PowerMOS transistor
Fast recovery diode FET

BUK617-500AE/BE

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in ISOTOP envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations where faster recovery characteristics simplify design for inductive loads.

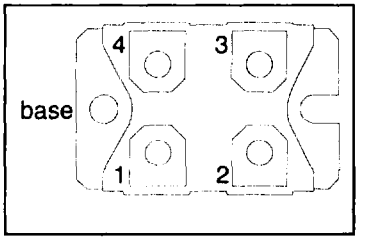
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK617	-500AE	-500BE	
V_{DS}	Drain-source voltage	500	500	V
I_D	Drain current (DC)	29	27	A
P_{tot}	Total power dissipation	310	310	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.15	0.18	Ω
t_{rr}	Diode reverse recovery time	250	250	ns

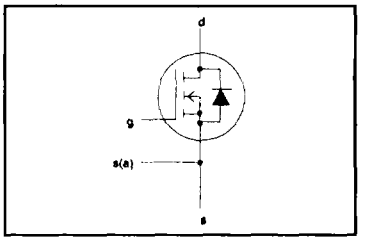
PINNING - SOT227B

PIN	DESCRIPTION
1	source
2	gate
3	drain
4	ancillary source
base	isolated

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.		UNIT
V_{DS}	Drain-source voltage	-	-	500		V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	-	500		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-500AE	-500BE	
I_D	Drain current (DC)	T_{mb} = 25 °C	-	29	27	A
I_D	Drain current (DC)	T_{mb} = 100 °C	-	19	17	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	-	116	108	A
$I_{S(A)M}$	Ancillary Source current (pulse peak value)		-	5.0		A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	-	310		W
T_{stg}	Storage temperature	-	- 40	150		°C
T_j	Junction Temperature	-	-	150		°C

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j\text{-}mb}$	Thermal resistance junction to mounting base		-	-	0.4	K/W
$R_{th\ mb\text{-}hs}$	Thermal resistance mounting base to heatsink	with heatsink compound	-	0.05	-	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.0 mA	500	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j = 25 °C	-	20	200	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 500 V; V_{GS} = 0 V; T_j =125 °C	-	0.5	5.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	200	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; **BUK617-500AE**	-	0.13	0.15	Ω
		I_D = 16 A **BUK617-500BE**	-	0.15	0.18	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 16 A	15.0	30.0	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	7.5	9.0	nF
C_{oss}	Output capacitance		-	0.85	1.35	nF
C_{rss}	Feedback capacitance		-	0.35	0.60	nF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.8 A;	-	80	120	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	200	250	ns
$t_{d\,off}$	Turn-off delay time	R_{gen} = 50 Ω	-	1100	1350	ns
t_f	Turn-off fall time	Resistive Load	-	250	350	ns
$t_{d\,on}$	Turn-on delay time	V_{DD} = 250 V; I_D = 29 A;	-	40	80	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{gen} = 3.3 Ω;	-	70	100	ns
$t_{d\,off}$	Turn-off delay time	Resistive Load	-	300	350	ns
t_f	Turn-off fall time		-	100	150	ns
L_d	Internal drain inductance	Measured from contact screw on terminal 3 to centre of die	-	5	-	nH
L_s	Internal source inductance	Measured from contact screw on terminal 1 to source bond pad	-	5	-	nH

ISOLATION

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	R.M.S. voltage from terminals to mounting base	Sinusoidal voltage waveform; f = 50 - 60 Hz	-	-	2500	V
C_{isol}	Capacitance from T3 to mounting base	f = 1 MHz	-	45	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-		-	-	29	A
I_{DRM}	Pulsed reverse drain current	-		-	-	116	A
V_{SD}	Diode forward voltage	I_F = 29 A ;	V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 29 A;	T_j - 25 °C	-	200	250	ns
		-dI_F/dt =	T_j - 125 °C	-	300	400	ns
Q_{rr}	Reverse recovery charge	200 A/µs;	T_j - 25 °C	-	2.0	4.0	µC
		V_{GS} = 0 V;	T_j - 125 °C	-	7.0	10.0	µC
I_{rrm}	Reverse recovery current	V_R = 100 V	T_j - 125 °C	-	35	45	A

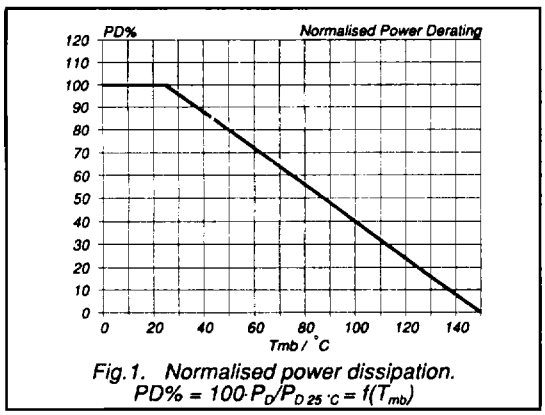


Fig.1. Normalised power dissipation.
PD% = 100·$P_D/P_{D\,25\,°C}$ = f(T_{mb})

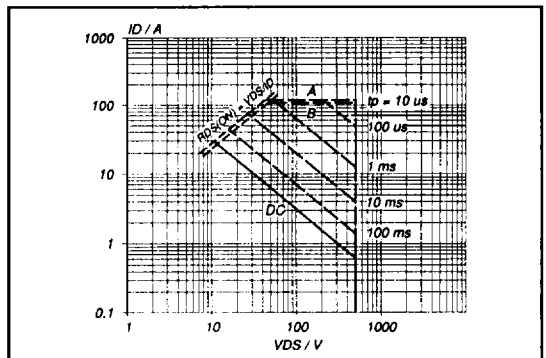


Fig.3. Safe operating area. T_{mb} = 25 °C
I_D & I_{DM} = f(V_{DS}); I_{DM} single pulse; parameter t_p

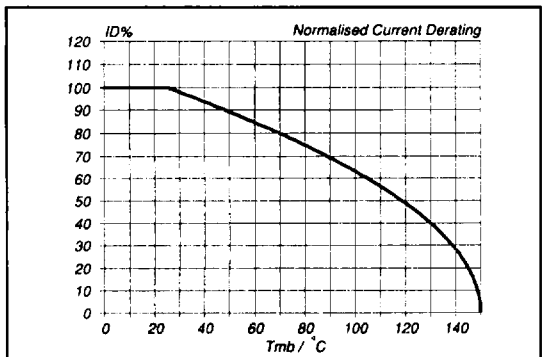


Fig.2. Normalised continuous drain current.
ID% = 100·$I_D/I_{D\,25\,°C}$ = f(T_{mb}); conditions: $V_{GS} \geq$ 10 V

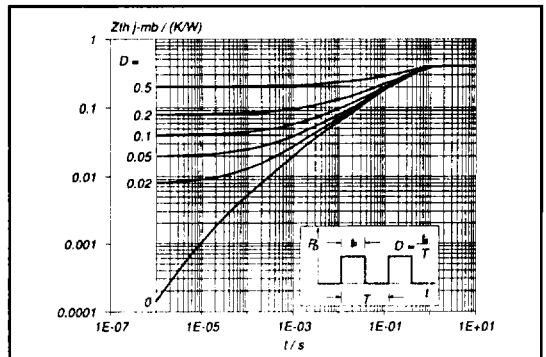


Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}mb}$ = f(t); parameter D = t_p/T

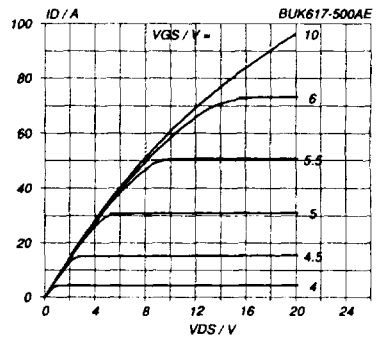


Fig.5. Typical output characteristics, T_j = 25 °C. $I_D = f(V_{DS})$; parameter V_{GS}

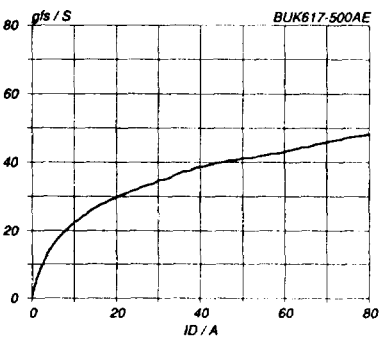


Fig.8. Typical transconductance, T_j = 25 °C. $g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V

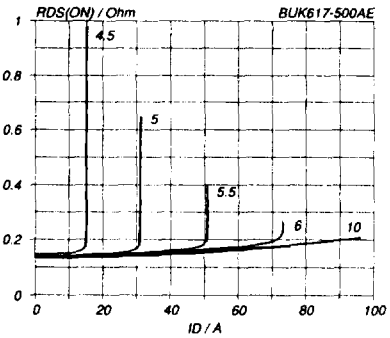


Fig.6. Typical on-state resistance, T_j = 25 °C. $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

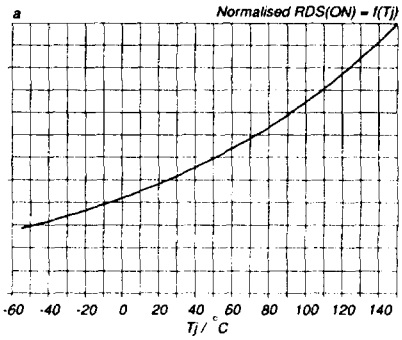


Fig.9. Normalised drain-source on-state resistance. $a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_j)$; I_D = 16 A; V_{GS} = 10 V

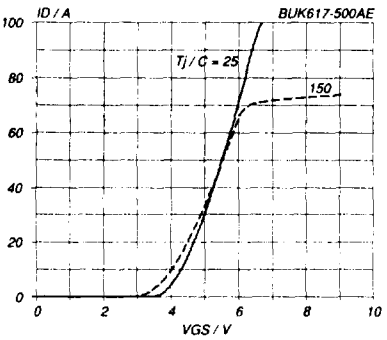


Fig.7. Typical transfer characteristics. $I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_j

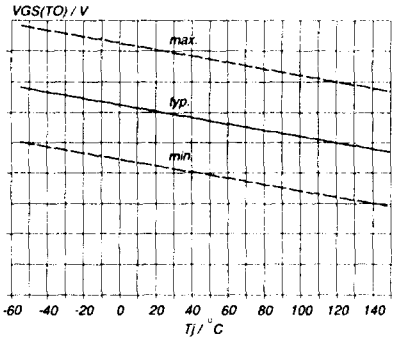


Fig.10. Gate threshold voltage. $V_{GS(TO)} = f(T_j)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$

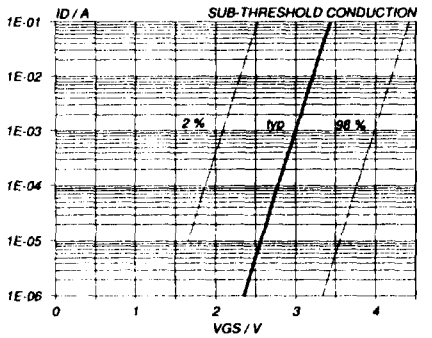


Fig.11. Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$

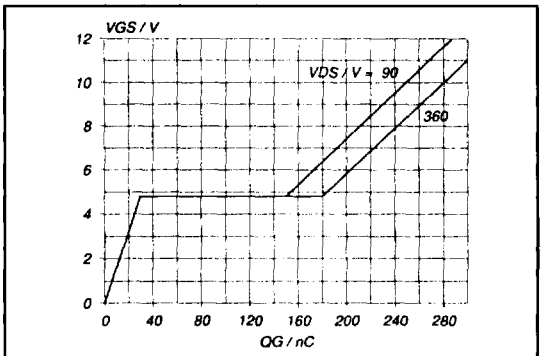


Fig.13. Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 29$ A; parameter V_{DS}

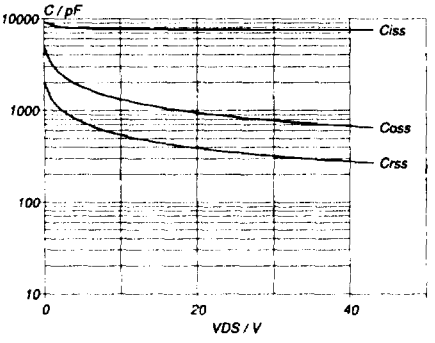


Fig.12. Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

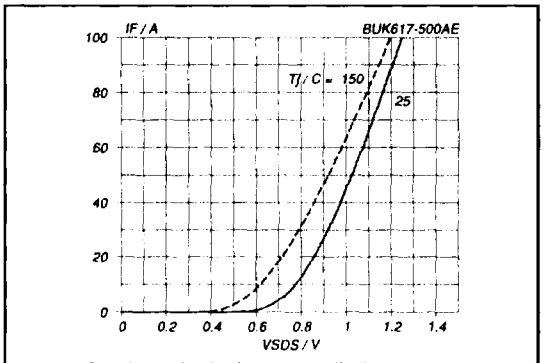


Fig.14. Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j