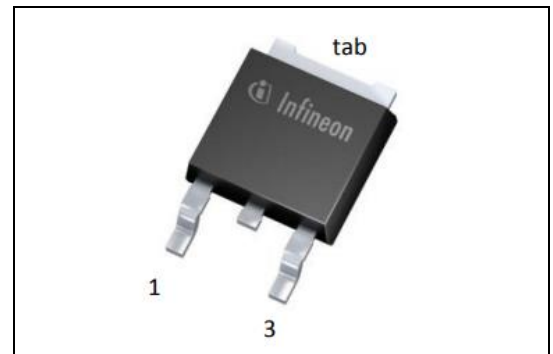


60V p-channel Radiation Tolerant power MOSFET

BUP06CP038F-01

Features

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



RoHS



Product validation

Qualified for space applications according to the relevant tests of 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 (tab)	3	
BUP06CP038F-01		G	D	S	DPAK (TO252)

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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 ¹	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 ²	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	$I_D = -35\text{ A}, R_{GS} = 25\text{ }\Omega$

¹ Limited by junction temperature² 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	$R_{th,JC}$	-	-	1.2	K/W	
Thermal resistance, junction - ambient	$R_{th,JA}$	-	-	75	K/W	Device on 40mm*40mm *1.5mm epoxy PCB FR4 with 6cm ² (one layer, 70μm 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

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	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{V}$
Gate threshold voltage	$V_{GS(th)}$	-2	-3	-5	V	$I_D = -1.7\text{ mA}$, $V_{DS} = V_{GS}$
Gate to source leakage current	I_{GSS}	-	-10	-100	nA	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$
Zero gate voltage drain current	I_{DSS}	-	-0.1	-1	μA	$V_{DS} = -48\text{V}$, $V_{GS} = 0\text{V}$, $T_A = 25^\circ\text{C}$ $V_{DS} = -48\text{V}$, $V_{GS} = 0\text{V}$, $T_A = 125^\circ\text{C}$
Drain source on-state resistance ¹	$R_{DS(ON)}$	-	32	38	m Ω	$V_{GS} = -10\text{V}$, $I_D = -35\text{A}$
Diode forward voltage	V_{SD}	-	-1.2	-1.6	V	$V_{GS} = 0\text{V}$, $I_S = -35\text{A}$

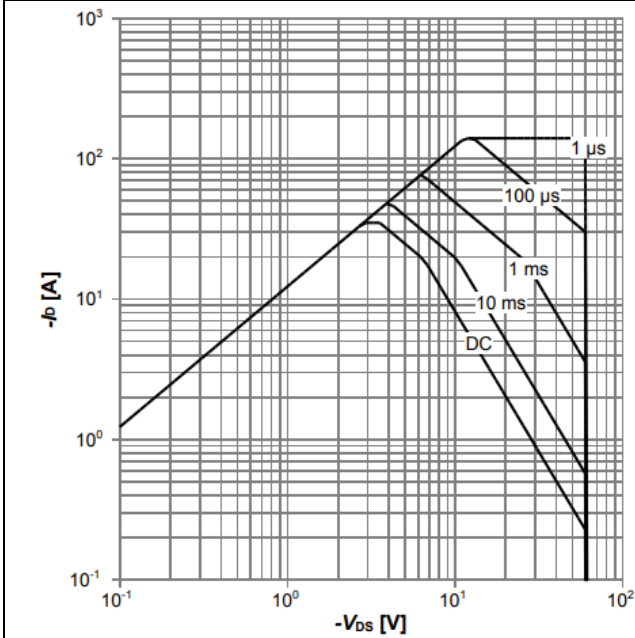
Table 5 Dynamic characteristics

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	-	19	-	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	-	19	-	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}	-	63	-	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}	-	0.36	-	nF	$V_{DS} = -30\text{V}$, $V_{GS} = 0\text{V}$, $f = 1.0\text{MHz}$
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	-	63	-	nC	$V_{DD} = -30\text{V}$, $V_{GS} = 0\text{ to } -10\text{V}$, $I_D = -35\text{A}$

¹ Pulsed measurement: Pulse Width < 300 μs , Duty Cycle < 2.0%.

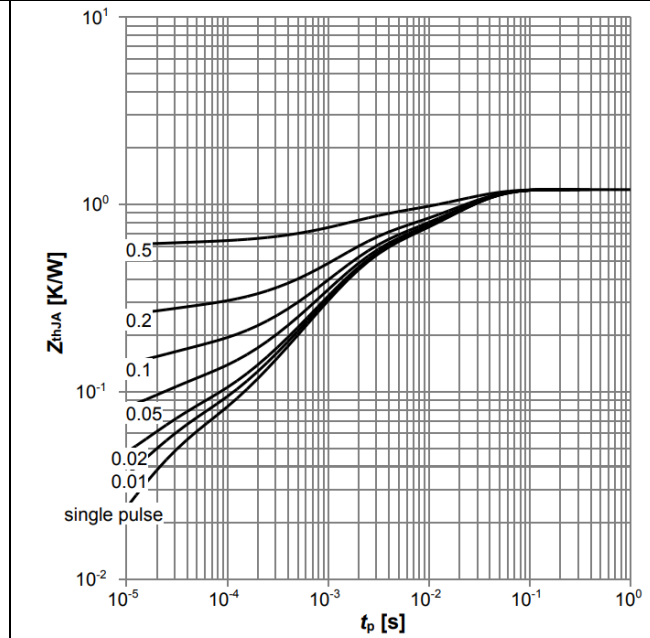
4 Electrical characteristics diagrams

Diagram 1: Safe operating area



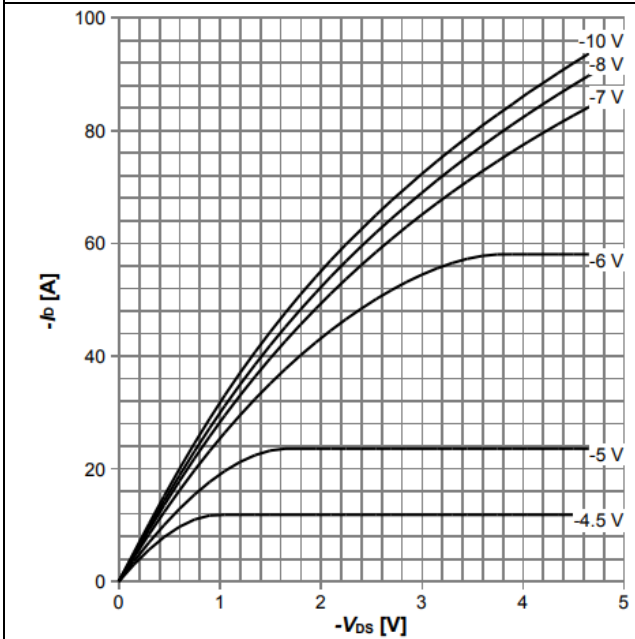
$I_D = f(V_{DS}); T_C = 25^\circ\text{C}; D=0; \text{parameter: } t_p$

Diagram 2: Max. transient thermal impedance



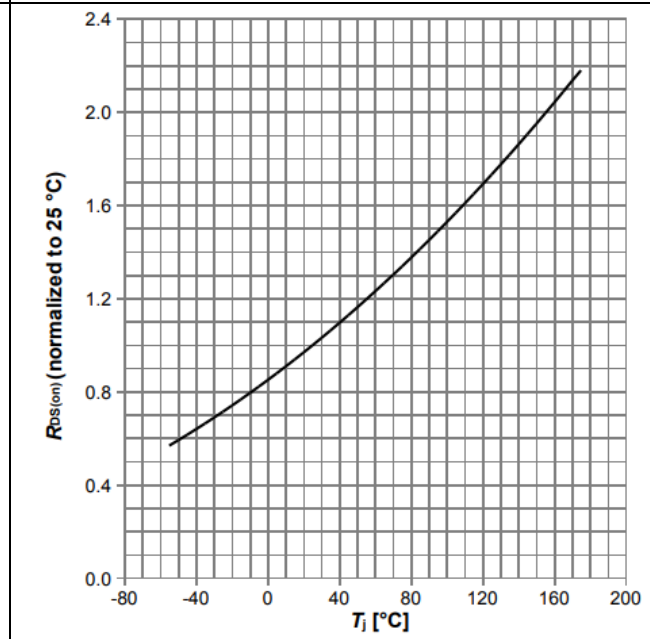
$Z_{thJC} = f(t_p); \text{parameter: } D = t_p/T$

Diagram 3: Typ. output characteristics



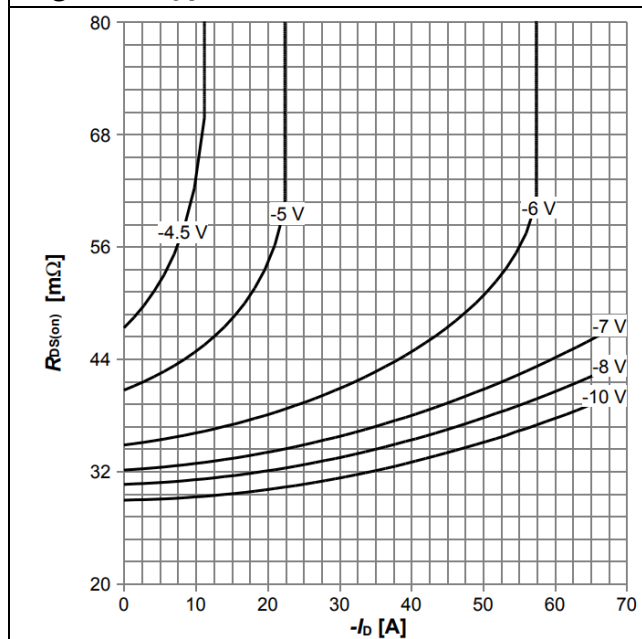
$I_D = f(V_{DS}); T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 4: Typ. drain-source on-state resistance



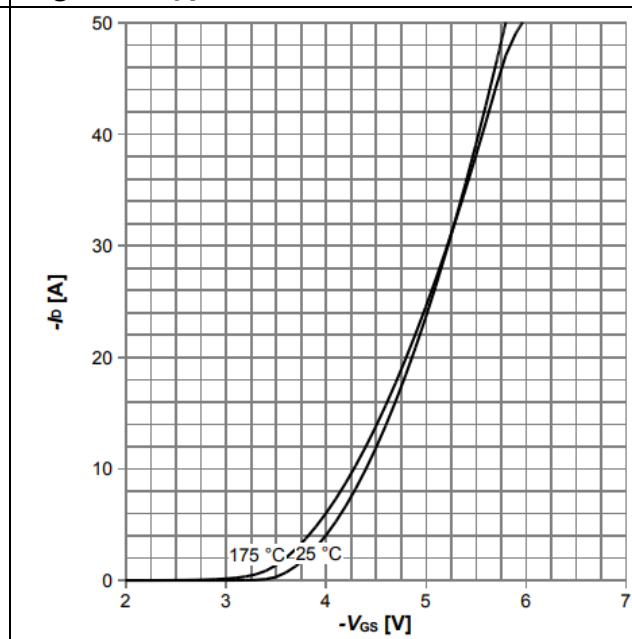
$R_{DS(on)} = f(T_J); I_D = -35\text{A}; V_{GS} = -10\text{V}$

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



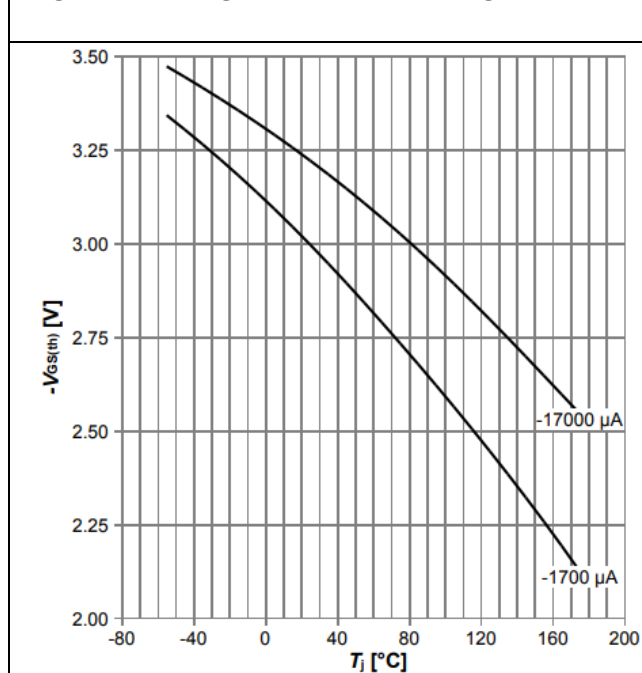
$R_{DS(on)} = f(I_D)$; $T_j = 25^\circ\text{C}$; parameter: V_{GS}

Diagram 6: Typ. transfer characteristics



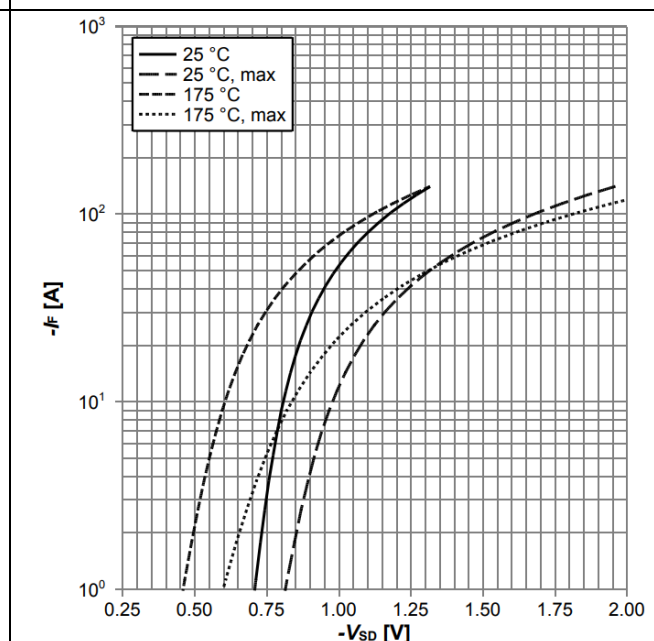
$I_D = f(V_{GS})$, $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$; parameter: T_j

Diagram 7: Typ. gate threshold voltage



$I_D = f(T_j)$; $V_{GS} = V_{DS}$; parameter: I_D

Diagram 8: Forward characteristics of reverse diode



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

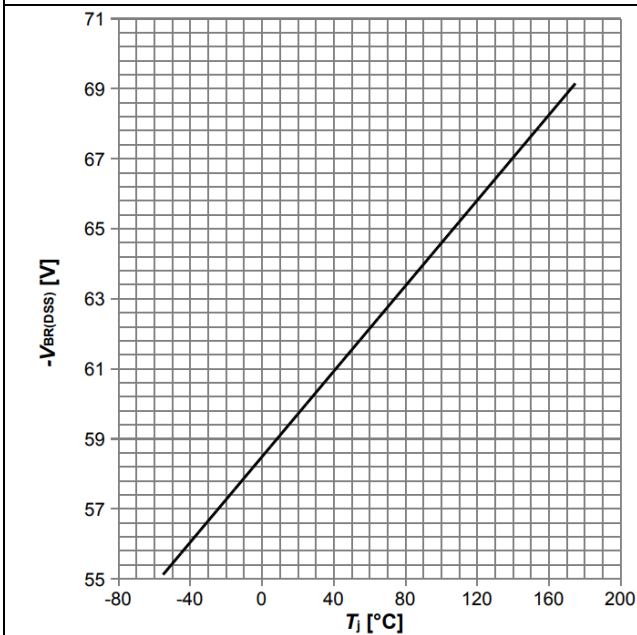
60V p-channel Radiation Tolerant power MOSFET

BUP06CP038F-01



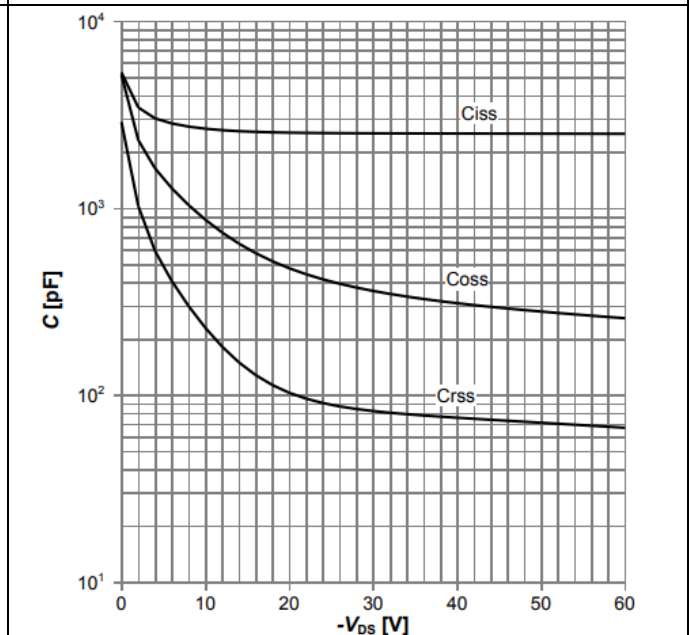
Electrical characteristics diagrams

Diagram 9: Drain-source breakdown voltage



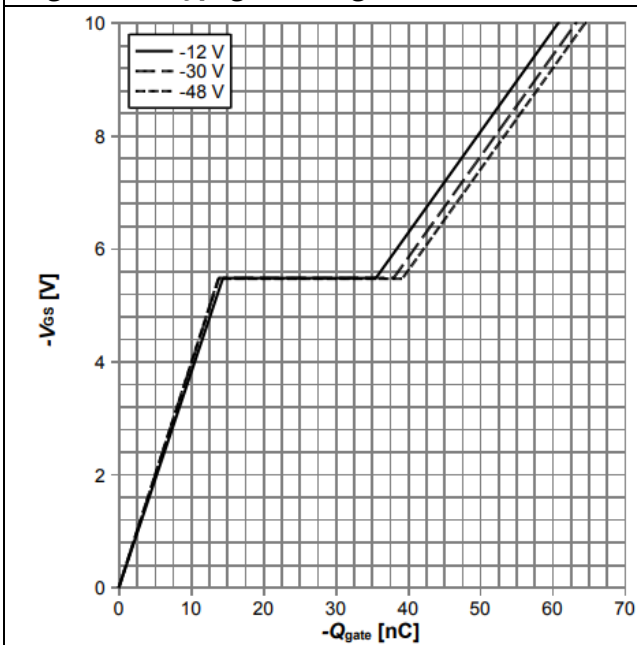
$BV_{DSS} = f(T_J); I_D = -250 \mu A$

Diagram 10: Typ. capacitances



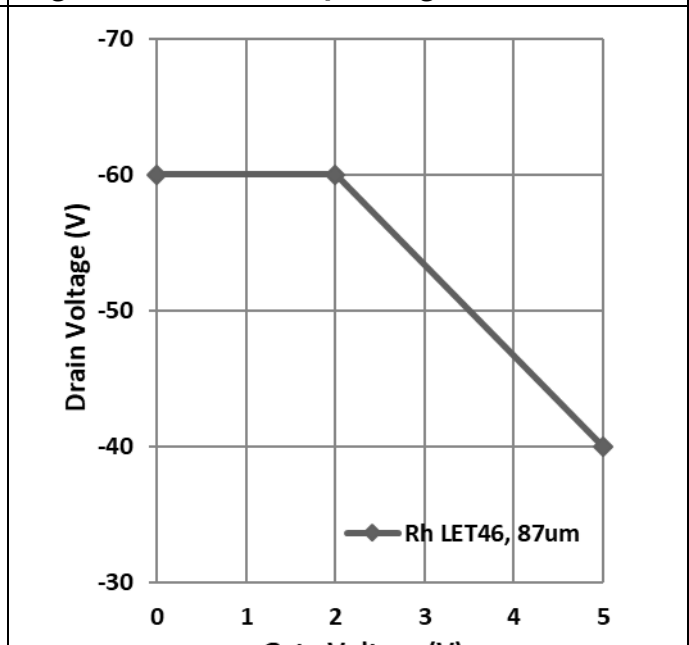
$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$

Diagram 11: Typ. gate charge

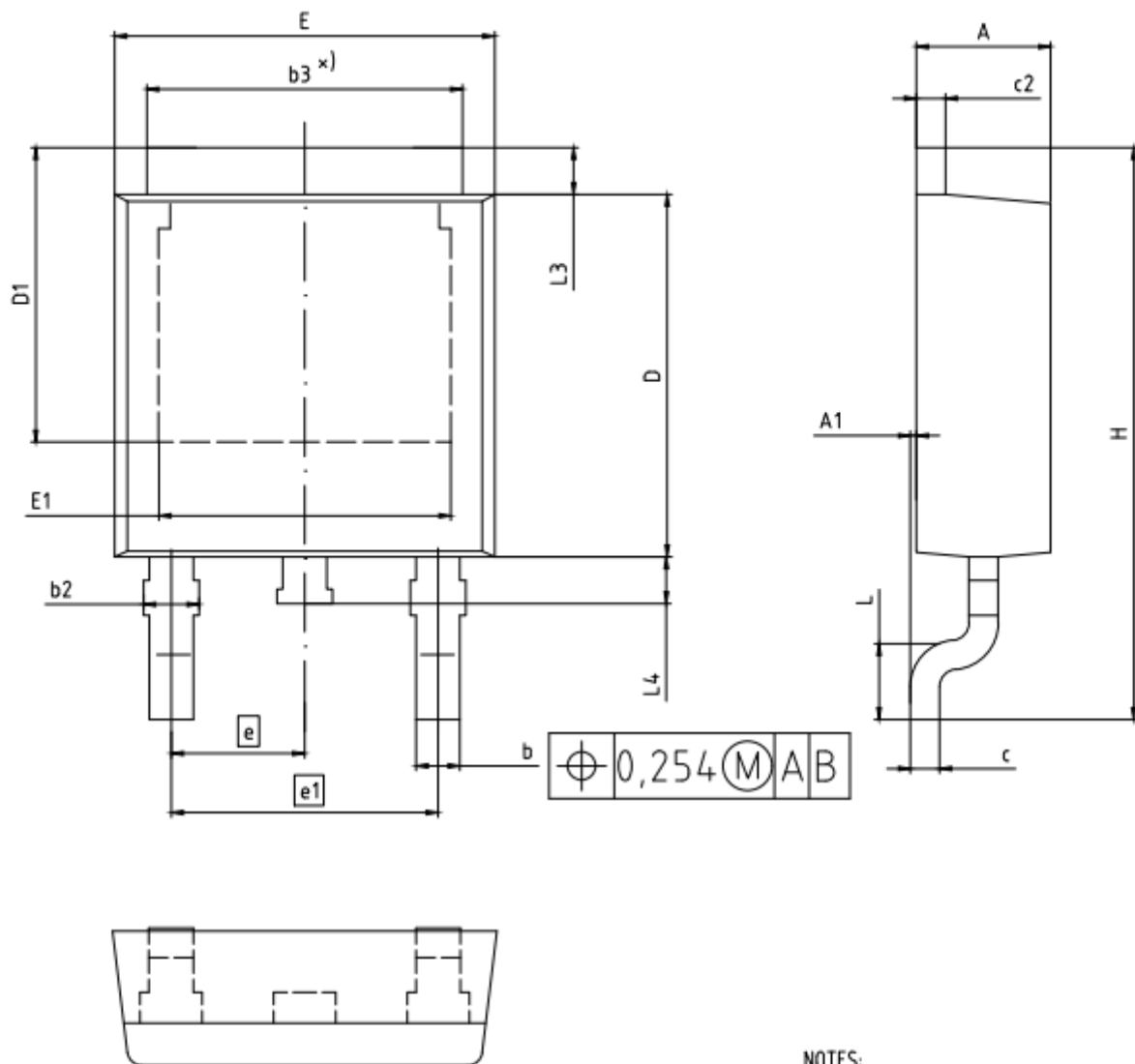


$V_{GS} = f(Q_{gate}); I_D = -35.0 A$ pulsed; parameter: V_{DD}

Diagram 12: SEE - Safe operating area



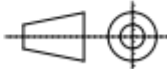
5 Package outlines



NOTES:

1. INDUSTRIAL QUALITY GRADE
2. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-252 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.16	2.41	0.085	0.095
A1	0.00	0.15	0.000	0.006
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b3	4.95	5.50	0.195	0.217
c	0.46	0.61	0.018	0.024
c2	0.40	0.98	0.016	0.039
D	5.97	6.22	0.235	0.245
D1	5.02	5.84	0.198	0.230
E	6.35	6.73	0.250	0.265
E1	4.32	5.21	0.185	0.205
e	2.29 (BSC)		0.090 (BSC)	
e1	4.57 (BSC)		0.180 (BSC)	
N	3		3	
H	9.40	10.48	0.370	0.413
L	1.18	1.78	0.046	0.070
L3	0.89	1.27	0.035	0.050
L4	0.51	1.02	0.020	0.040

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