

# 60V Radiation Tolerant power MOSFET

## BUP06CN015E-01

### Features

- LOW  $R_{DS(on)}$
- Single Event Effect (SEE) tolerant
- Total Ionisation Dose (TID) tolerant  
30 kRad approved
- N-channel



### Product validation



Qualified according AEC Q101

Electrical parameters in Table 4 are guaranteed pre- and post-irradiation.

### Description

**Table 1 Product information**

Type	Comment	Pin Configuration			Package
		1	2	3	
BUP06CN015E-01		G	D	S	TO-247

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## Maximum ratings

# 1 Maximum ratings

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain source voltage	$V_{DS}$	-	-	60	V	
Gate source voltage	$V_{GS}$	-20	-	20	V	static
Drain gate voltage	$V_{DG}$	-	-	60	V	
Continuous drain current <sup>1</sup>	$I_D$	-	-	106 87	A	$T_C = 25\text{ °C}$ $T_C = 100\text{ °C}$
Continuous source current	$I_S$	-	-	106	A	
Drain current pulsed	$I_{DM}$	-	-	417	Apk	$t_p$ limited by $T_{j,max}$
Total power dissipation <sup>2</sup>	$P_{tot}$	-	-	390	W	$T_C \leq 25\text{ °C}$
Operating temperature	$T_{op}$	-40	-	125	°C	
Storage temperature	$T_{stg}$	-55	-	150	°C	
Junction temperature	$T_j$	-40	-	150	°C	
Avalanche energy, single pulse	$E_{AS}$	-	-	1400	mJ	$V_{DD} = 50V, L = 108\mu H$

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<sup>1</sup> Limited by package

<sup>2</sup> For  $T_C > 25\text{ °C}$  derating is required.

## Thermal characteristics

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{th,JC}$	-	-	0.32	K/W	
Thermal resistance, junction - ambient	$R_{th,JA}$	-	-	62	K/W	leaded
Soldering temperature	$T_{sol}$	-	-	260	°C	1.6 mm (0.063 in.) from case for 10 s

## Electrical characteristics

### 3 Electrical characteristics

at  $T_A=25^\circ\text{C}$ , unless otherwise specified

**Table 4 Static characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$BV_{DSS}$	60	-	-	V	$I_D = 0.25\text{mA}$ , $V_{GS} = 0\text{V}$
Gate threshold voltage	$V_{GS(th)}$	2	-	4	V	$I_D = 1.0\text{mA}$ , $V_{DS} \geq V_{GS}$
Gate to source leakage current	$I_{GSS}$	-100 -200	-	100 200	nA	$V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$ , $T_A = 25^\circ\text{C}$ $V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$ , $T_A = 125^\circ\text{C}$
Zero gate voltage drain current	$I_{DSS}$	-	-	25 250	$\mu\text{A}$	$V_{DS} = 48\text{V}$ , $V_{GS} = 0\text{V}$ , $T_A = 25^\circ\text{C}$ $V_{DS} = 48\text{V}$ , $V_{GS} = 0\text{V}$ , $T_A = 125^\circ\text{C}$
Drain source on-state resistance <sup>1</sup>	$R_{DS(ON)}$	-	9.5	15 20	$\text{m}\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 35\text{A}$ , $T_A = 25^\circ\text{C}$ $V_{GS} = 10\text{V}$ , $I_D = 35\text{A}$ , $T_A = 125^\circ\text{C}$
Diode forward voltage <sup>1,2</sup>	$V_{SD}$	-	-	1.1	V	$V_{GS} = 0\text{V}$ , $I_S = 45\text{A}$

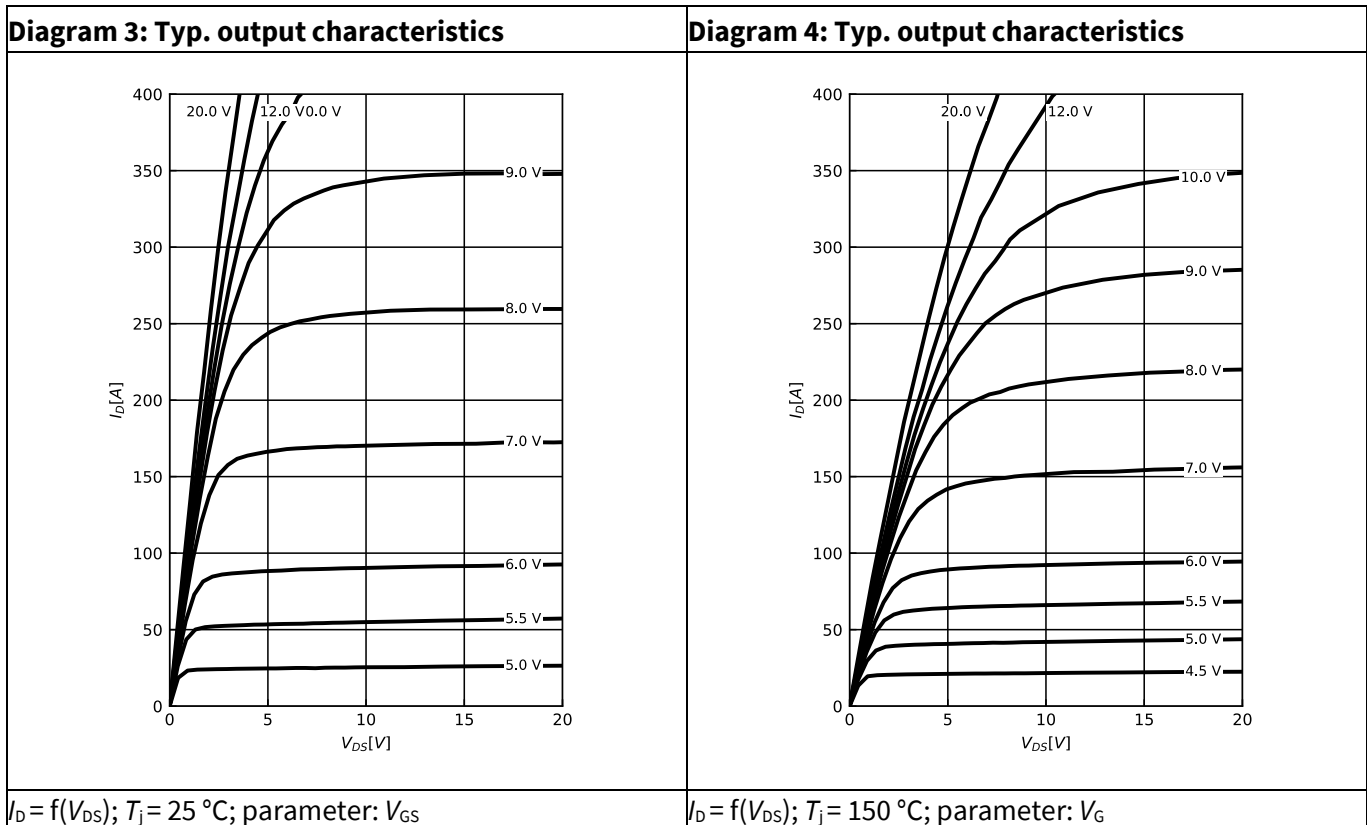
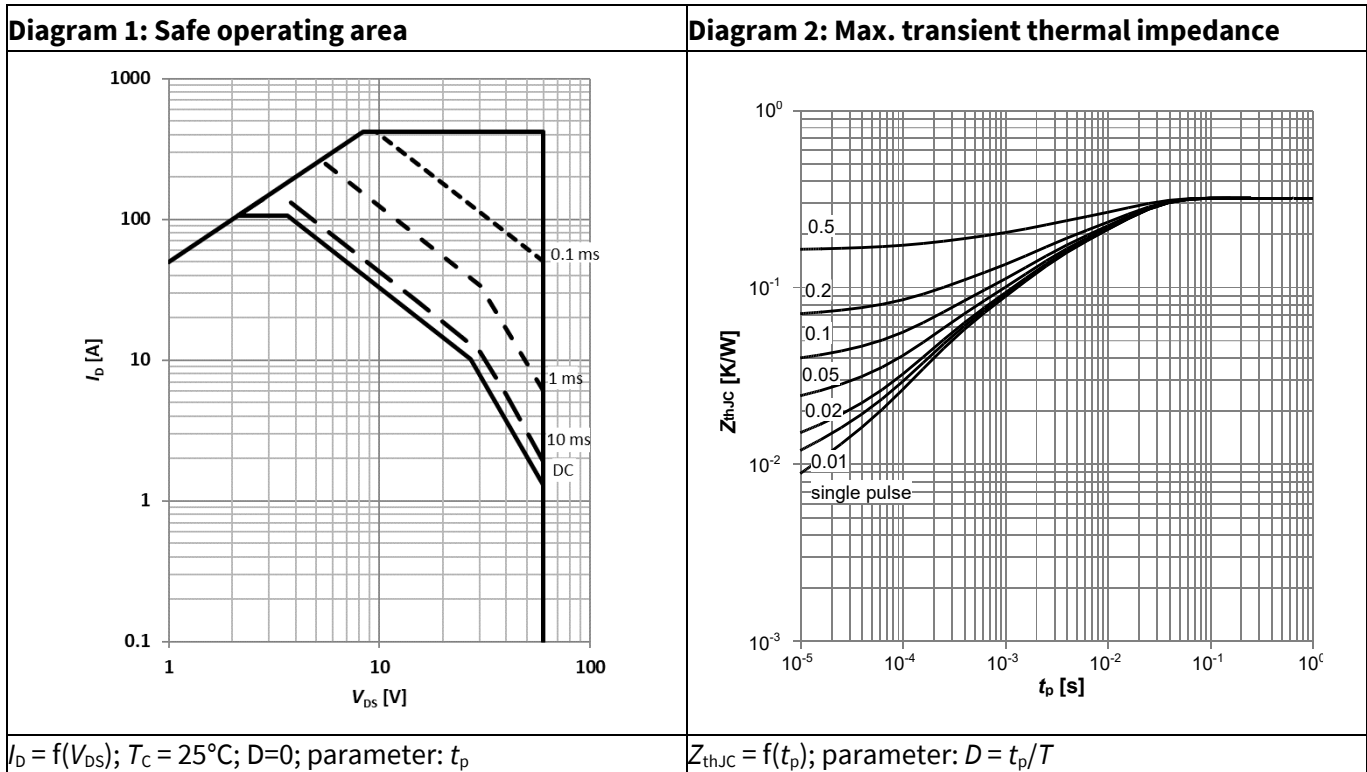
**Table 5 Dynamic characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Turn-on delay time	$t_{d(ON)}$	-	24	-	ns	$V_{DD} = 50\% V_{DS}$ , $I_D = 35\text{A}$ , $R_G = 4.7\Omega$
Rise time	$t_r$	-	28	-	ns	$V_{DD} = 50\% V_{DS}$ , $I_D = 35\text{A}$ , $R_G = 4.7\Omega$
Turn-off delay time	$t_{d(OFF)}$	-	43	-	ns	$V_{DD} = 50\% V_{DS}$ , $I_D = 35\text{A}$ , $R_G = 4.7\Omega$
Fall time	$t_f$	-	21	-	ns	$V_{DD} = 50\% V_{DS}$ , $I_D = 35\text{A}$ , $R_G = 4.7\Omega$
Reverse recovery time	$t_{rr}$	-	185	-	ns	$V_{DD} \leq 50\text{V}$ , $I_D = 45\text{A}$
Common source input capacitance	$C_{iss}$	-	4.75	-	nF	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$
Common source output capacitance	$C_{oss}$	-	1220	-	pF	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$
Common source reverse transfer capacitance	$C_{rss}$	-	300	-	pF	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$
Total gate charge	$Q_G$	-	76	-	nC	$V_{DD} = 50\% V_{DS}$ , $V_{GS} = 10\text{V}$ , $I_D = 45\text{A}$

<sup>1</sup> Pulsed measurement: Pulse Width < 300 $\mu\text{s}$ , Duty Cycle < 2.0%.

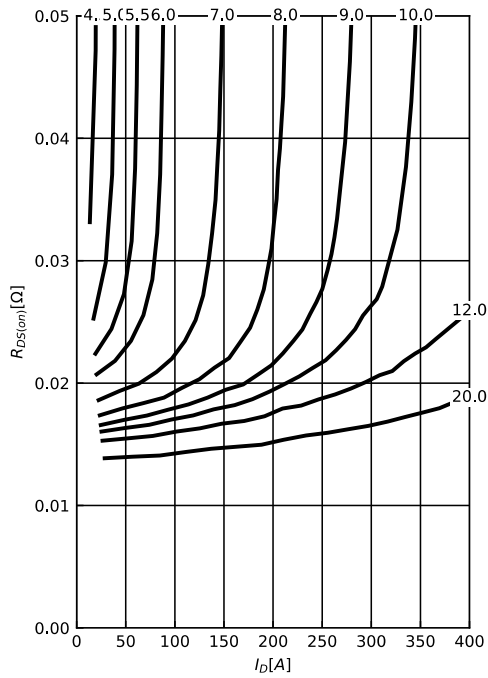
<sup>2</sup> Measured within 2.0 mm of case

### 4 Electrical characteristics diagrams



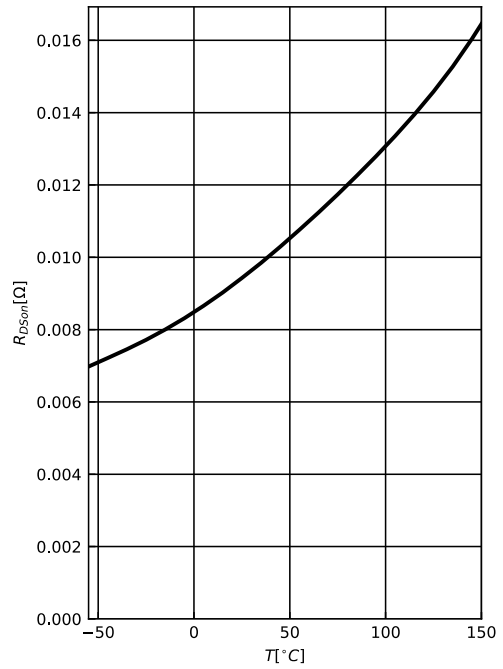
### Electrical characteristics diagrams

**Diagram 5: Typ. drain-source on-state resistance**



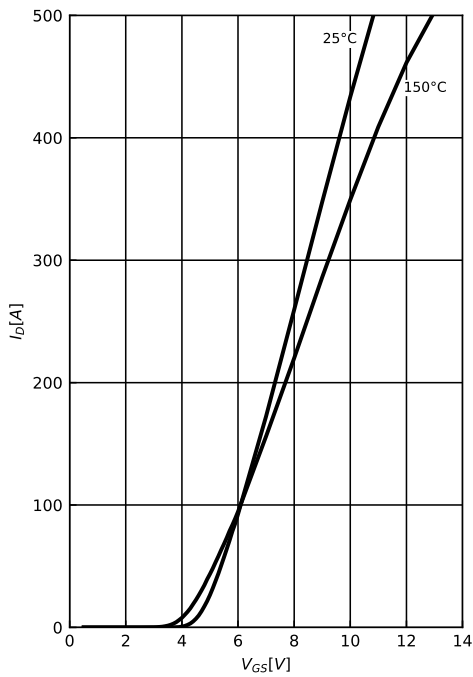
$R_{DS(on)} = f(I_D); T_j = 150^\circ\text{C}; \text{parameter: } V_{GS}$

**Diagram 6: Typ. drain-source on-state resistance**



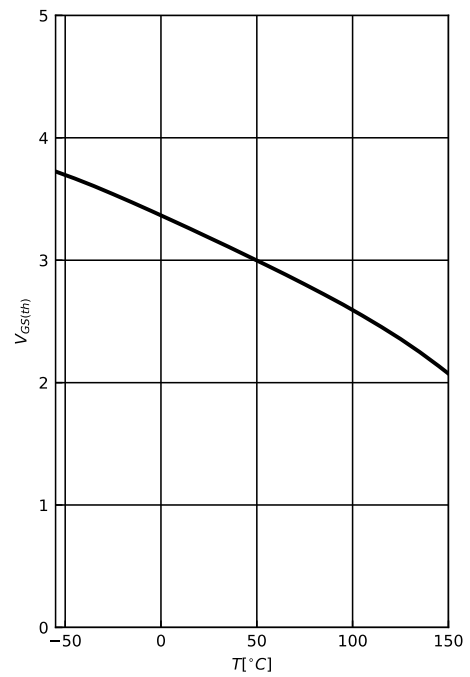
$R_{DS(on)} = f(T_j); I_D = 35\text{A}$

**Diagram 7: Typ. transfer characteristics**



$I_D = f(V_{GS}); V_{DS} = 20\text{V}; \text{parameter: } T_j$

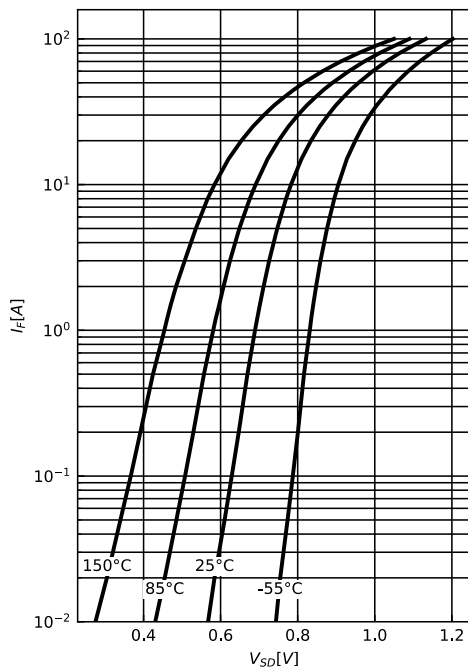
**Diagram 8: Typ. gate threshold voltage**



$V_{GS(th)} = f(T_j); I_D = 1\text{mA}$

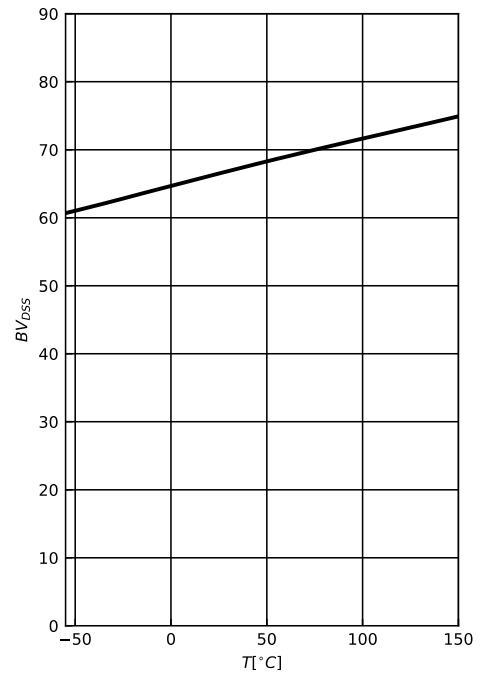
### Electrical characteristics diagrams

**Diagram 9: Forward characteristics of reverse diode**



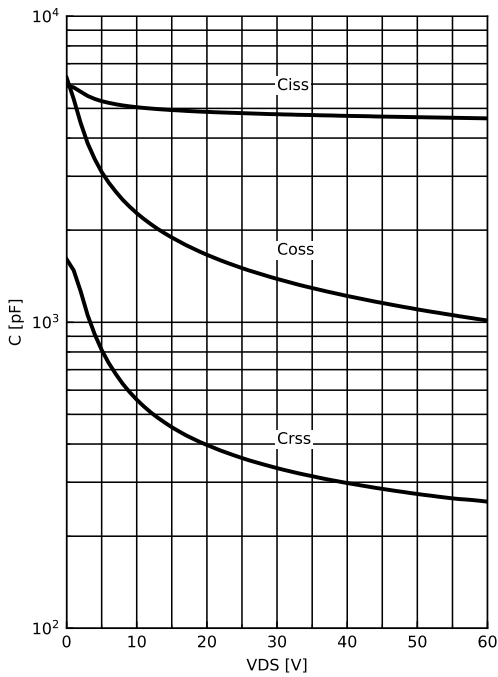
$I_F = f(V_{SD});$  parameter:  $T_j$

**Diagram 10: Drain-source breakdown voltage**



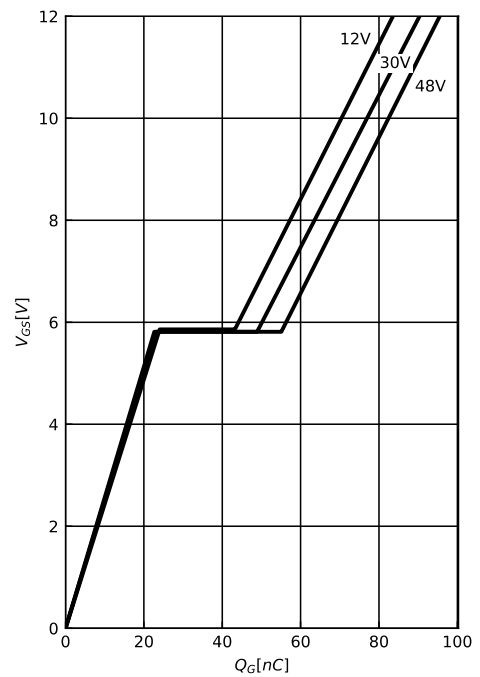
$BV_{DSS} = f(T_j); I_D = 250\mu A$

**Diagram 11: Typ. capacitances**



$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$

**Diagram 12: Typ. gate charge**

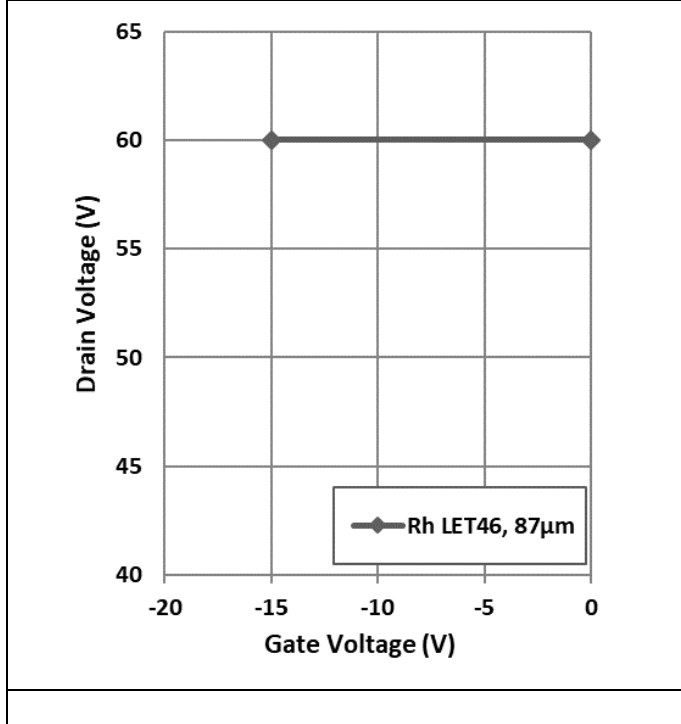


$V_{GS} = f(Q_{gate}); I_D = 45.0 A$  pulsed; parameter:  $V_{DD}$

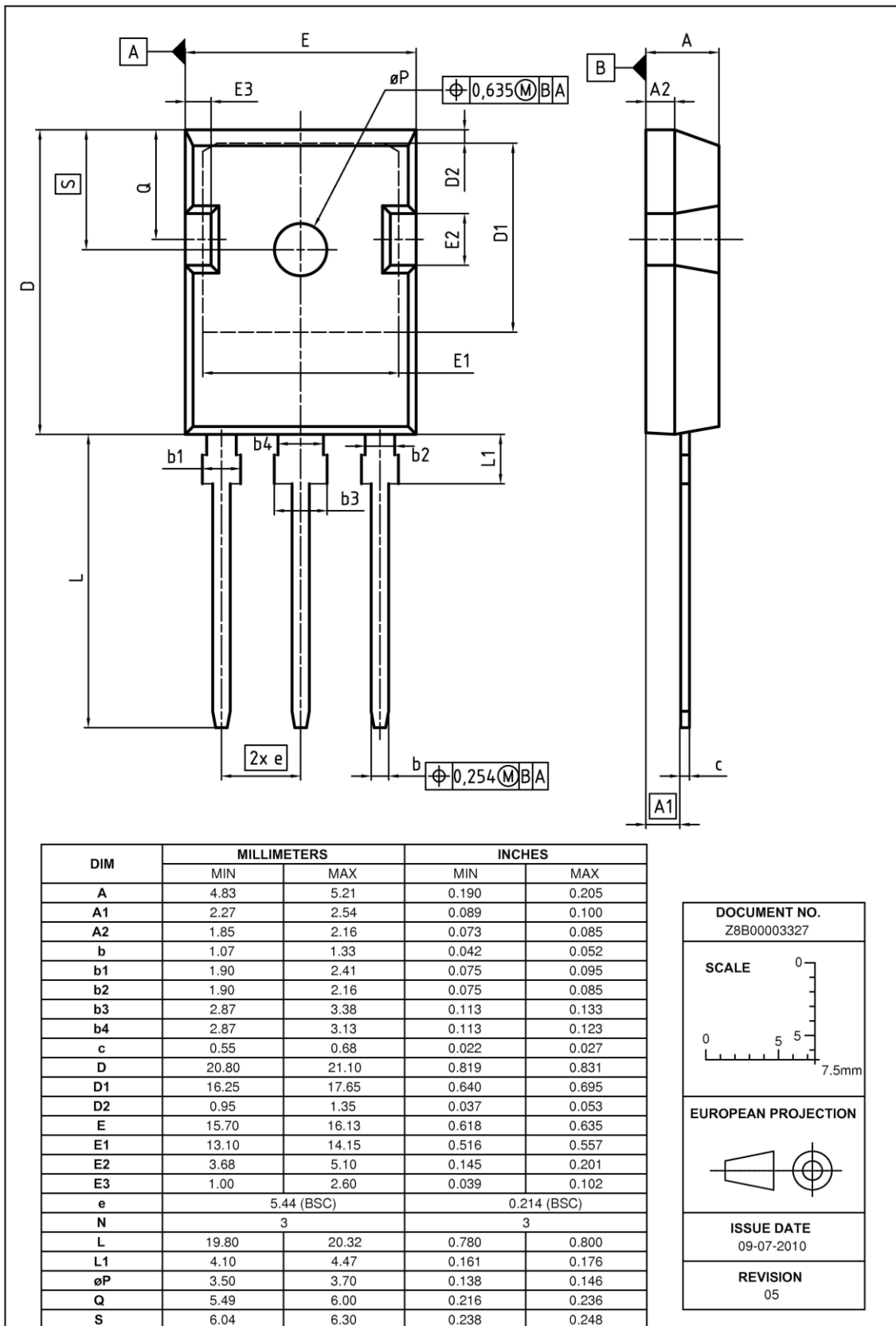


Electrical characteristics diagrams

Diagram 13: SEE - Safe operating area



## 5 Package outlines



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