

MOSFET

Metal Oxide Semiconductor Field Effect Transistor

CoolMOS™ C3 800V

800V CoolMOS™ C3 Power Transistor
SPW55N80C3

Data Sheet

Rev. 2.0
Final

Industrial & Multimarket

1 Description

800V CoolMOS™ C3 designed for:

- Industrial application with high DC bulk voltage
- Switching Application (i.e. active clamp forward)

Features

New revolutionary high voltage technology

- Extreme dv/dt rated
- High peak current capability
- Qualified according to JEDEC1) for target applications
- Pb-free lead plating; RoHS compliant
- Ultra low gate charge
- Ultra low effective capacitances

Applications

PFC stages, hard switching PWM stages and resonant switching PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV, Lighting, Server, Telecom, UPS and Solar.

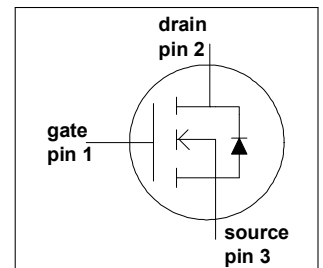
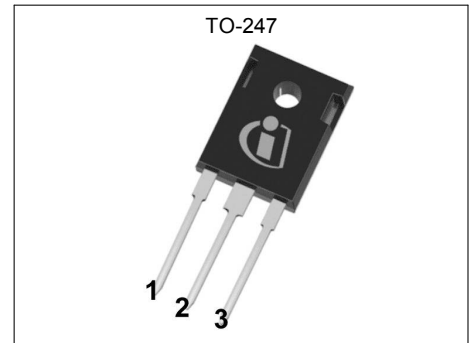


Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j \max}$	850	V
$R_{DS(on),max}$	0.085	Ω
Q_g,typ	288	nC
$I_D,pulse$	150	A
$E_{oss} @ 400V$	21.5	μJ
Body diode di/dt	100	A/ μs



Type / Ordering Code	Package	Marking	Related Links
SPW55N80C3	PG-TO 247	55N80C3	see Appendix A

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2 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			54.9	A	$T_C = 25^\circ\text{C}$
				34.7		$T_C = 100^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$			150	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}			2150	mJ	$I_b = 9.5\text{A}$, $V_{DD} = 50\text{V}$
Avalanche energy, repetitive	E_{AR}			3.26	mJ	$I_b = 9.5\text{A}$, $V_{DD} = 50\text{V}$
Avalanche current, repetitive	I_{AR}			9.5	A	
MOSFET dv/dt ruggedness	dv/dt			50	V/ns	$V_{DS} = 0 \dots 400\text{V}$
Gate source voltage	V_{GS}	-20		20	V	static
		-30		30		AC ($f > 1\text{ Hz}$)
Power dissipation (non FullPAK) TO-247	P_{tot}			500.0	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				60	Ncm	M3 and M3.5 screws
Continuous diode forward current	I_S			47.6	A	$T_C = 25^\circ\text{C}$
Diode pulse current	$I_{S,pulse}$			150	A	$T_C = 25^\circ\text{C}$
Reverse diode dv/dt ³⁾	dv/dt			4	V/ns	$V_{DS} = 0 \dots 400\text{V}$, $I_{SD} \leq I_b$, $T_j = 25^\circ\text{C}$
Maximum diode commutation speed	di _r /dt			100	A/ μs	

¹⁾ Limited by $T_{j \max}$. Maximum duty cycle $D=0.75$

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

³⁾ $V_{peak} < V_{(BR)DSS}$, $T_j < T_{j \max}$, identical low and high side switch with same R_g

3 Thermal characteristics

Table 3 Thermal characteristics TO-247

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}			0.25	°C/W	
Thermal resistance, junction - ambient	R_{thJA}			62	°C/W	leaded
Soldering temperature, wavesoldering only allowed at leads	T_{sold}			260	°C	1.6 mm (0.063 in.) from case for 10s

4 Electrical characteristics

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

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	800			V	$V_{GS} = 0V$, $I_D = 0.25mA$
Gate threshold voltage	$V_{GS(th)}$	2.1	3	3.9	V	$V_{DS} = V_{GS}$, $I_D = 3.3mA$
Zero gate voltage drain current	I_{DSS}			25	μA	$V_{DS} = 800V$, $V_{GS} = 0V$, $T_j = 25^\circ\text{C}$
			150			$V_{DS} = 800V$, $V_{GS} = 0V$, $T_j = 150^\circ\text{C}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS} = 20V$, $V_{DS} = 0V$
Drain-source on-state resistance	$R_{DS(on)}$		0.077	0.085	Ω	$V_{GS} = 10V$, $I_D = 32.6A$, $T_j = 25^\circ\text{C}$
			0.199			$V_{GS} = 10V$, $I_D = 32.6A$, $T_j = 150^\circ\text{C}$
Gate resistance	R_G		0.8		Ω	$f = 1MHz$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}		7520		pF	$V_{GS} = 0V$, $V_{DS} = 100V$, $f = 1MHz$
Output capacitance	C_{oss}		305		pF	
Effective output capacitance, energy related ¹⁾	$C_{o(er)}$		1535		pF	$V_{GS} = 0V$, $V_{DS} = 0 \dots 400V$
Effective output capacitance, time related ²⁾	$C_{o(tr)}$		277		pF	$I_D = \text{constant}$, $V_{GS} = 0V$, $V_{DS} = 0 \dots 400V$
Turn-on delay time	$t_{d(on)}$		45		ns	$V_{DD} = 400V$, $V_{GS} = 13V$, $I_D = 54.9A$, $R_G = 3.4\Omega$
Rise time	t_r		21		ns	
Turn-off delay time	$t_{d(off)}$		200		ns	
Fall time	t_f		9		ns	

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}		42		nC	$V_{DD} = 480V$, $I_D = 54.9A$, $V_{GS} = 0 \text{ to } 10V$
Gate to drain charge	Q_{gd}		125		nC	
Gate charge total	Q_g		288		nC	
Gate plateau voltage	$V_{plateau}$		5.5		V	

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 400V

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 400V

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}		0.95		V	$V_{GS} = 0V, I_F = 54.9A, T_J = 25^{\circ}C$
Reverse recovery time	t_{rr}		1050		ns	$V_R = 400V, I_F = 54.9A,$ $dI_F/dt = 100A/\mu s$
Reverse recovery charge	Q_{rr}		43		μC	
Peak reverse recovery current	I_{rrm}		78		A	

5 Electrical characteristics diagrams

Table 8

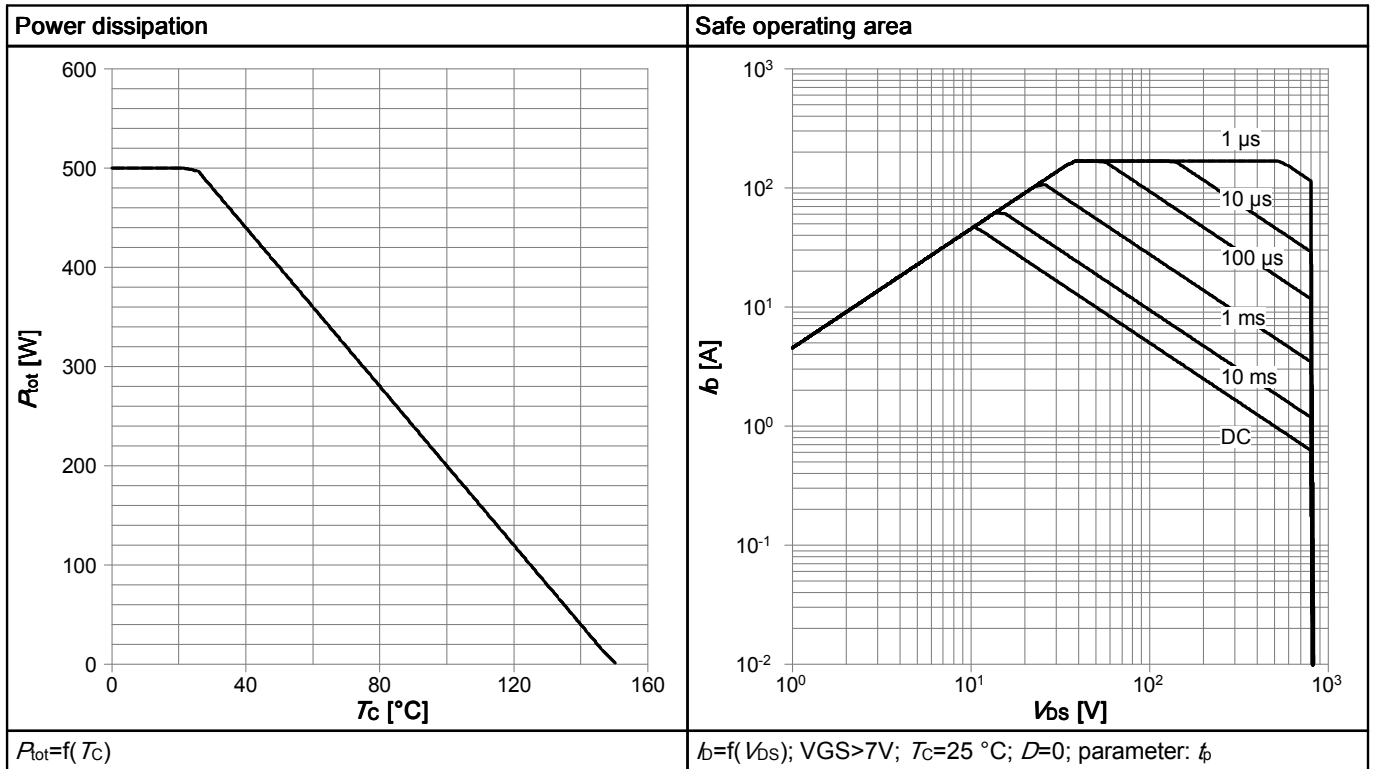


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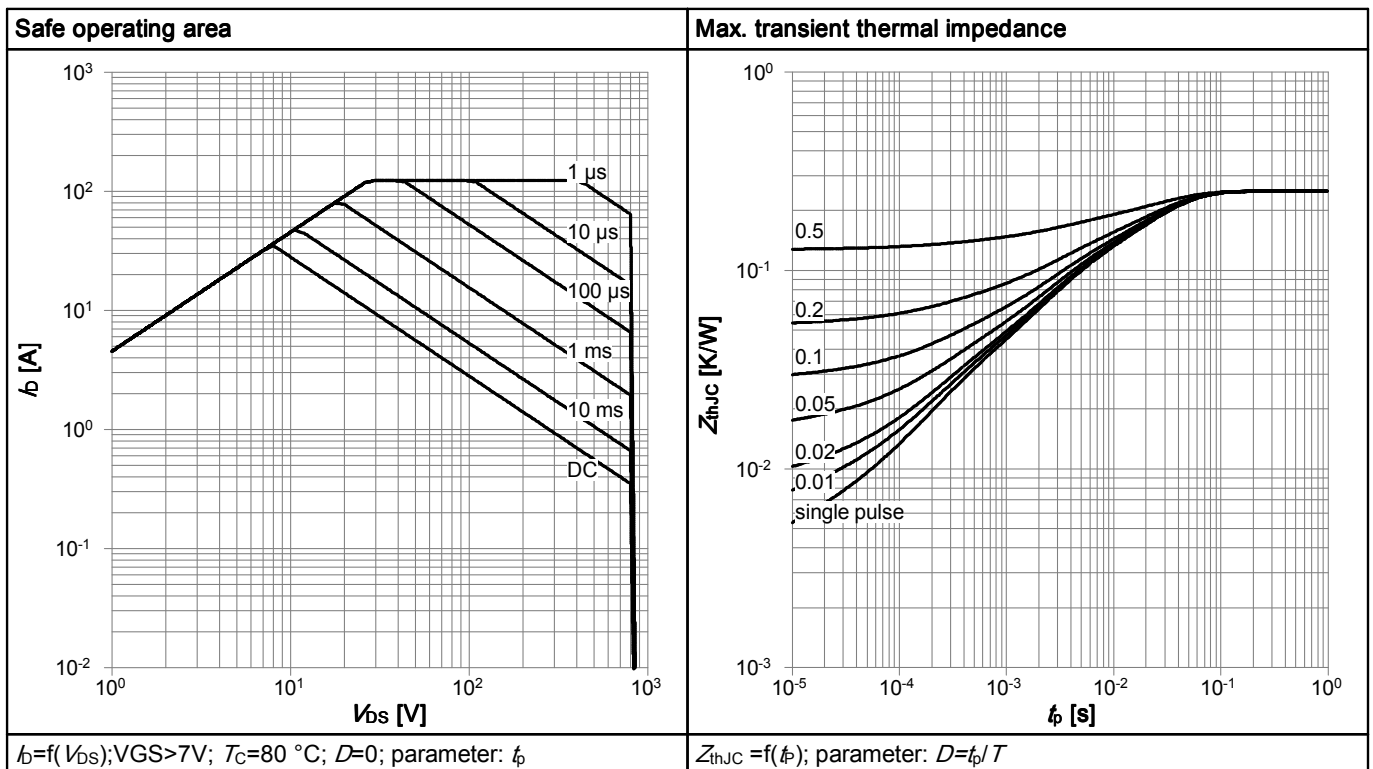


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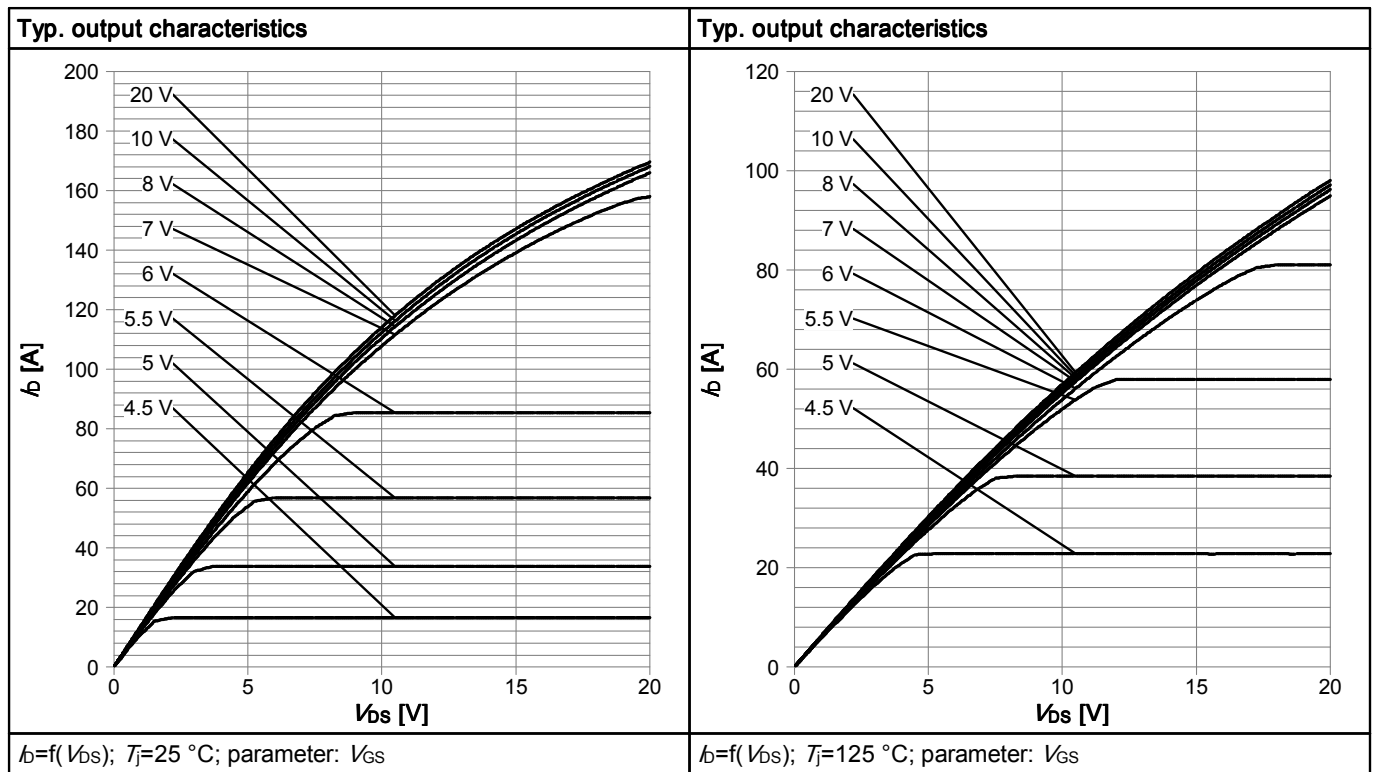


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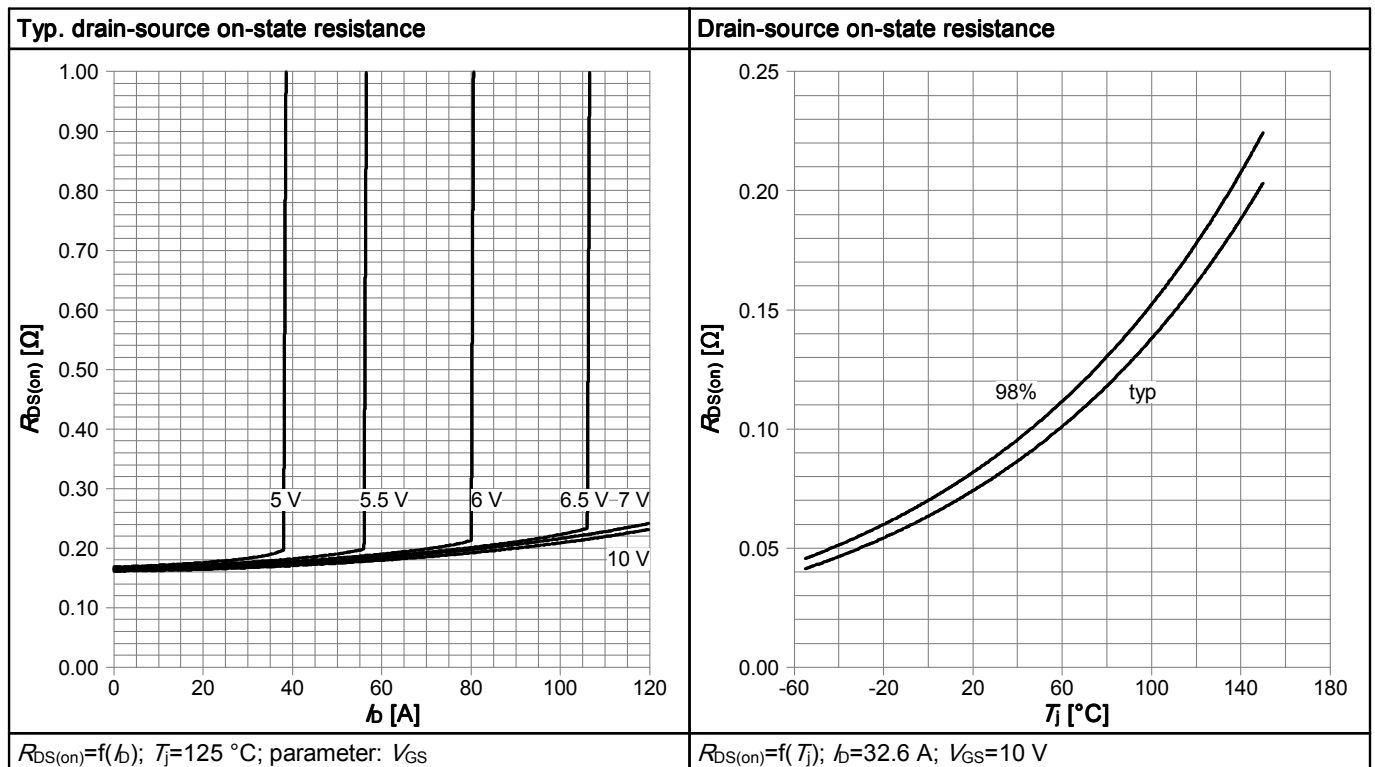


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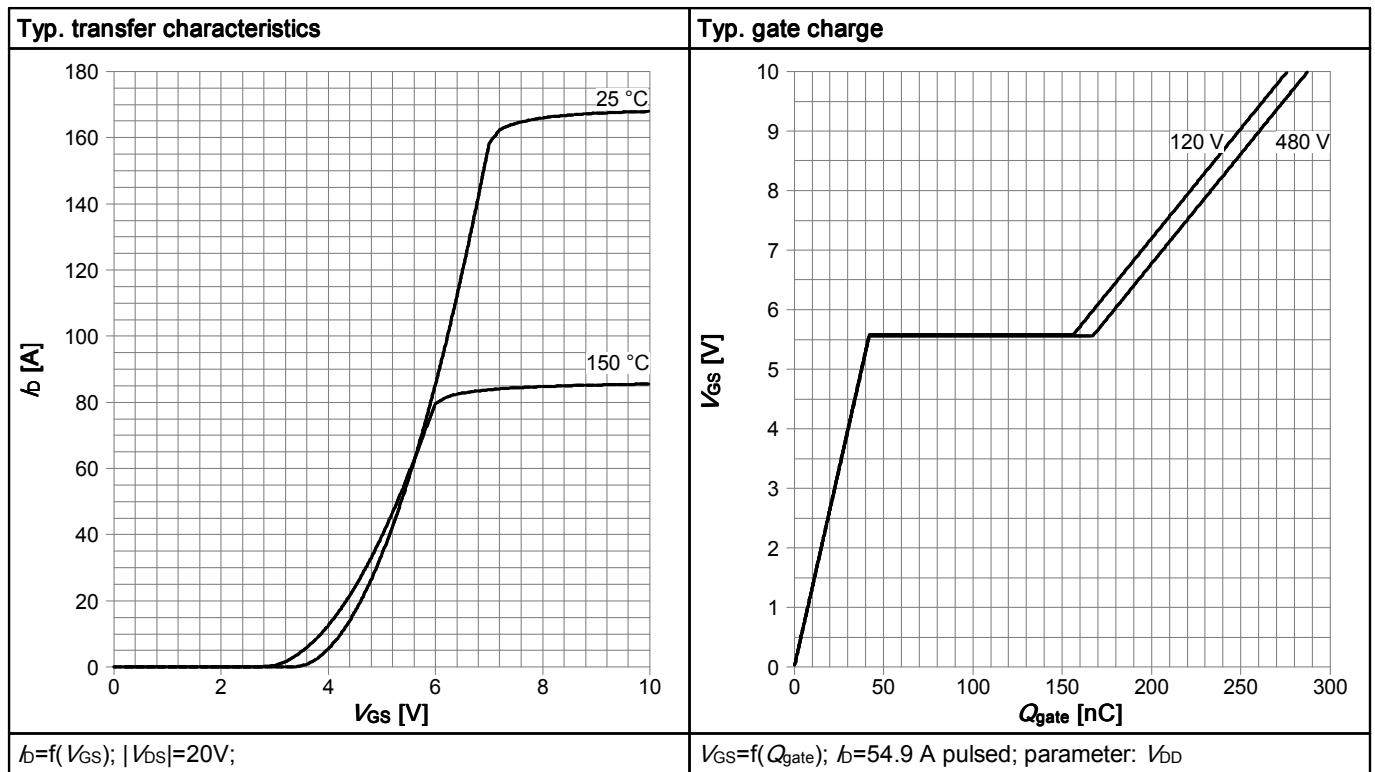


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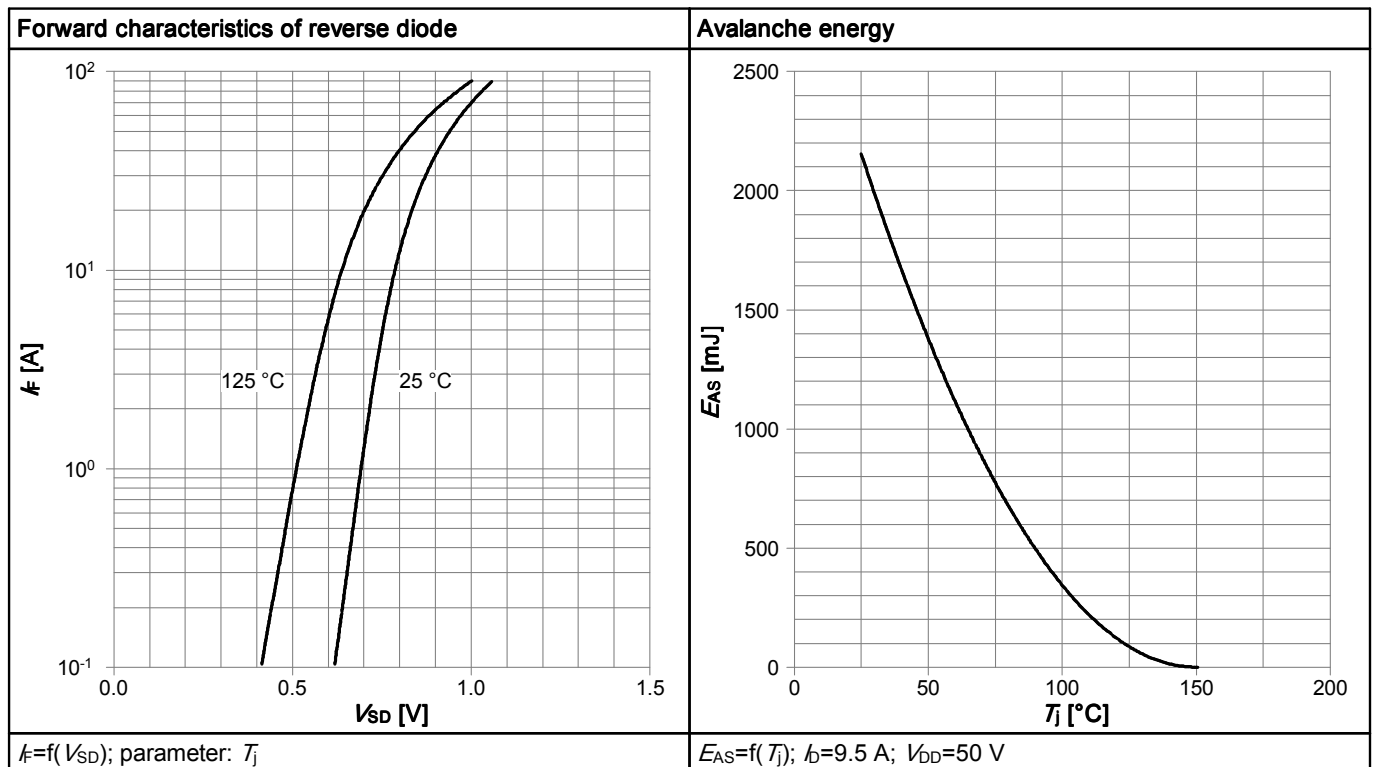


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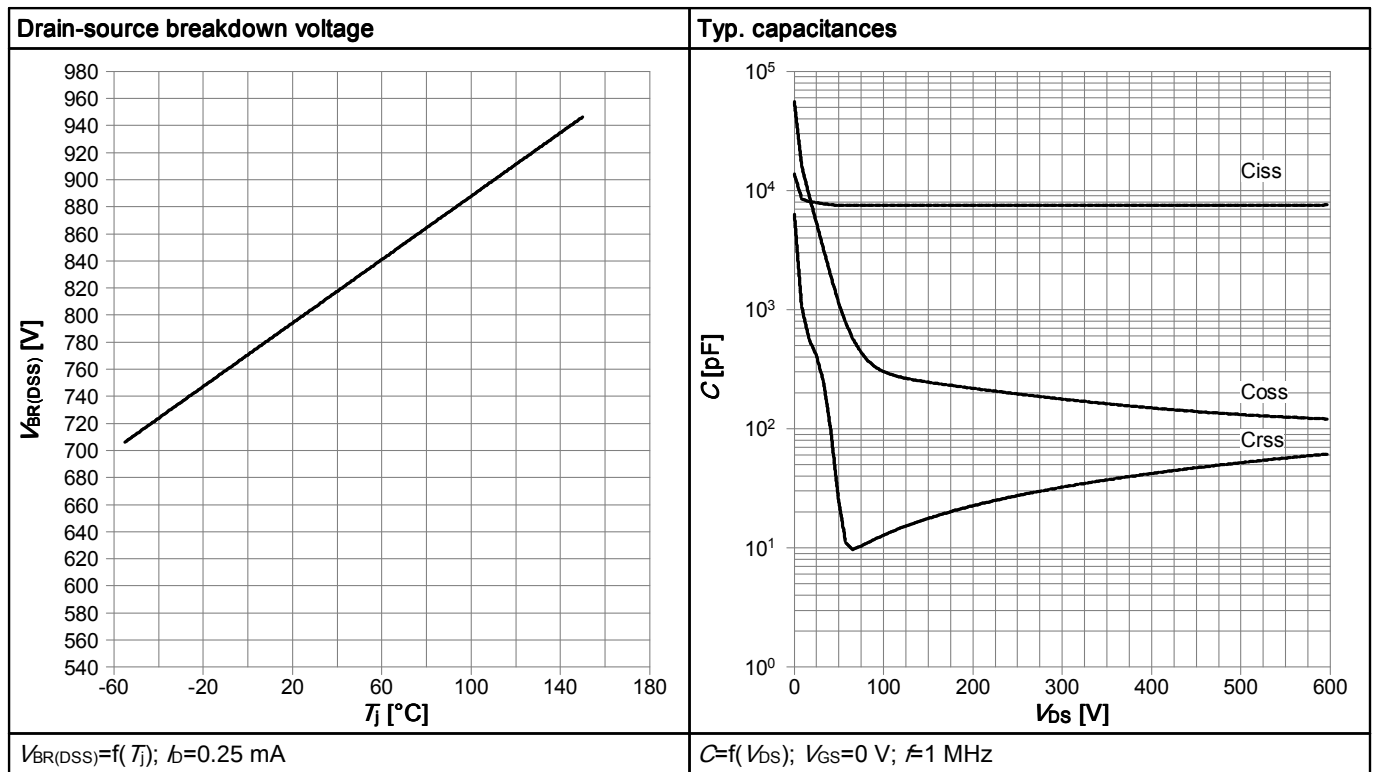
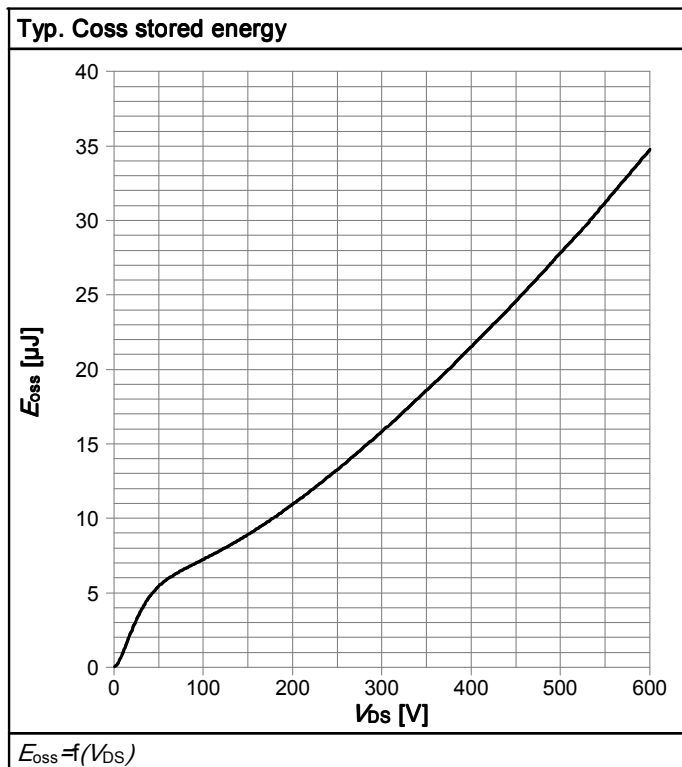


Table 15



6 Test Circuits

Table 16 Diode_characteristics

Test circuit for diode characteristics	Diode recovery waveform
 $R_{G1} = R_{G2}$	 $t_{rr} = t_s + t_F$ $Q_{rr} = Q_s + Q_F$

Table 17 Switching_times

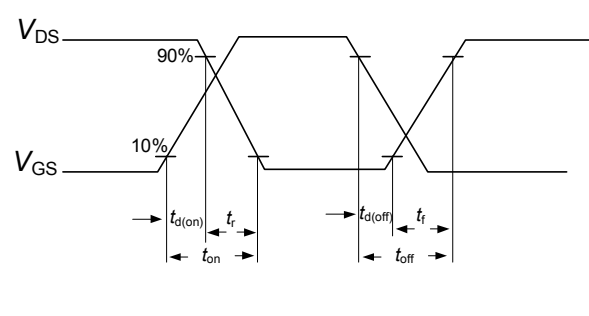
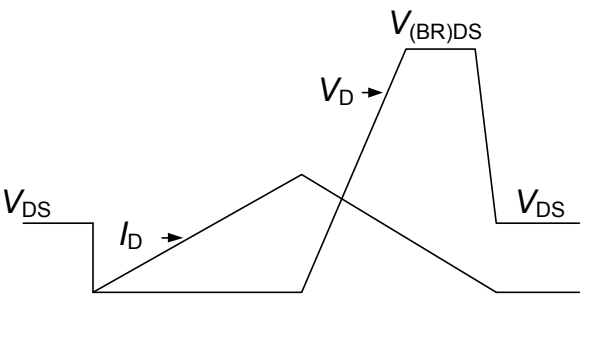
Switching times test circuit for inductive load	Switching times waveform
	

Table 18 Unclamped_inductive

Unclamped inductive load test circuit	Unclamped inductive waveform
	

7 Package Outlines

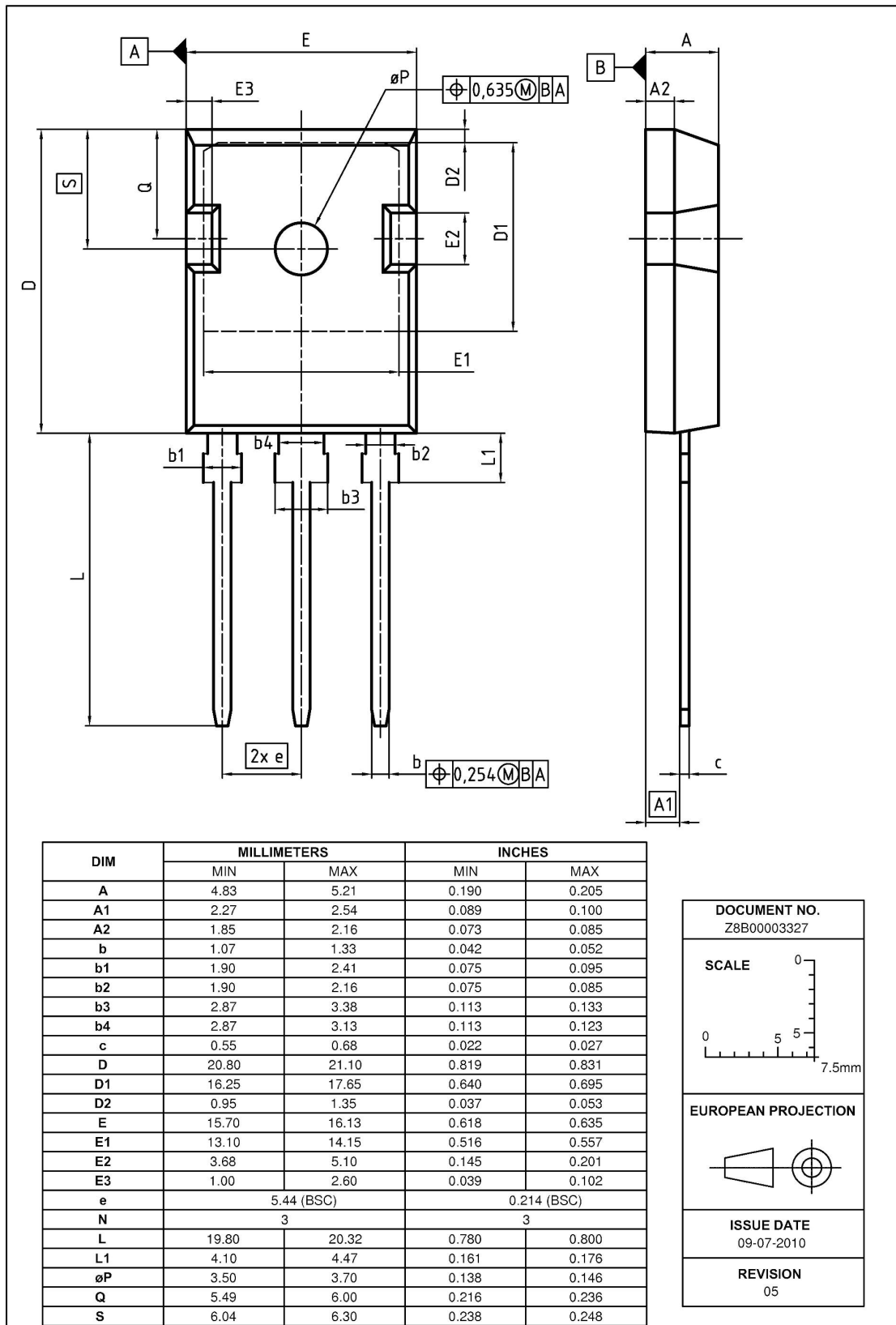


Figure 1 Outline PG-TO 247, dimensions in mm/inches

8 Appendix A

Table 19 Related Links

- **IFX CoolMOS Webpage:**
<http://www.infineon.com/cms/en/product/channel.html?channel=ff80808112ab681d0112ab6a628704d8>
- **IFX Design Tools:**
<http://www.infineon.com/cms/en/product/promopages/designtools/index.html>

Revision History

SPW55N80C3

Revision: 2011-10-12, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2011-09-26	release of final datasheet

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Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331