

1. General description

WSJ3M65R065D is a high voltage N-channel MOSFET in TO220 package, which utilizes the advanced super-junction technology to provide superior FOM $R_{DS(on)} \cdot Q_g$ among silicon based MOSFETs. It is particularly suitable for applications require extreme high efficiency and power density.



2. Features and benefits

- Superior FOM $R_{DS(on)} \cdot Q_g$
- Extremely low switching loss
- Integrated ultrafast body diode
- 100% avalanche tested

3. Applications

- Telecom and server power supplies
- LED lighting
- LEV charger
- LLC applications

4. Quick reference data

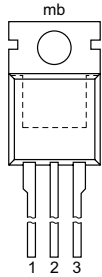
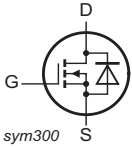
Table 1. Quick reference data

Table 11: Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V _{DS}	drain-source voltage			650			V
V _{GS}	gate-source voltage	static		±20			V
V _{GS}	gate-source voltage	dynamic AC (f > 1 HZ)		±30			V
I _D	continuous drain current	T _C = 25 °C		42			A
P _{tot}	power dissipation	T _C = 25 °C		298			W
T _j	junction temperature			-55 to 150			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
R _{DS(on)}	drain-source on-state resistance	V _{GS} = 10 V, I _D = 21 A		-	54	65	mΩ
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 21 A; V _{DS} = 400 V; V _{GS} = 10 V		-	82	-	nC
E _{OSS}	coss stored energy	V _{GS} = 0 V; V _{DS} = 0 to 400 V		-	9.4	-	μJ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WSJ3M65R065D	TO220	WSJ3M65R065DQ	Tube	50	SOT78	13-Jun-2008

7. Marking

Table 4. Marking codes

Type number	Marking codes
WSJ3M65R065D	WSJ3M 65R065D

8. Limiting values

Table 5. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Notes	Values	Unit
V_{DS}	drain-source voltage			650	V
V_{GS}	gate-source voltage	static		± 20	V
V_{GS}	gate-source voltage	dynamic AC ($f > 1\text{ Hz}$)		± 30	V
I_D	continuous drain current	$T_C = 25\text{ }^\circ\text{C}$		42	A
		$T_C = 100\text{ }^\circ\text{C}$		27	A
I_{DM}	pulsed drain current	$T_C = 25\text{ }^\circ\text{C}$		168	A
P_{tot}	power dissipation	$T_C = 25\text{ }^\circ\text{C}$		298	W
E_{AS}	single pulse drain-to-source avalanche	$I_{AS} = 8.4\text{ A}$; $R_{GS} = 25\text{ }\Omega$; $V_{DD} = 50\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$		352	mJ
E_{AR}	repetitive avalanche energy	$I_{AS} = 8.4\text{ A}$; $R_{GS} = 25\text{ }\Omega$; $V_{DD} = 50\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$		1.98	mJ
I_{AS}	avalanche current, single pulse			8.4	A
dv/dt	MOSFET dv/dt ruggedness			120	V/ns
dv/dt	reverse diode dv/dt			60	V/ns
dI _F /dt	maximum diode commutation speed			1000	A/ μs
T_{stg}	storage temperature			-55 to 150	$^\circ\text{C}$
T_j	junction temperature			-55 to 150	$^\circ\text{C}$

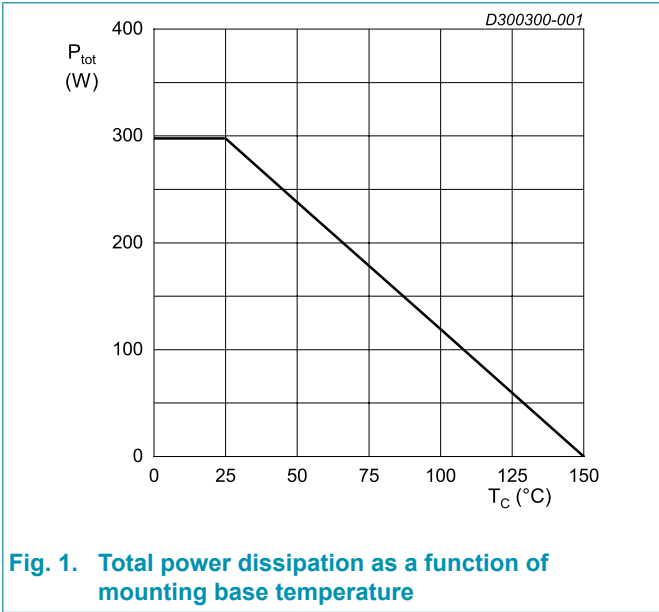


Fig. 1. Total power dissipation as a function of mounting base temperature

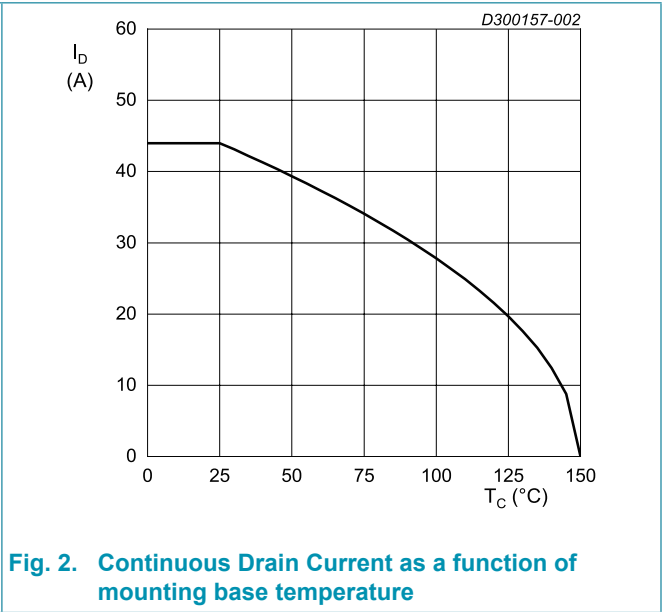
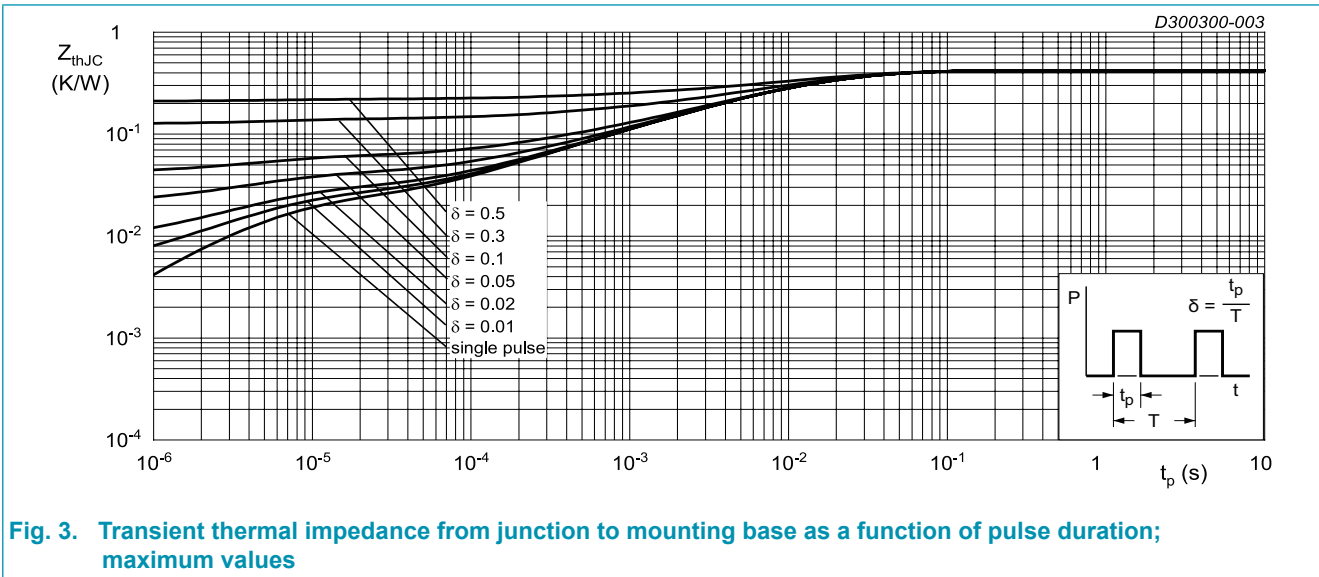


Fig. 2. Continuous Drain Current as a function of mounting base temperature

9. Thermal & Mechanical characteristics

Table 6. Thermal & Mechanical characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
R_{thJC}	thermal resistance from junction to mounting base			-	0.3	0.42	K/W
R_{thJA}	thermal resistance from junction to ambient	in free air		-	60	-	K/W



10. Characteristics

Table 7. Characteristics
 $T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 1 mA; V _{GS} = 0 V		650	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 250 μA; V _{DS} = V _{GS}		3.0	-	5.0	V
I _{DSS}	drain leakage current	V _{DS} = 650 V; V _{GS} = 0 V		-	-	20	μA
		V _{DS} = 650 V; V _{GS} = 0 V; T _j = 125 °C		-	-	1	mA
I _{GSS}	gate leakage current	V _{GS} = ±20 V; V _{DS} = 0 V		-	-	±100	nA
R _{DS(on)}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 21 A		-	54	65	mΩ
R _G	gate resistance	f = 1 MHz		-	1.3	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	I _D = 21 A; V _{DS} = 400 V; V _{GS} = 10 V		-	82	-	nC
Q _{GS}	gate-source charge			-	28	-	nC
Q _{GD}	gate-drain charge			-	34	-	nC
C _{iss}	input capacitance	V _{DS} = 400 V; V _{GS} = 0 V; f = 1 MHz		-	3368	-	pF
C _{oss}	output capacitance			-	61	-	pF
C _{rss}	reverse transfer capacitance			-	2.0	-	pF
C _{o(er)}	effective output capacitance, energy related	V _{GS} = 0 V; V _{DS} = 0 to 400 V		-	117	-	pF
C _{o(tr)}	effective output capacitance, time related			-	1021	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 400 V; V _{GS} = 10 V; R _G = 5 Ω; I _D = 21 A		-	62	-	ns
t _r	rise time			-	12	-	ns
t _{d(off)}	turn-off delay time			-	73	-	ns
t _f	fall time			-	3.5	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	V _{GS} = 0 V; I _S = 21 A		-	1.0	1.2	V
I _S	body-diode continuous current	T _C = 25 °C		-	-	42	A
t _{rr}	reverse recovery time	V _R = 400 V; I _F = 21 A; dI _F /dt = 100 A/μs		-	123	-	ns
Q _{rr}	reverse recovered charge			-	0.7	-	μC
I _{rrm}	reverse recovery current			-	11	-	A

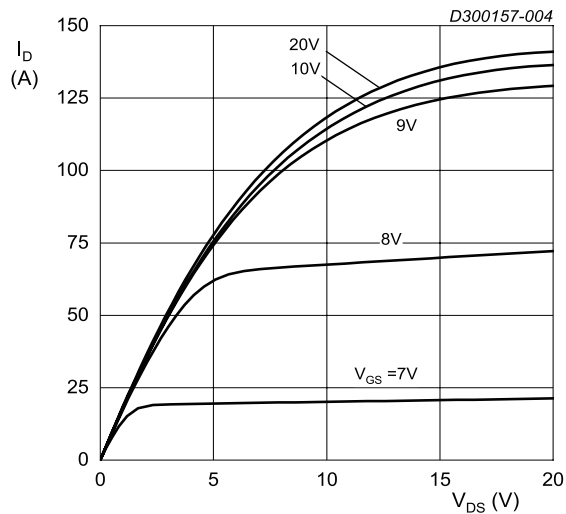


Fig. 4. Drain current as a function of drain-source voltage; typical values

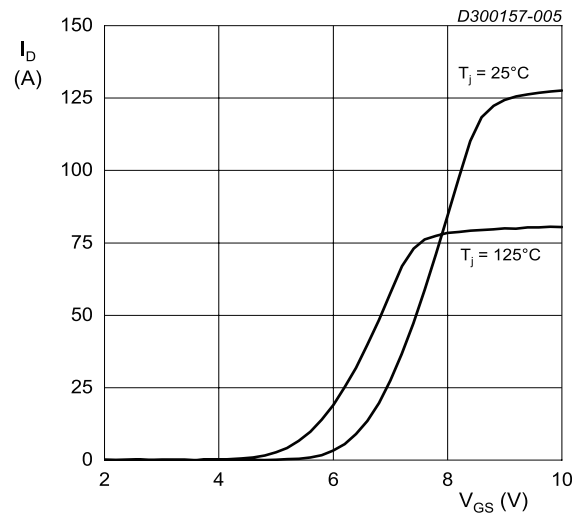


Fig. 5. Drain current as a function of gate-source voltage; typical values
 $V_{DS} = 20\text{ V}$

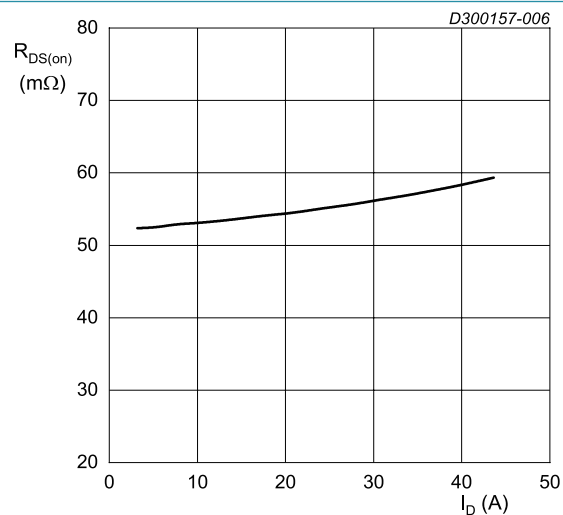


Fig. 6. Drain-source on-state resistance as a function of drain current; typical values
 $V_{GS} = 10\text{ V}$

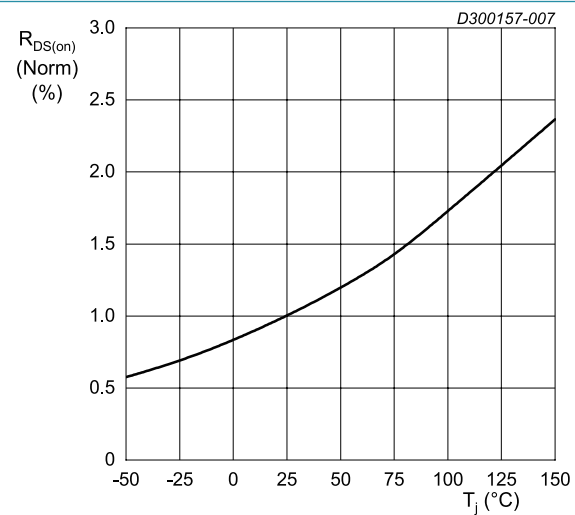
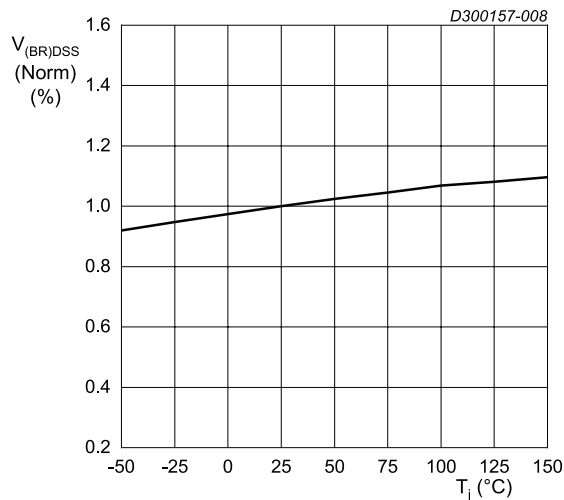
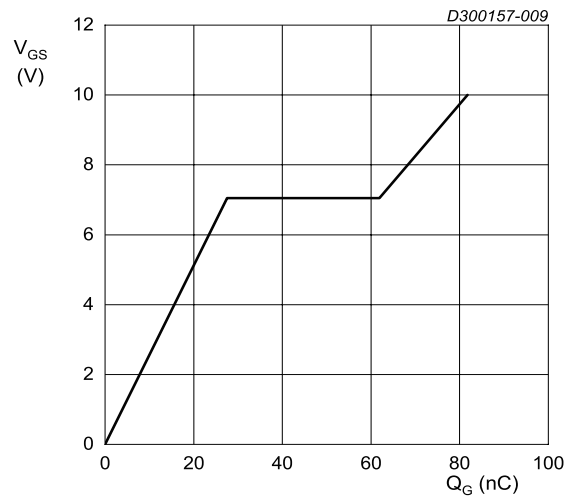


Fig. 7. Normalized drain-source on-state resistance as a function of junction temperature
 $V_{GS} = 10\text{ V}$; $I_D = 21\text{ A}$



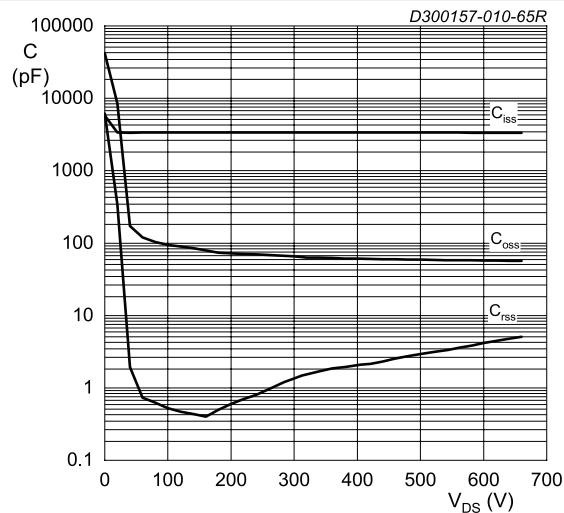
$I_D = 5 \text{ mA}$

Fig. 8. Normalized drain-source breakdown voltage as a function of junction temperature



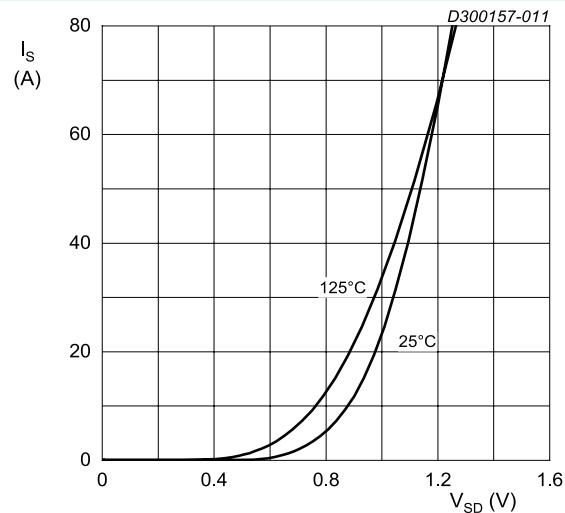
$I_D = 21 \text{ A}; V_{DS} = 400 \text{ V}$

Fig. 9. Gate-source voltage as a function of gate charge; typical values



$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig. 10. Capacitances as a function of drain-source voltage; typical values



$V_{GS} = 0 \text{ V}$

Fig. 11. Source current as a function of source-drain voltage; typical values

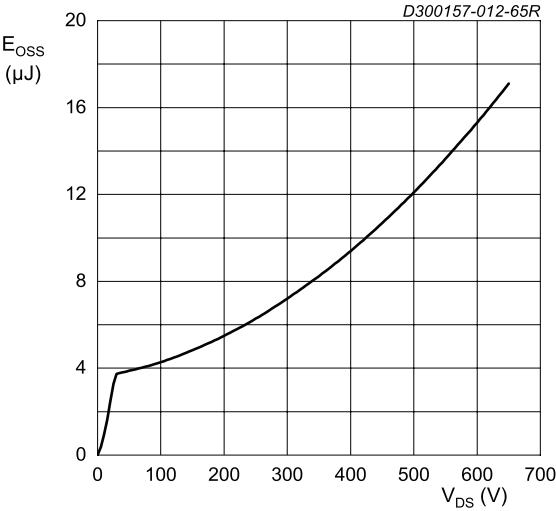
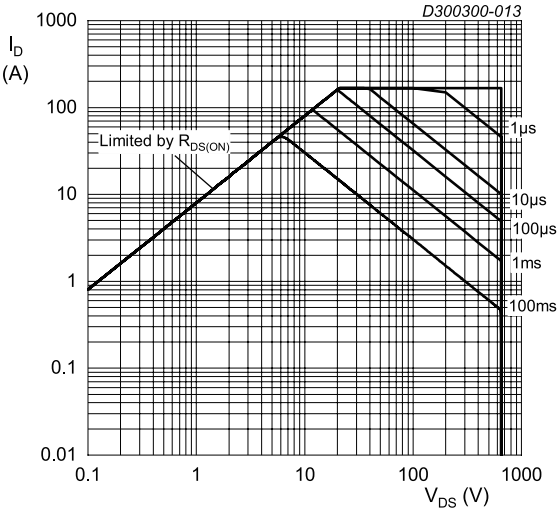


Fig. 12. Output capacitance stored energy as a function of drain-source voltage

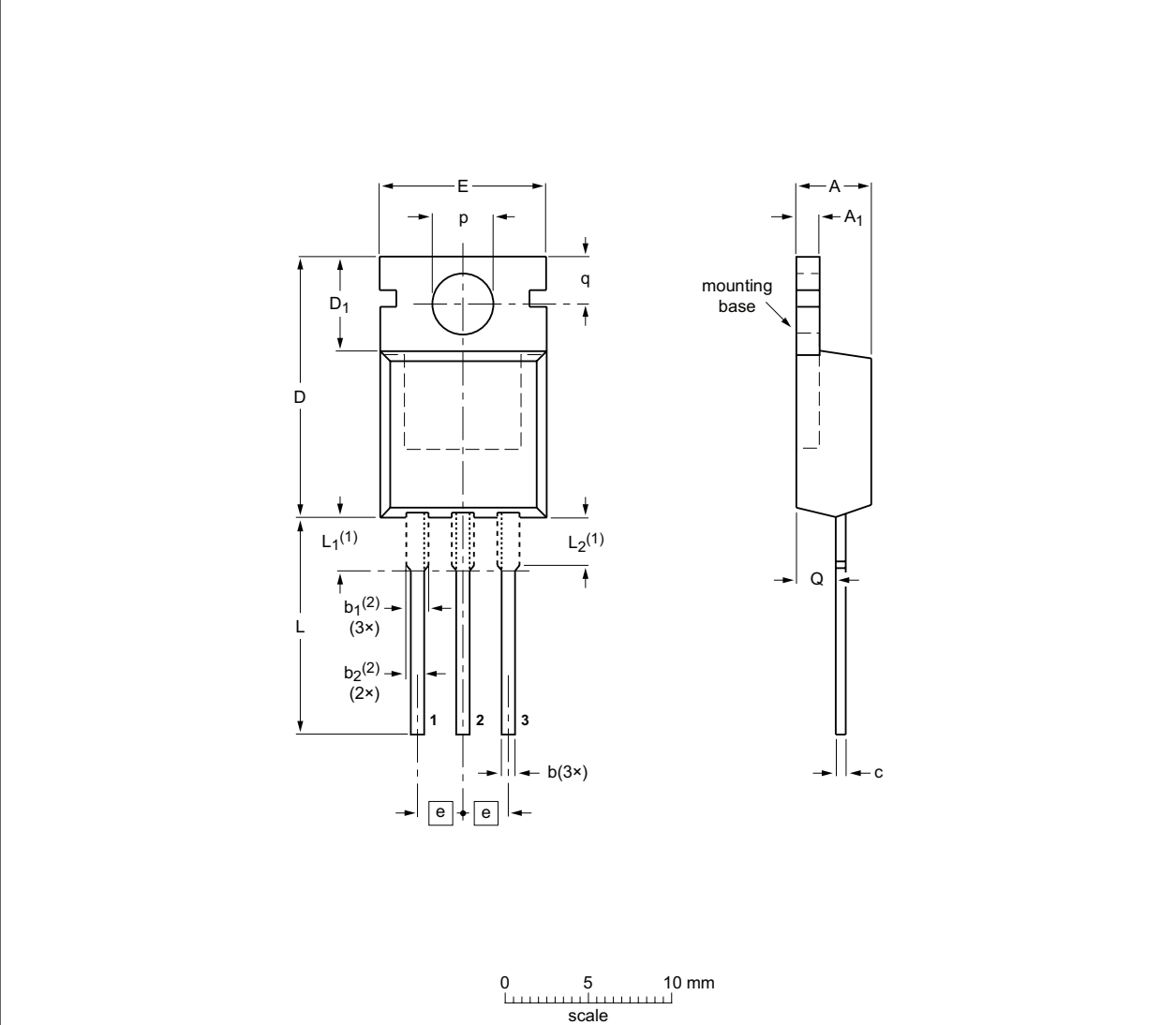


$T_C = 25^\circ C$
Fig. 13. Safe operating area

11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁ ⁽²⁾	b ₂ ⁽²⁾	c	D	D ₁	E	e	L	L ₁ ⁽¹⁾	L ₂ ⁽¹⁾ max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

- Notes
- 1. Lead shoulder designs may vary.
 - 2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			08-04-23 08-06-13

12. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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