

Table of Contents

Description 1

Maximum ratings 3

Thermal characteristics 3

Electrical characteristics 4

Electrical characteristics diagrams 6

Test Circuits 10

Package Outlines 11

Appendix A 13

Revision History 14

Trademarks 14

Disclaimer 14

1 Maximum ratings

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

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D	-	-	24.8 15.7	A	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	63	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	339	mJ	$I_D = 7.7\text{A}$; $V_{DD} = 50\text{V}$
Avalanche energy, repetitive	E_{AR}	-	-	0.51	mJ	$I_D = 7.7\text{A}$; $V_{DD} = 50\text{V}$
Avalanche current, repetitive	I_{AR}	-	-	7.7	A	-
MOSFET dv/dt ruggedness	dv/dt	-	-	50	V/ns	$V_{DS} = 0 \dots 400\text{V}$
Gate source voltage	V_{GS}	-20 -30	-	20 30	V	static; AC ($f > 1\text{ Hz}$)
Power dissipation (non FullPAK) TO-247, TO-220	P_{tot}	-	-	152	W	$T_C = 25^\circ\text{C}$
Operating and storage temperature	T_j, T_{stg}	-55	-	150	$^\circ\text{C}$	-
Mounting torque (non FullPAK) TO-247, TO-220	-	-	-	60	Ncm	M3 and M3.5 screws
Continuous diode forward current	I_S	-	-	17.6	A	$T_C = 25^\circ\text{C}$
Diode pulse current ²⁾	$I_{S,pulse}$	-	-	63.0	A	$T_C = 25^\circ\text{C}$
Reverse diode dv/dt ³⁾	dv/dt	-	-	15	V/ns	$V_{DS} = 0 \dots 400\text{V}$, $I_{SD} \leq I_S$, $T_j = 25^\circ\text{C}$, $t_{cond} < 2\mu\text{s}$
Maximum diode commutation speed ³⁾	di/dt	-	-	500	A/ μs	$V_{DS} = 0 \dots 400\text{V}$, $I_{SD} \leq I_S$, $T_j = 25^\circ\text{C}$, $t_{cond} < 2\mu\text{s}$

2 Thermal characteristics

Table 3 Thermal characteristics (non FullPAK) TO-247, TO-220

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.82	$^\circ\text{C/W}$	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	$^\circ\text{C/W}$	loaded
Soldering temperature, wavesoldering only allowed at leads	T_{sold}	-	-	260	$^\circ\text{C}$	1.6mm (0.063 in.) from case for 10s

¹⁾ Limited by $T_{j,max} < 150^\circ\text{C}$, Maximum Duty Cycle $D = 0.5$

²⁾ Pulse width t_p limited by $T_{j,max}$

³⁾ $V_{DClamp} = 400\text{V}$; $V_{DS,peak} < V_{(BR)DSS}$; identical low side and high side switch with identical R_G

3 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	500	-	-	V	$V_{GS}=0V, I_D=1mA$
Gate threshold voltage	$V_{(GS)th}$	2.50	3	3.50	V	$V_{DS}=V_{GS}, I_D=0.51mA$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=500V, V_{GS}=0V, T_j=25^\circ C$ $V_{DS}=500V, V_{GS}=0V, T_j=150^\circ C$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.17 0.45	0.19 -	Ω	$V_{GS}=13V, I_D=6.2A, T_j=25^\circ C$ $V_{GS}=13V, I_D=6.2A, T_j=150^\circ C$
Gate resistance	R_G	-	3	-	Ω	$f=1\text{ MHz}$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	1137	-	pF	$V_{GS}=0V, V_{DS}=100V, f=1MHz$
Output capacitance	C_{oss}	-	68	-	pF	$V_{GS}=0V, V_{DS}=100V, f=1MHz$
Effective output capacitance, energy related ¹⁾	$C_{o(er)}$	-	56	-	pF	$V_{GS}=0V, V_{DS}=0...400V$
Effective output capacitance, time related ²⁾	$C_{o(tr)}$	-	251	-	pF	$I_D=\text{constant}, V_{GS}=0V, V_{DS}=0...400V$
Turn-on delay time	$t_{d(on)}$	-	9.5	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$
Rise time	t_r	-	8.5	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$
Turn-off delay time	$t_{d(off)}$	-	54	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$
Fall time	t_f	-	7.5	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	6.1	-	nC	$V_{DD}=400V, I_D=7.7A, V_{GS}=0\text{ to }10V$
Gate to drain charge	Q_{gd}	-	24.5	-	nC	$V_{DD}=400V, I_D=7.7A, V_{GS}=0\text{ to }10V$
Gate charge total	Q_g	-	47.2	-	nC	$V_{DD}=400V, I_D=7.7A, V_{GS}=0\text{ to }10V$
Gate plateau voltage	$V_{plateau}$	-	5.4	-	V	$V_{DD}=400V, I_D=7.7A, V_{GS}=0\text{ to }10V$

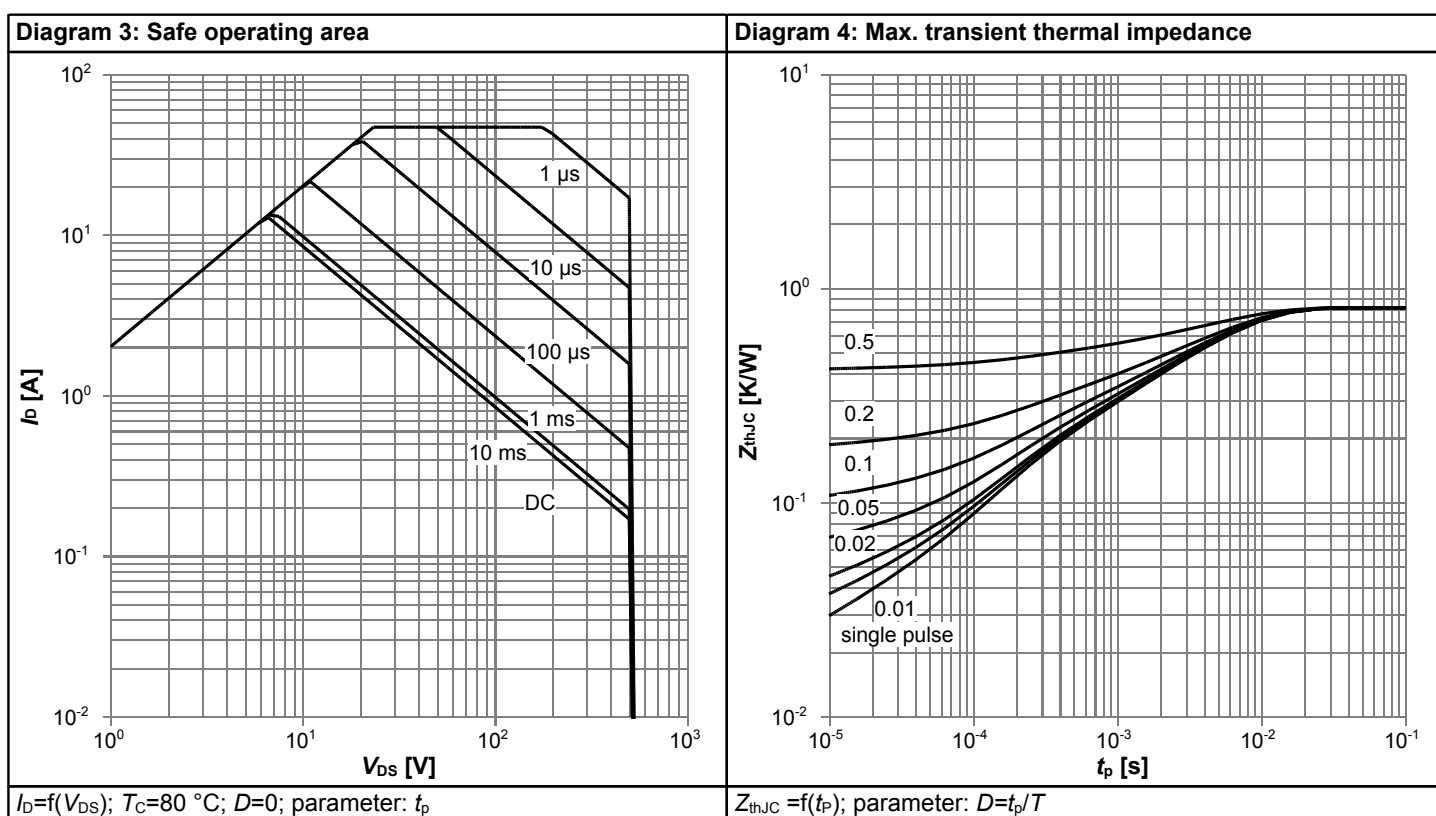
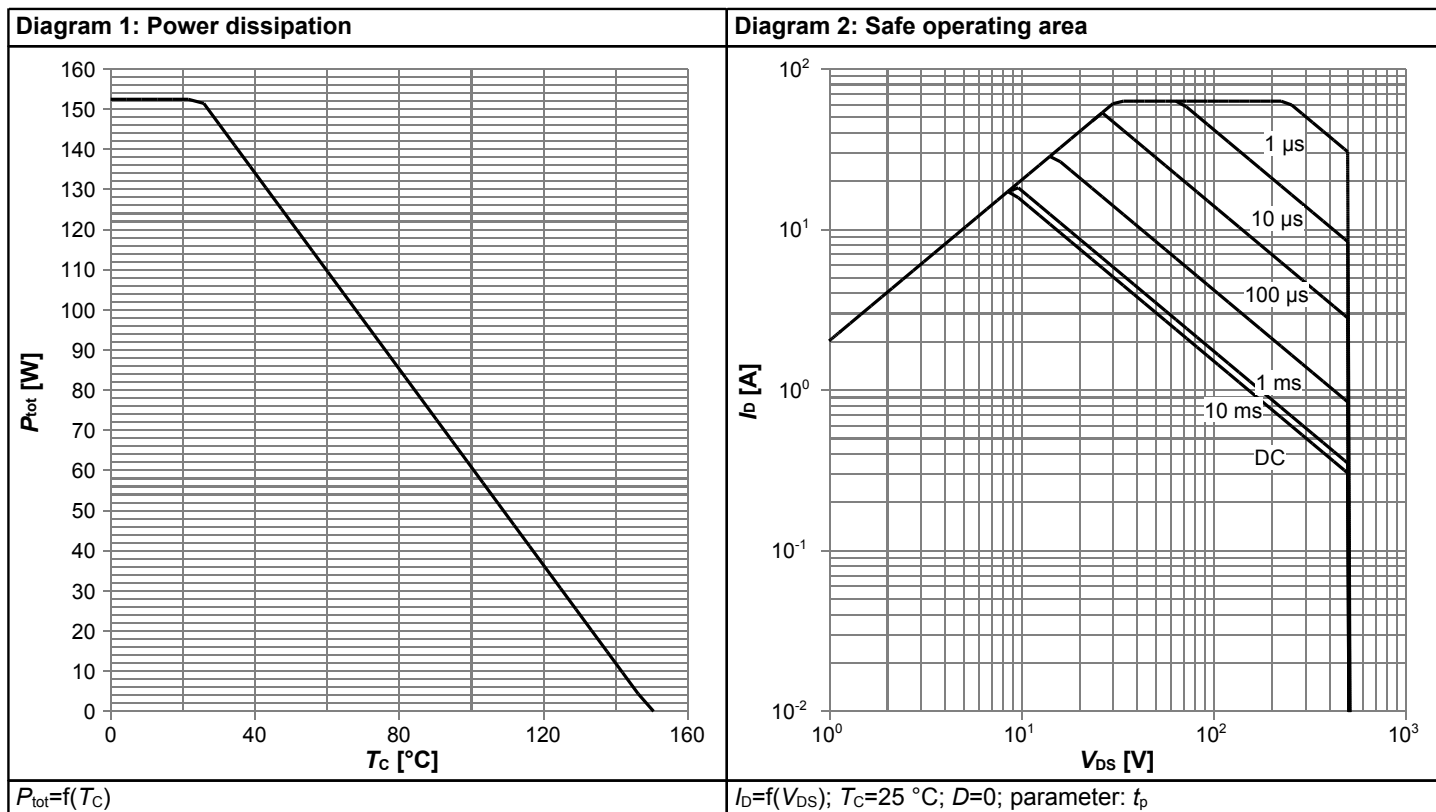
¹⁾ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$

²⁾ $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$

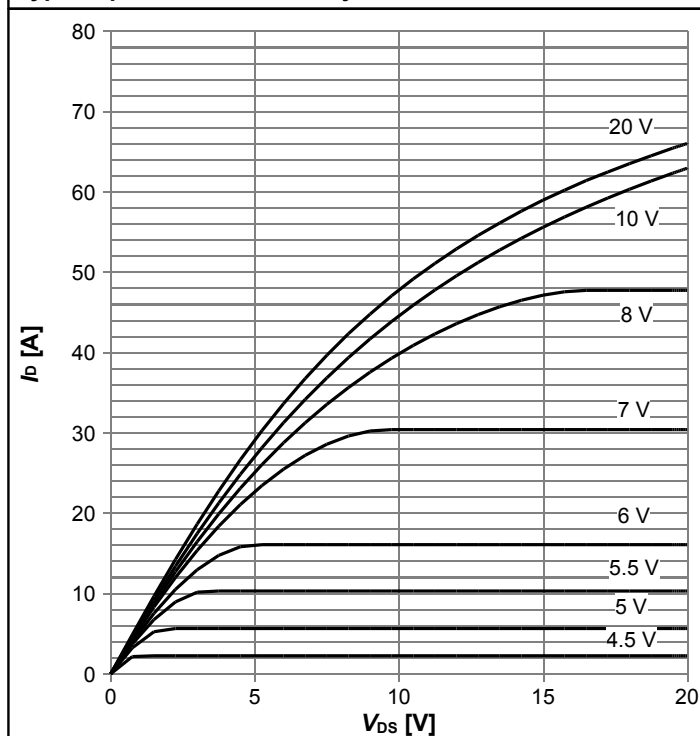
Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.85	-	V	$V_{GS}=0V, I_F=7.7A, T_f=25^{\circ}C$
Reverse recovery time	t_{rr}	-	280	-	ns	$V_R=400V, I_F=7.7A, di_F/dt=100A/\mu s$
Reverse recovery charge	Q_{rr}	-	3.2	-	μC	$V_R=400V, I_F=7.7A, di_F/dt=100A/\mu s$
Peak reverse recovery current	I_{rrm}	-	21.5	-	A	$V_R=400V, I_F=7.7A, di_F/dt=100A/\mu s$

4 Electrical characteristics diagrams

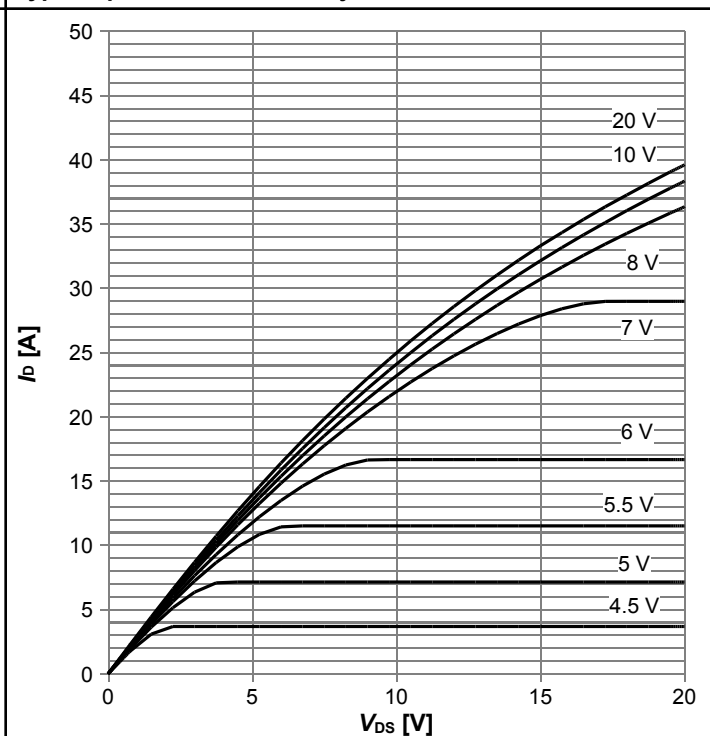


Typ. output characteristics $T_j=25^\circ\text{C}$



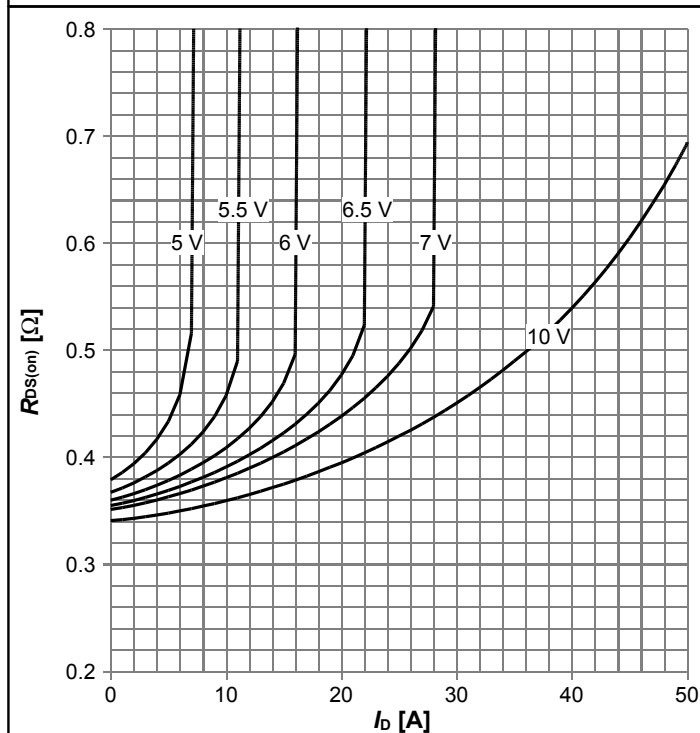
$I_D=f(V_{DS})$; $T_j=25^\circ\text{C}$; parameter: V_{GS}

Typ. output characteristics $T_j=125^\circ\text{C}$



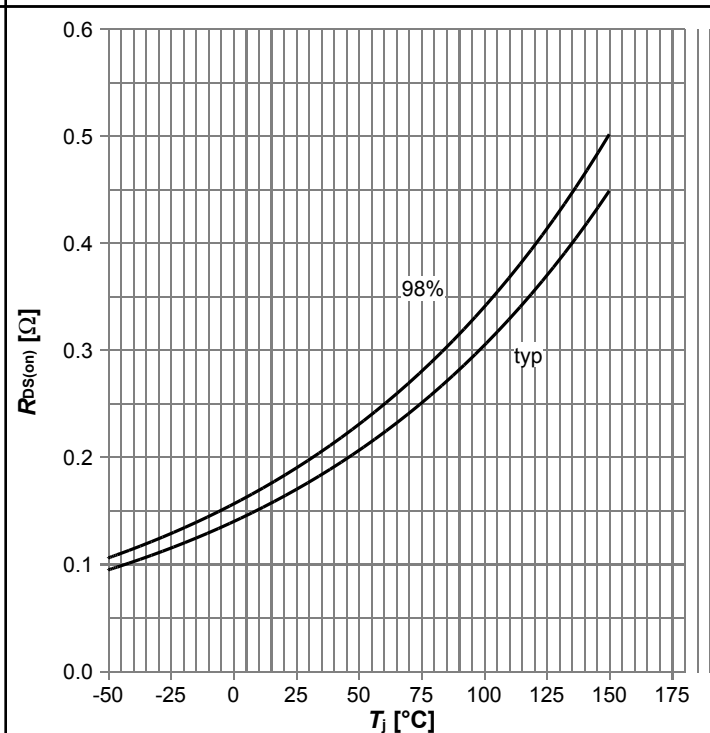
$I_D=f(V_{DS})$; $T_j=125^\circ\text{C}$; parameter: V_{GS}

Typ. drain-source on-state resistance

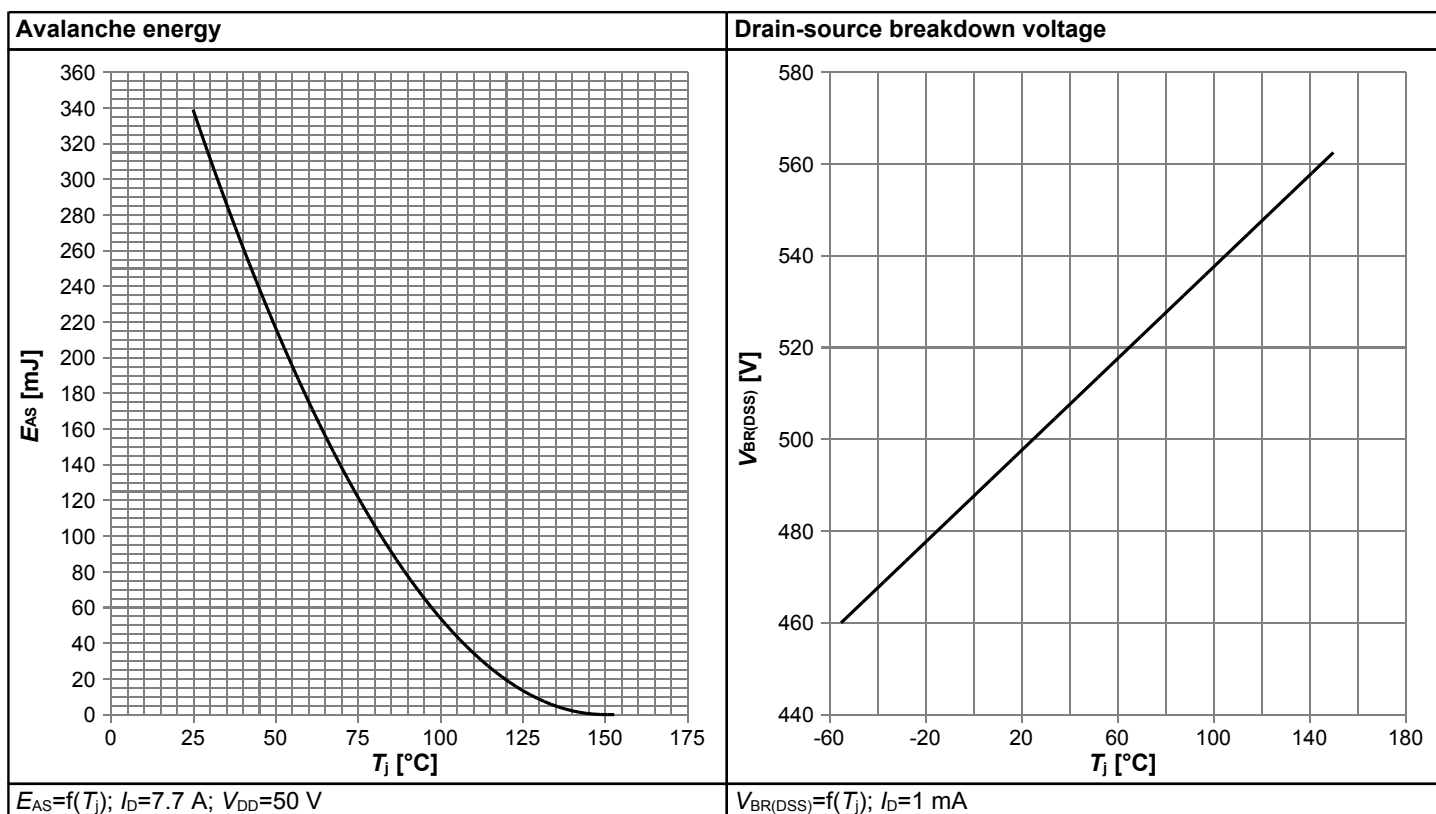
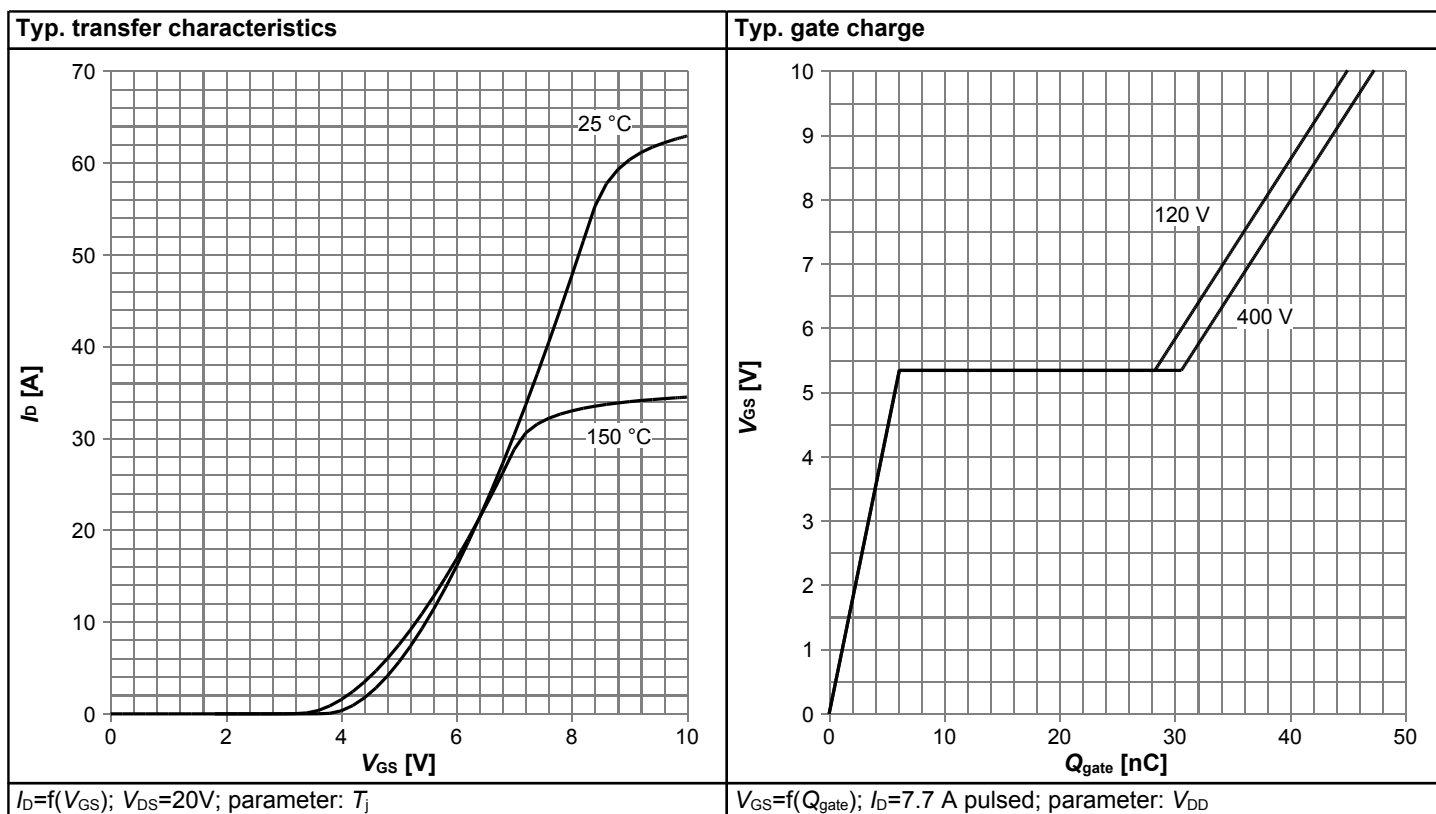


$R_{DS(on)}=f(I_D)$; $T_j=125^\circ\text{C}$; parameter: V_{GS}

Drain-source on-state resistance

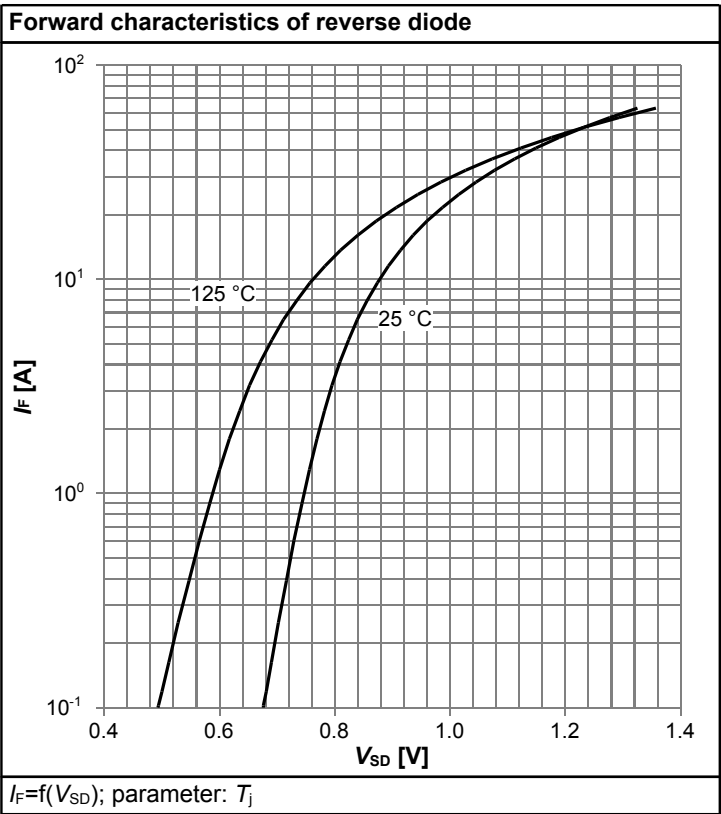
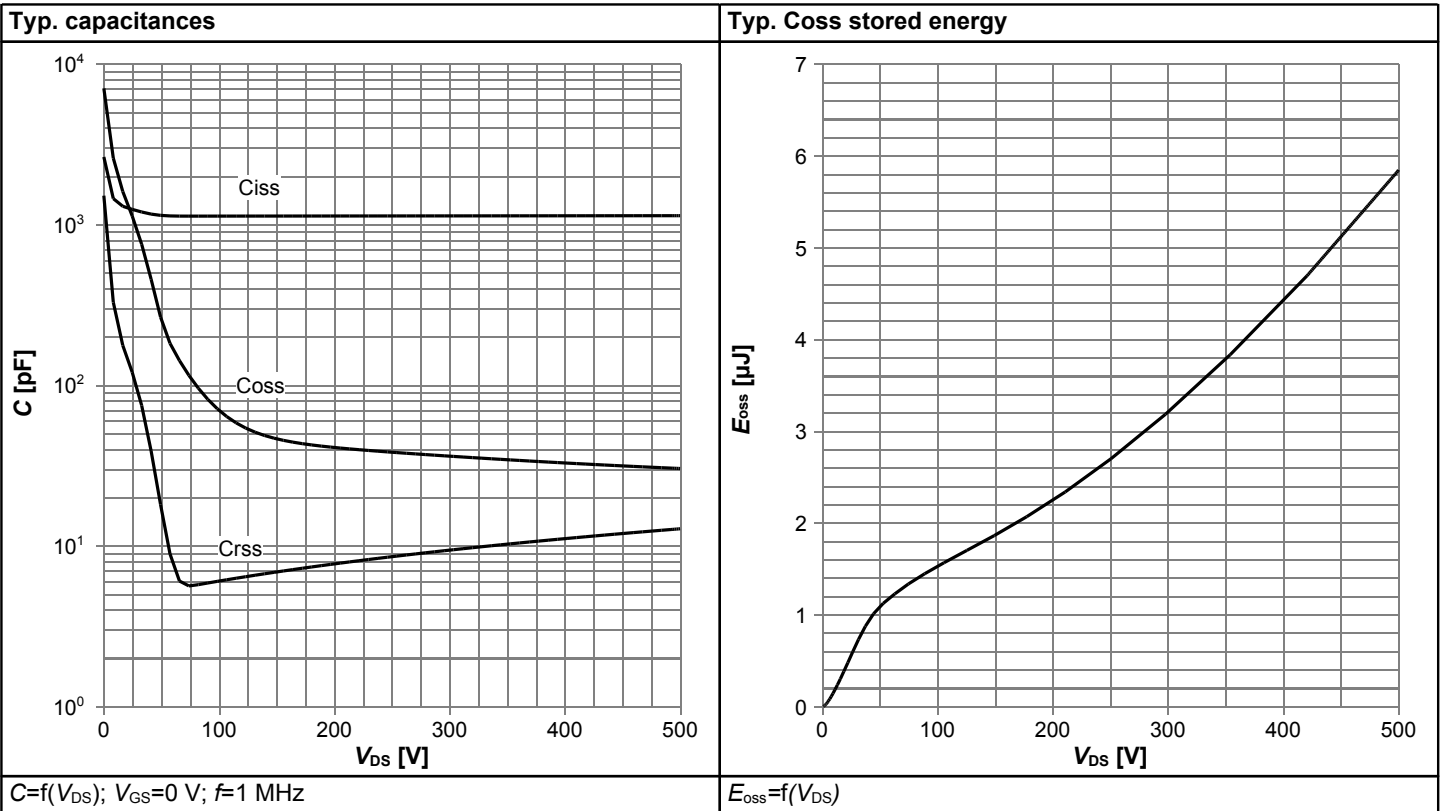


$R_{DS(on)}=f(T_j)$; $I_D=6.2\text{ A}$; $V_{GS}=13\text{ V}$



500V CoolMOS™ CE Power Transistor

IPW50R190CE, IPP50R190CE



6 Package Outlines

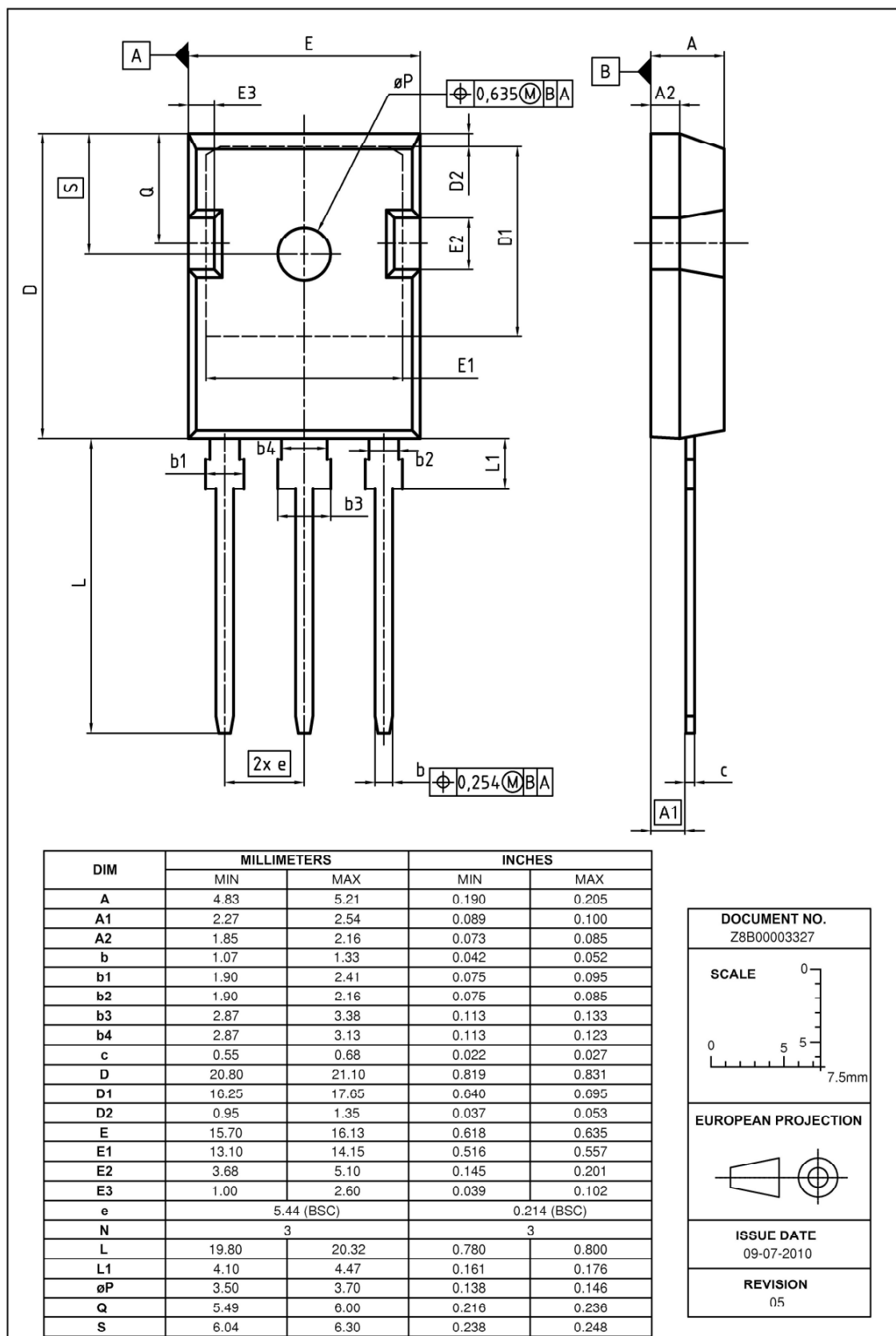


Figure 1 Outline PG-TO 247, dimensions in mm/inches

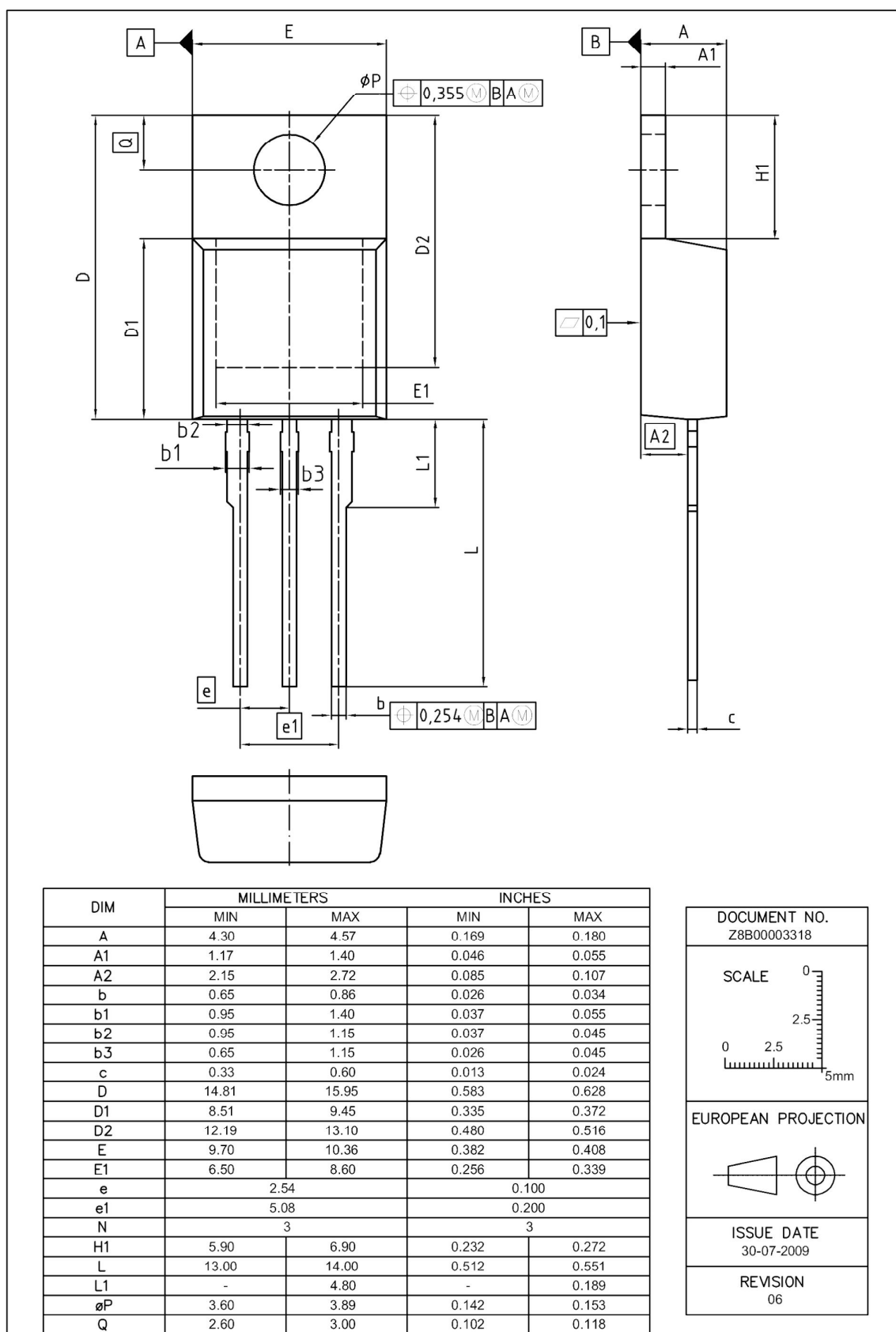


Figure 2 Outline PG-TO 220, dimensions in mm/inches

7 Appendix A

Table 11 Related Links

- **IFX CoolMOS Webpage:** www.infineon.com
- **IFX Design tools:** www.infineon.com

Revision History

IPW50R190CE, IPP50R190CE

Revision: 2016-06-13, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2012-08-24	Release of final version
2.1	2015-08-20	removal of TO-220FP
2.2	2016-06-13	Updated ID ratings, Zth, SOA and Power dissipation curves

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