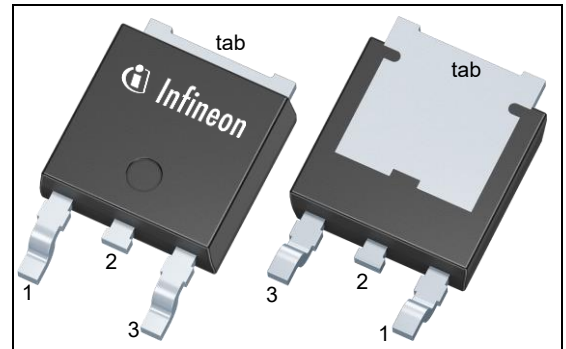


# 60V p-channel radiation tolerant power MOSFET

## BUP06CP045F-02

### Features

- LOW  $R_{DS(on)}$
- Single Event Effect (SEE) tolerant up to Linear Energy Transfer (LET) = 46 MeVcm<sup>2</sup>/mg
- Total Ionisation Dose (TID) tolerant up to 50 kRad(Si)
- P-channel



### Product validation

Qualified for space applications according to the relevant tests of AEC-Q101

TID irradiation according to ESCC 22900 standard<sup>1</sup>

### Description

**Table 1** Product information

Type	Comment	Pin Configuration			Package
		1	2 (tab)	3	
BUP06CP045F-02		G	D	S	DPAK (TO252)

<sup>1</sup> TID irradiation testing for this device conforms to the ESCC 22900 standard. Parameters specified in this datasheet reflect post irradiation performance only. Rad report can be provided by request. Please contact sales to request a report.

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## 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>	$I_D$	-	-	-35 -28	A	$T_C = 25\text{ °C}$ $T_C = 100\text{ °C}$
Continuous source current	$I_S$	-	-	-35	A	
Drain current pulsed	$I_{DM}$	-	-	-140	Apk	
Total power dissipation <sup>2</sup>	$P_{tot}$	-	-	125	W	$T_C \leq 25\text{ °C}$
Operating temperature	$T_{op}$	-55	-	175	°C	
Junction temperature	$T_j$	-55	-	175	°C	
Storage temperature	$T_{stg}$	-55	-	175	°C	
Avalanche energy	$E_{AS}$	-	-	500	mJ	$I_D = -35A, R_{GS} = 25\ \Omega$

<sup>1</sup> Limited by junction temperature

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

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{th,JC}$	-	-	1.2	K/W	
Thermal resistance, junction - ambient	$R_{th,JA}$	-	-	75	K/W	Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm <sup>2</sup> (one layer, 70 μm thickness) copper area for drain connection. PCB is vertical without air stream cooling
Soldering temperature	$T_{sol}$	-	-	260	°C	1.6 mm (0.063 in.) from case for 10 s

### 3 Electrical characteristics

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

**Table 4 Static characteristics**

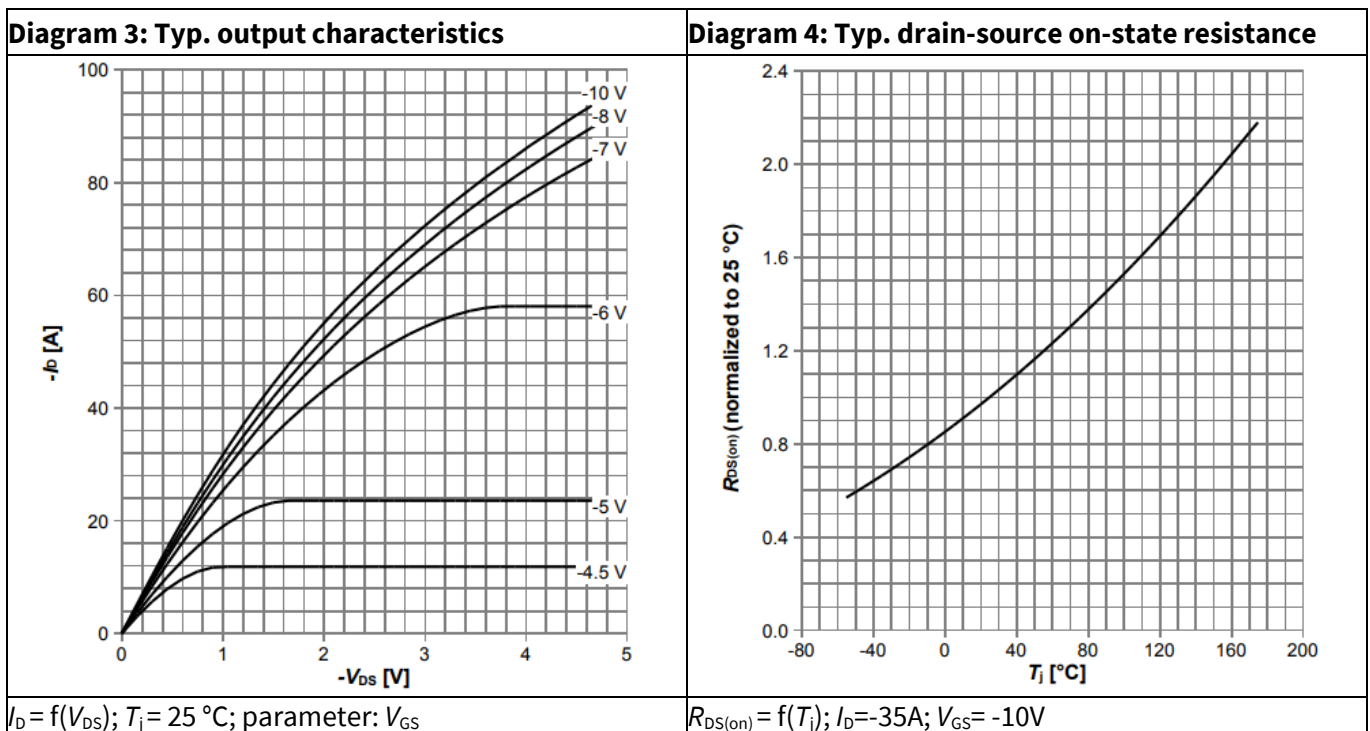
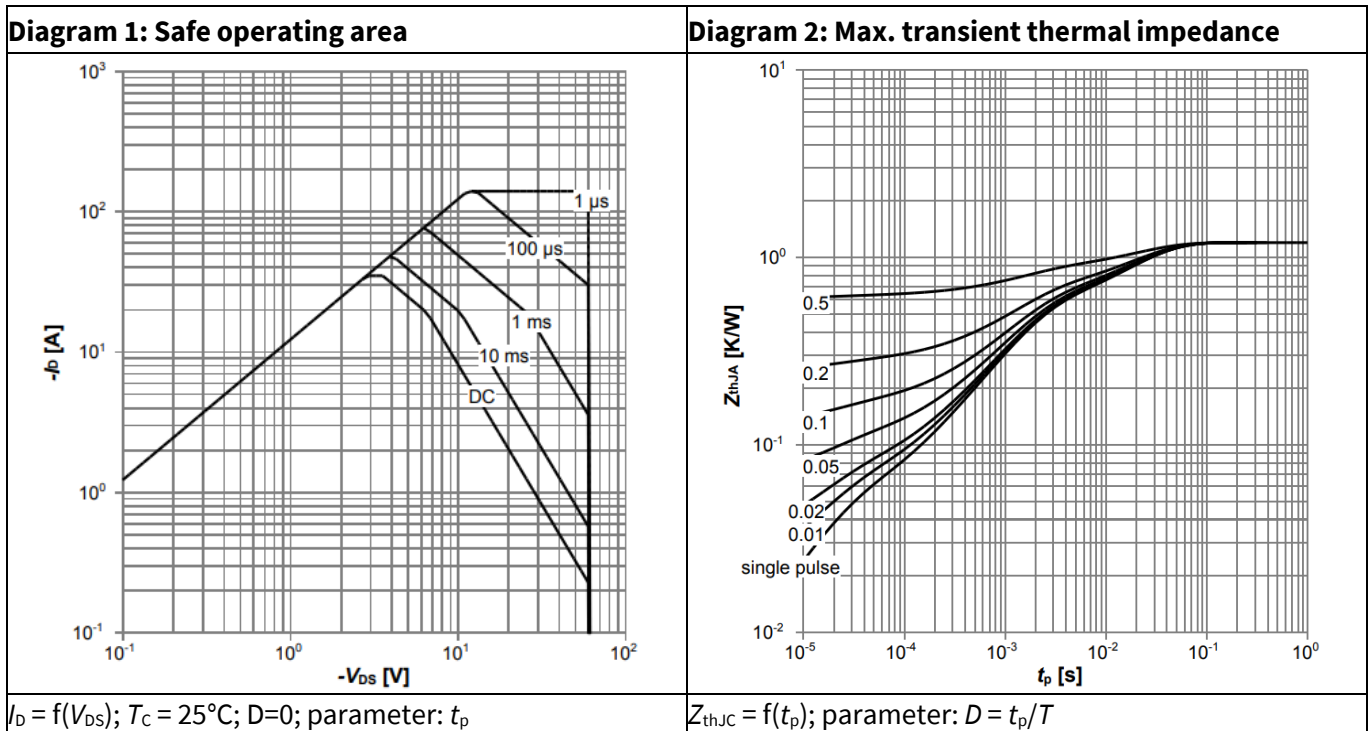
Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$BV_{DSS}$	-60	-	-	V	$I_D = 1 \text{ mA}, V_{GS} = 0 \text{ V}$
Gate threshold voltage	$V_{GS(th)}$	-2	-3	-6	V	$I_D = -1.7 \text{ mA}, V_{DS} = V_{GS}$
Gate to source leakage current	$I_{GSS}$	-	-10	-100	nA	$V_{DS} = 0 \text{ V}, V_{GS} = +/- 20 \text{ V}$
Zero gate voltage drain current	$I_{DSS}$	-	-0.1	-1	$\mu\text{A}$	$V_{DS} = -48 \text{ V}, V_{GS} = 0 \text{ V}, T_A = 25^\circ\text{C}$ $V_{DS} = -48 \text{ V}, V_{GS} = 0 \text{ V}, T_A = 125^\circ\text{C}$
Drain source on-state resistance <sup>1</sup>	$R_{DS(ON)}$	-	35	45	m $\Omega$	$V_{GS} = -10 \text{ V}, I_D = -35 \text{ A}$
Diode forward voltage	$V_{SD}$	-	-1.2	-1.6	V	$V_{GS} = 0 \text{ V}, I_S = -35 \text{ A}$

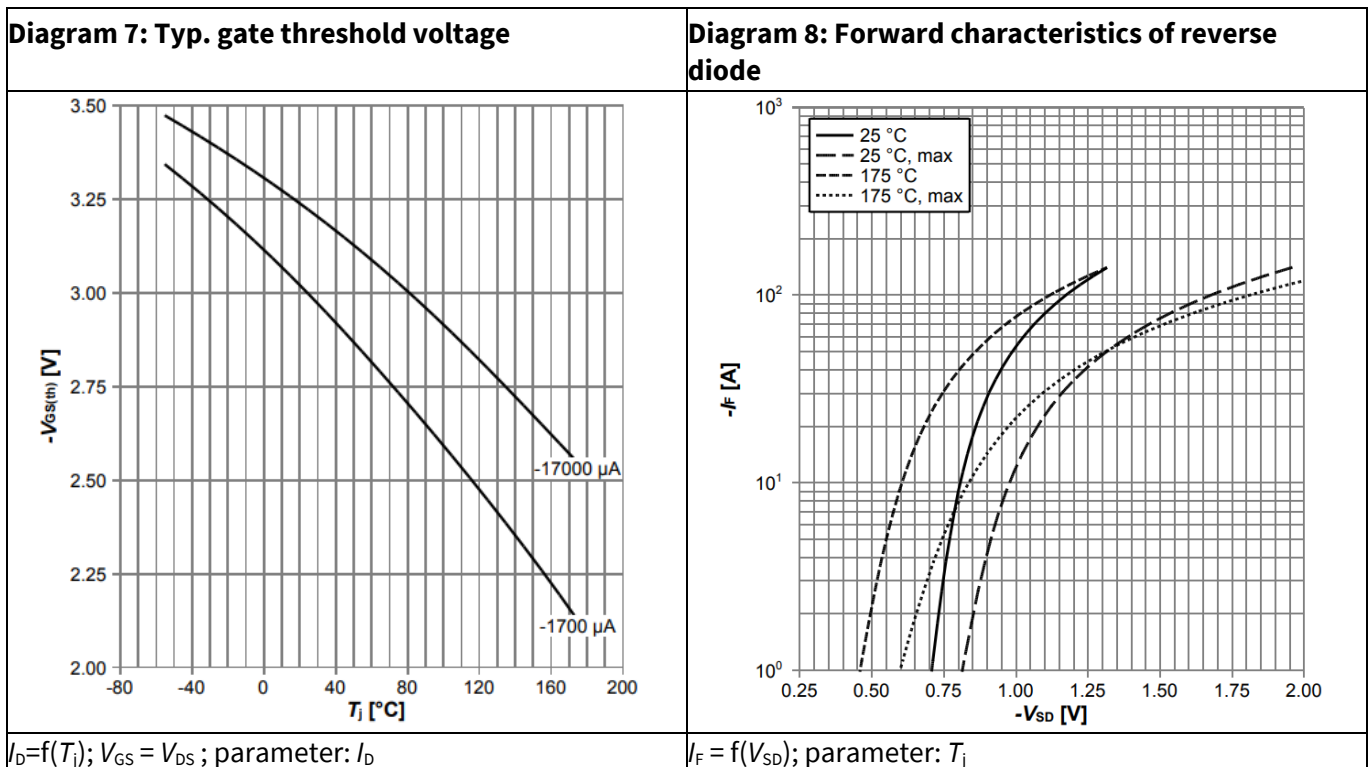
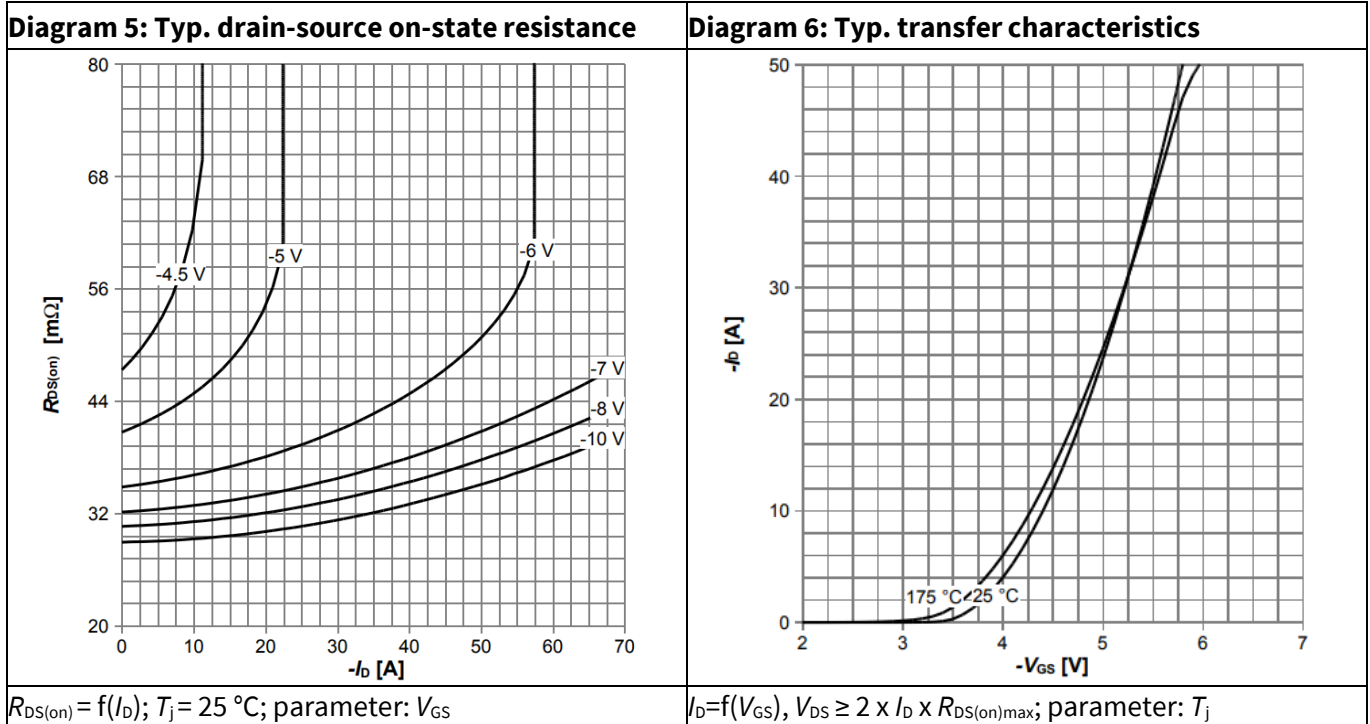
**Table 5 Dynamic characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Turn-on delay time	$t_{d(ON)}$	-	16	-	ns	$V_{DD} = -30 \text{ V}, V_{GS} = -10 \text{ V},$ $I_D = -17.5 \text{ A}, R_G = 1.6 \Omega$
Rise time	$t_r$	-	20	-	ns	$V_{DD} = -30 \text{ V}, V_{GS} = -10 \text{ V},$ $I_D = -17.5 \text{ A}, R_G = 1.6 \Omega$
Turn-off delay time	$t_{d(OFF)}$	-	47	-	ns	$V_{DD} = -30 \text{ V}, V_{GS} = -10 \text{ V},$ $I_D = -17.5 \text{ A}, R_G = 1.6 \Omega$
Fall time	$t_f$	-	20	-	ns	$V_{DD} = -30 \text{ V}, V_{GS} = -10 \text{ V},$ $I_D = -17.5 \text{ A}, R_G = 1.6 \Omega$
Reverse recovery time	$t_{rr}$	-	65	-	ns	$V_{DD} = -30 \text{ V}, I_F = I_S,$ $di_F/dt = 100 \text{ A}/\mu\text{s}$
Common source input capacitance	$C_{iss}$	-	2.5	-	nF	$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$
Common source output capacitance	$C_{oss}$	-	355	-	pF	$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$
Common source reverse transfer capacitance	$C_{rss}$	-	83	-	pF	$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$
Total gate charge	$Q_G$	-	65	-	nC	$V_{DD} = -30 \text{ V}, V_{GS} = 0 \text{ to } -10 \text{ V},$ $I_D = -35 \text{ A}$

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

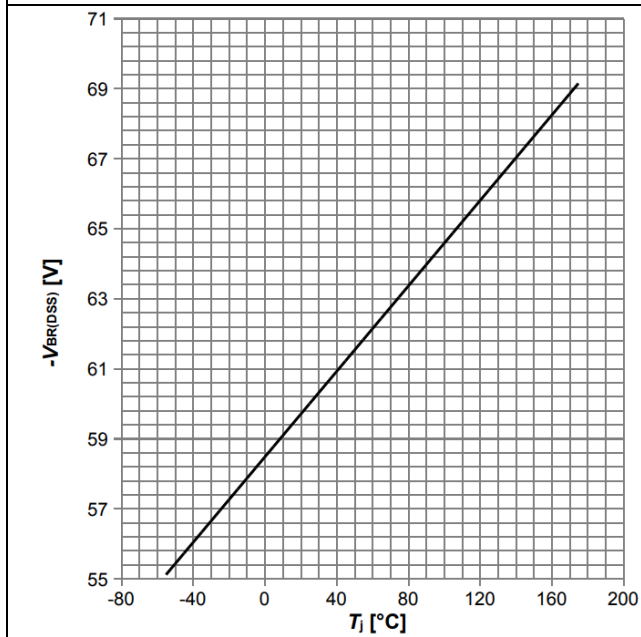
## 4 Electrical characteristics diagrams





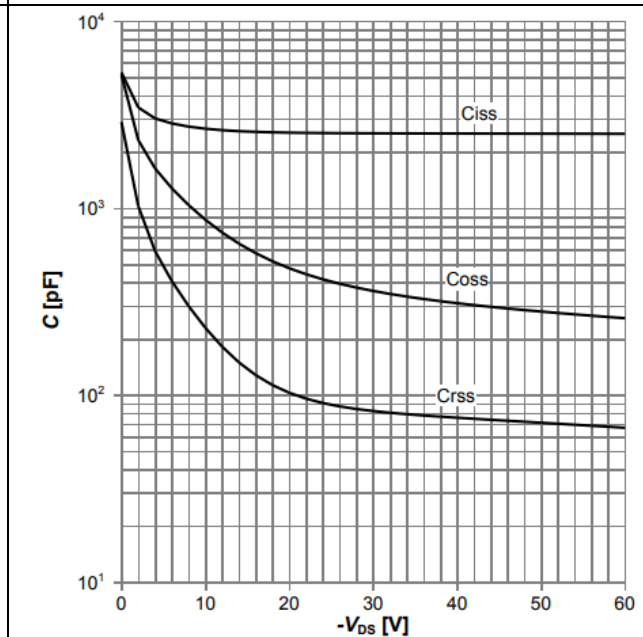
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**Diagram 9: Drain-source breakdown voltage**



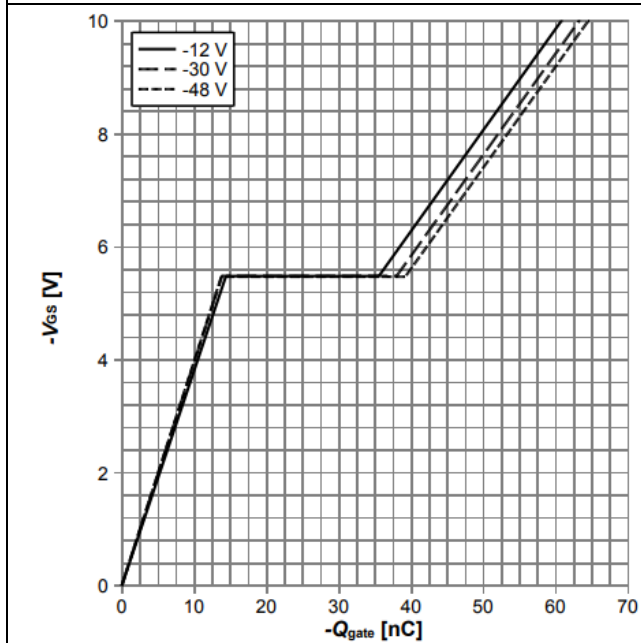
$BV_{DSS} = f(T_J); I_D = -250\mu A$

**Diagram 10: Typ. capacitances**



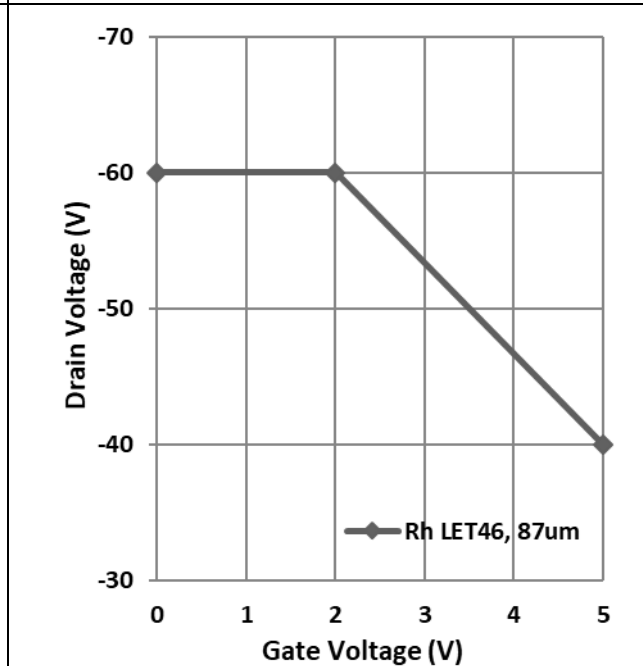
$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$

**Diagram 11: Typ. gate charge**



$V_{GS} = f(Q_{gate}); I_D = -35.0 A$  pulsed; parameter:  $V_{DD}$

**Diagram 12: SEE - Safe operating area**





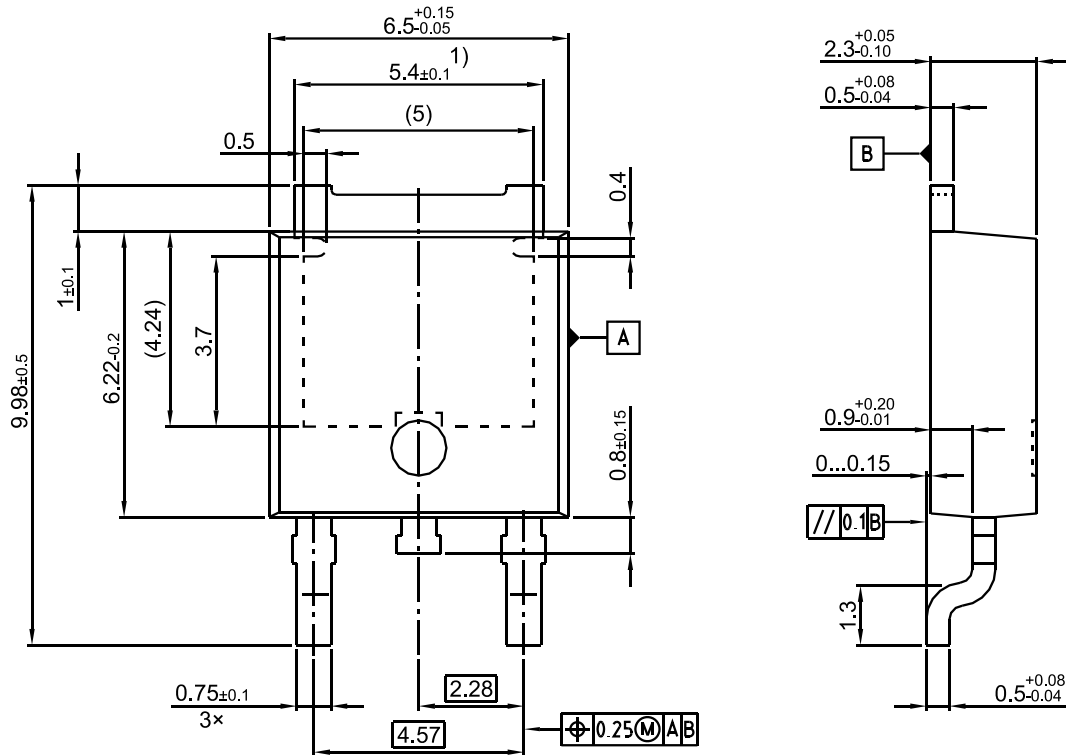
**5            Package outlines and footprint**

# 60V p-channel radiation tolerant power MOSFET

BUP06CP045F-02



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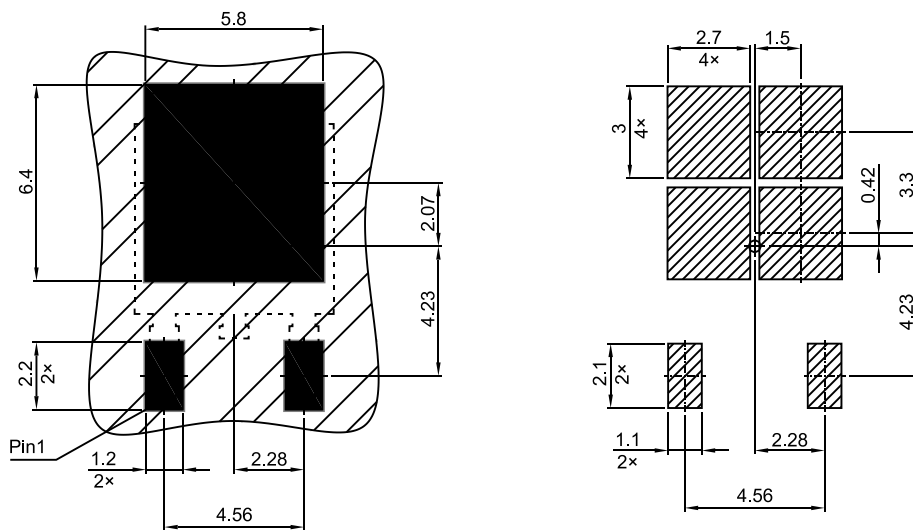


1) +0.22 mold flash

All metal surfaces tin plated except area of cut

All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1 [ ]



copper

solder mask

stencil apertures

All dimensions are in units mm  
All pads are solder mask defined

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