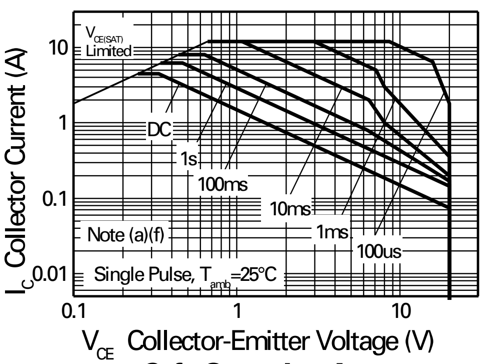
(f) For a dual device with one active die.

(g) For dual device with 2 active die running at equal power.

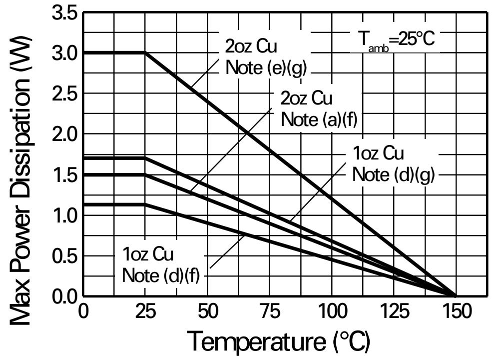
(h) Repetitive rating - pulse width limited by max junction temperature. Refer to Transient Thermal Impedance graph.

(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 Rth = 250°C/W giving a power rating of Ptot = 500mW.

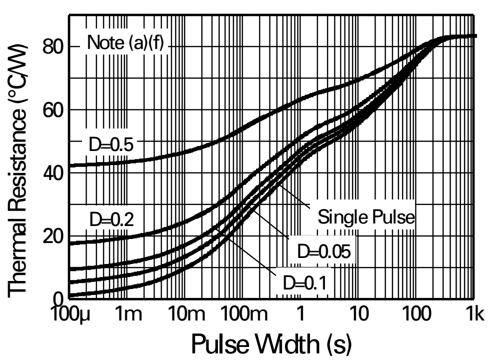
TRANSISTOR TYPICAL CHARACTERISTICS



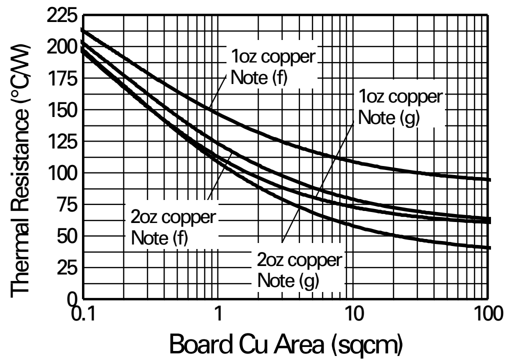
Safe Operating Area



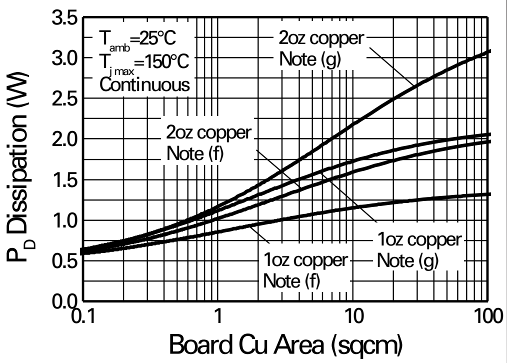
Derating Curve



Transient Thermal Impedance



Thermal Resistance v Board Area



Power Dissipation v Board Area

ZX3CDBS1M832

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	VALUE	UNIT
Schottky Diode			
Continuous Reverse Voltage	V_R	40	V
Forward Voltage @ I_F=1000mA(typ)	V_F	425	mV
Forward Current	I_F	1850	mA
Average Peak Forward Current D=50%	I_{FAV}	3	A
Non Repetitive Forward Current t≤ 100µs t≤ 10ms	I_{FSM}	12 7	A A
Power Dissipation at TA=25°C (a)(f) Linear Derating Factor	P_D	1.2 12	W mW/°C
Power Dissipation at TA=25°C (b)(f) Linear Derating Factor	P_D	2 20	W mW/°C
Power Dissipation at TA=25°C (c)(f) Linear Derating Factor	P_D	0.8 8	W mW/°C
Power Dissipation at TA=25°C (d)(f) Linear Derating Factor	P_D	0.9 9	W mW/°C
Power Dissipation at TA=25°C (d)(g) Linear Derating Factor	P_D	1.36 13.6	W mW/°C
Power Dissipation at TA=25°C (e)(g) Linear Derating Factor	P_D	2.4 24	W mW/°C
Storage Temperature Range	T_{stg}	-55 to +150	°C
Junction Temperature	T_j	125	°C

THERMAL RESISTANCE

PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a)(f)	$R_{\theta JA}$	83	°C/W
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Notes

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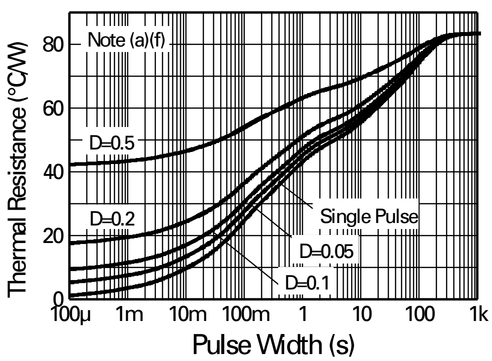
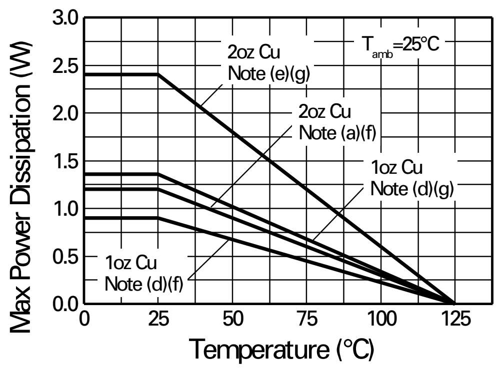
(h) Repetitive rating - pulse width limited by max junction temperature. Refer to Transient Thermal Impedance graph.

(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 Rth = 250°C/W giving a power rating of Ptot = 400mW.

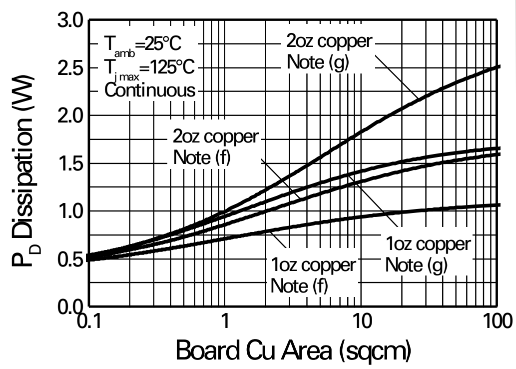
SCHOTTKY TYPICAL CHARACTERISTICS



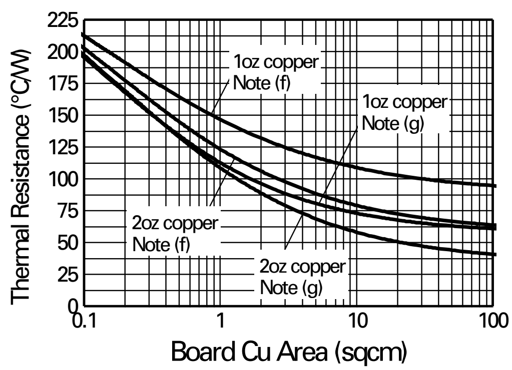
Transient Thermal Impedance



Derating Curve



Power Dissipation v Board Area



Thermal Resistance v Board Area

ZETEX SEMICONDUCTORS

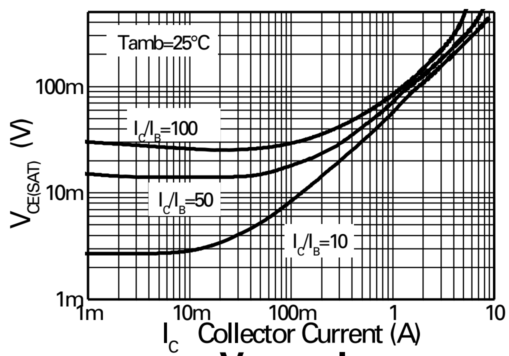
ZX3CDBS1M832

ELECTRICAL CHARACTERISTICS (at T_{amb} = 25°C unless otherwise stated).

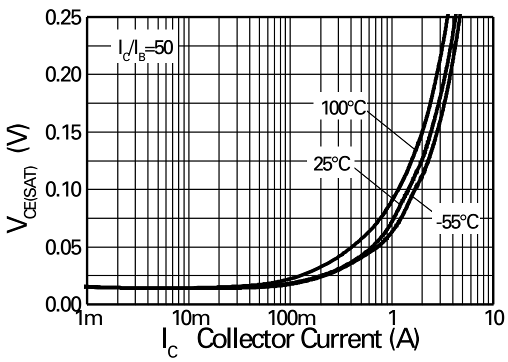
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
TRANSISTOR ELECTRICAL CHARACTERISTICS						
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	40	100		V	I_C=100μA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	20	27		V	I_C=10mA*
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	7.5	8.2		V	I_E=100μA
Collector Cut-Off Current	I_{CBO}			25	nA	V_{CB}=32V
Emitter Cut-Off Current	I_{EBO}			25	nA	V_{EB}=6V
Collector Emitter Cut-Off Current	I_{CES}			25	nA	V_{CES}=16V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$		8 90 115 190 210	15 150 135 250 270	mV mV mV mV mV	I_C=0.1A, I_B=10mA* I_C=1A, I_B=10mA* I_C=2A, I_B=50mA* I_C=3A, I_B=100mA* I_C=4.5A, I_B=125mA*
Base-Emitter Saturation Voltage	$V_{BE(sat)}$		0.98	-1.05	V	I_C=4.5A, I_B=125mA*
Base-Emitter Turn-On Voltage	$V_{BE(on)}$		0.88	-0.95	V	I_C=4.5A, V_{CE}=2V*
Static Forward Current Transfer Ratio	h_{FE}	200 300 200 100	400 450 360 180			I_C=10mA, V_{CE}=2V* I_C=0.2A, V_{CE}=2V* I_C=2A, V_{CE}=2V* I_C=6A, V_{CE}=2V*
Transition Frequency	f_T	100	140		MHz	I_C=50mA, V_{CE}=10V f=100MHz
Output Capacitance	C_{obo}		23	30	pF	V_{CB}=10V, f=1MHz
Turn-On Time	$t_{(on)}$		170		ns	V_{CC}=10V, I_C=3A I_{B1}=I_{B2}=10mA
Turn-Off Time	$t_{(off)}$		400		ns	
SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS						
Reverse Breakdown Voltage	$V_{(BR)R}$	40	60		V	I_R=300μA
Forward Voltage	V_F		240 265 305 355 390 425 495 420	270 290 340 400 450 500 600 —	mV mV mV mV mV mV mV mV	I_F=50mA* I_F=100mA* I_F=250mA* I_F=500mA* I_F=750mA* I_F=1000mA* I_F=1500mA* I_F=1000mA,T_a=100°C*
Reverse Current	I_R		50	100	μA	V_R=30V
Diode Capacitance	C_D		25		pF	f=1MHz,V_R=25V
Reverse Recovery Time	t_{rr}		12		ns	switched from I_F = 500mA to I_R = 500mA Measured at I_R = 50mA

*Measured under pulsed conditions.

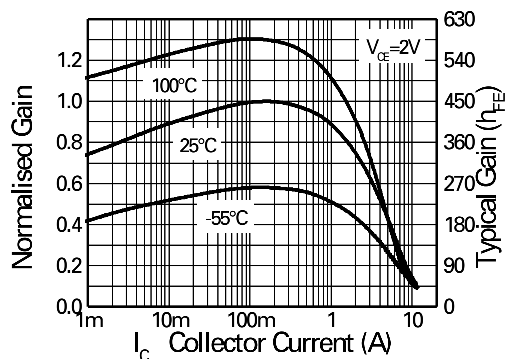
TRANSISTOR TYPICAL CHARACTERISTICS



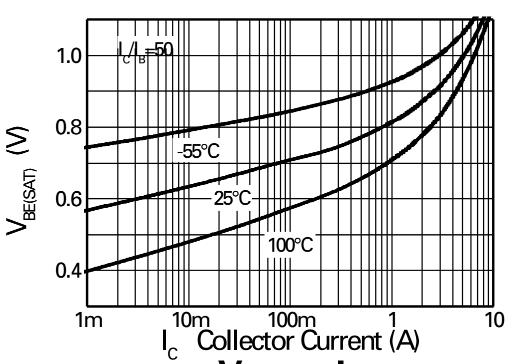
$V_{CE(SAT)}$ v I_C



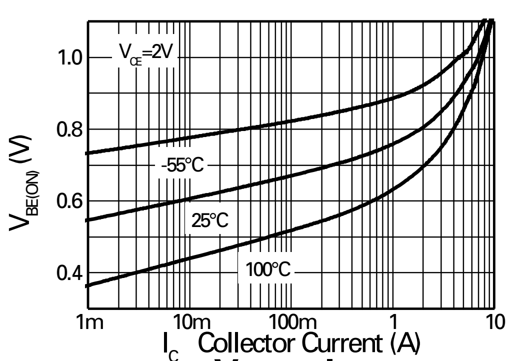
$V_{CE(SAT)}$ v I_C



h_{FE} v I_C

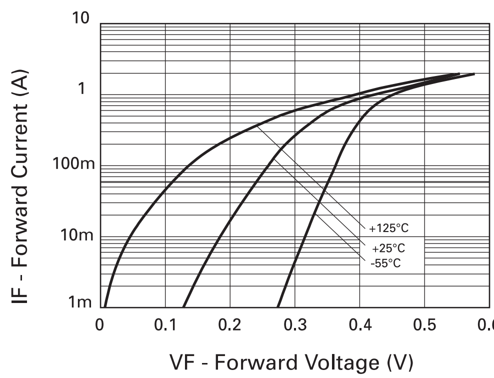


$V_{BE(SAT)}$ v I_C

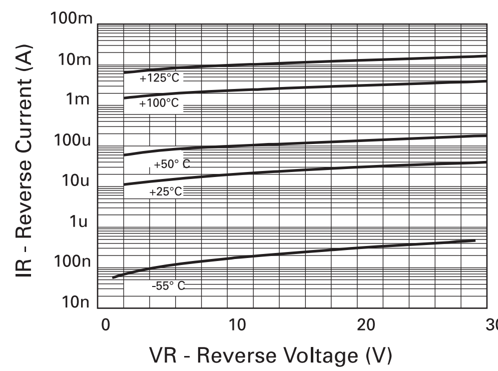


$V_{BE(ON)}$ v I_C

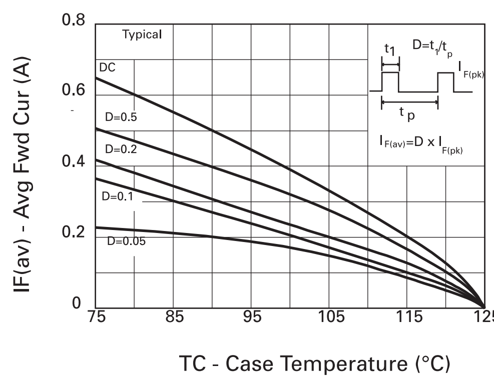
SCHOTTKY TYPICAL CHARACTERISTICS



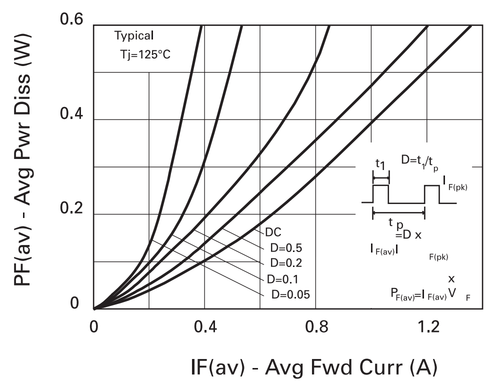
I_F v V_F



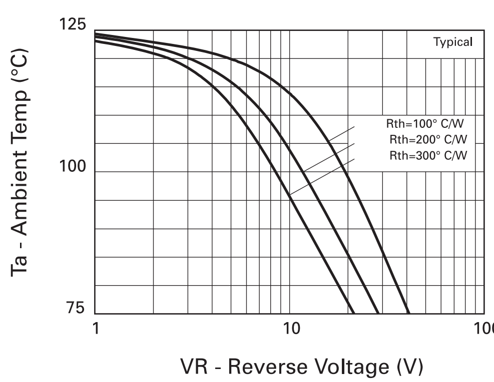
I_R v V_R



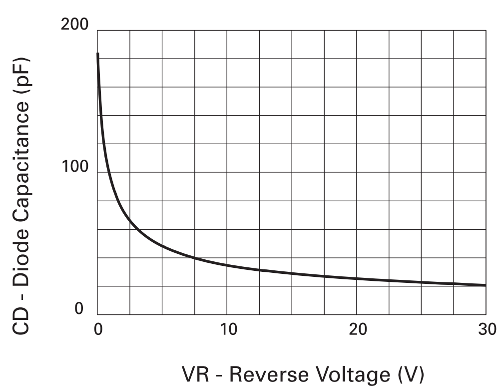
$I_{F(av)}$ v T_C



$P_{F(av)}$ v $I_{F(av)}$

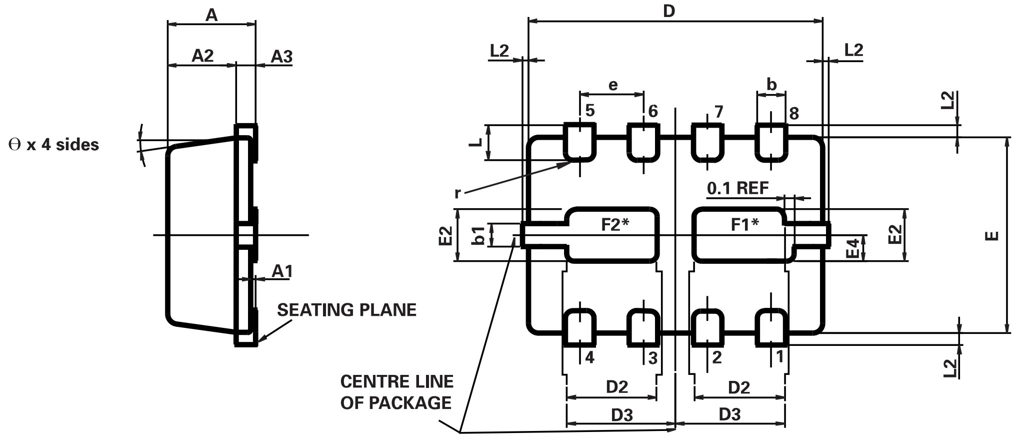


T_a v V_R



C_D v V_R

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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