

# 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)

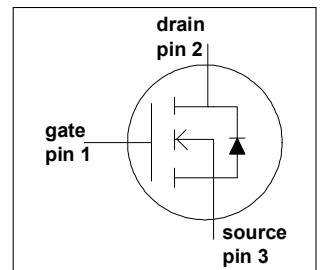
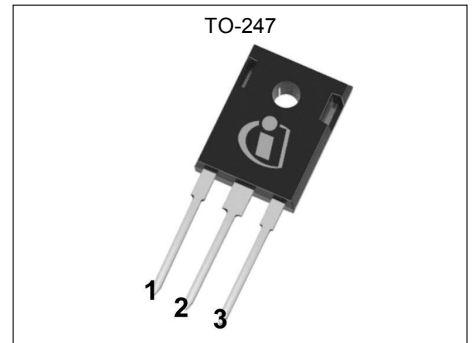
### Features

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	$\Omega$
$Q_g, typ$	288	nC
$I_{D, pulse}$	150	A
$E_{oss} @ 400V$	21.5	$\mu J$
Body diode di/dt	100	A/ $\mu s$



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 <sup>1)</sup>	$I_D$			54.9	A	$T_C = 25^\circ\text{C}$
				34.7		$T_C = 100^\circ\text{C}$
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$			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 <sup>3)</sup>	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	$di_f/dt$			100	A/ $\mu\text{s}$	

<sup>1)</sup> Limited by  $T_{j,max}$ . Maximum duty cycle  $D=0.75$

<sup>2)</sup> Pulse width  $t_p$  limited by  $T_{j,max}$

<sup>3)</sup>  $V_{peak} < V_{(BR)DSS}$ ,  $T_j < T_{j,max}$ , 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	$\mu A$	$V_{DS} = 800V, V_{GS} = 0V, T_j = 25^\circ C$
			150			$V_{DS} = 800V, V_{GS} = 0V, T_j = 150^\circ C$
Gate-source leakage current	$I_{GSS}$			100	nA	$V_{GS} = 20V, V_{DS} = 0V$
Drain-source on-state resistance	$R_{DS(on)}$		0.077	0.085	$\Omega$	$V_{GS} = 10V, I_D = 32.6A, T_j = 25^\circ C$
			0.199			$V_{GS} = 10V, I_D = 32.6A, T_j = 150^\circ C$
Gate resistance	$R_G$		0.8		$\Omega$	$f = 1MHz, \text{open drain}$

**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 <sup>1)</sup>	$C_{o(er)}$		1535		pF	$V_{GS} = 0V, V_{DS} = 0 \dots 400V$
Effective output capacitance, time related <sup>2)</sup>	$C_{o(tr)}$		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	

<sup>1)</sup>  $C_{o(er)}$  is a fixed capacitance that gives the same stored energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 400V

<sup>2)</sup>  $C_{o(tr)}$  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	$V_R = 400V, I_F = 54.9A, dI/dt = 100A/\mu s$
Reverse recovery charge	$Q_{rr}$		43		$\mu C$	
Peak reverse recovery current	$I_{rrm}$		78		A	

### 5 Electrical characteristics diagrams

Table 8

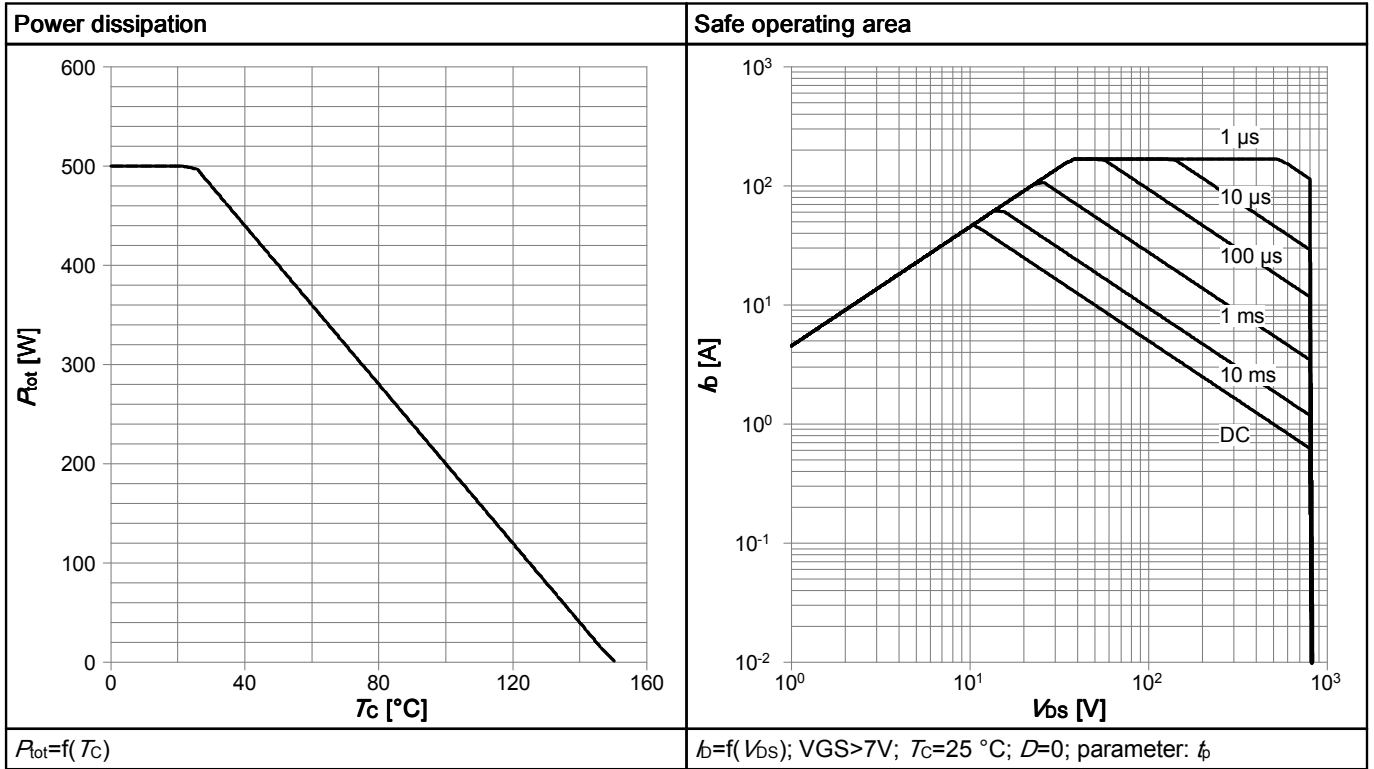


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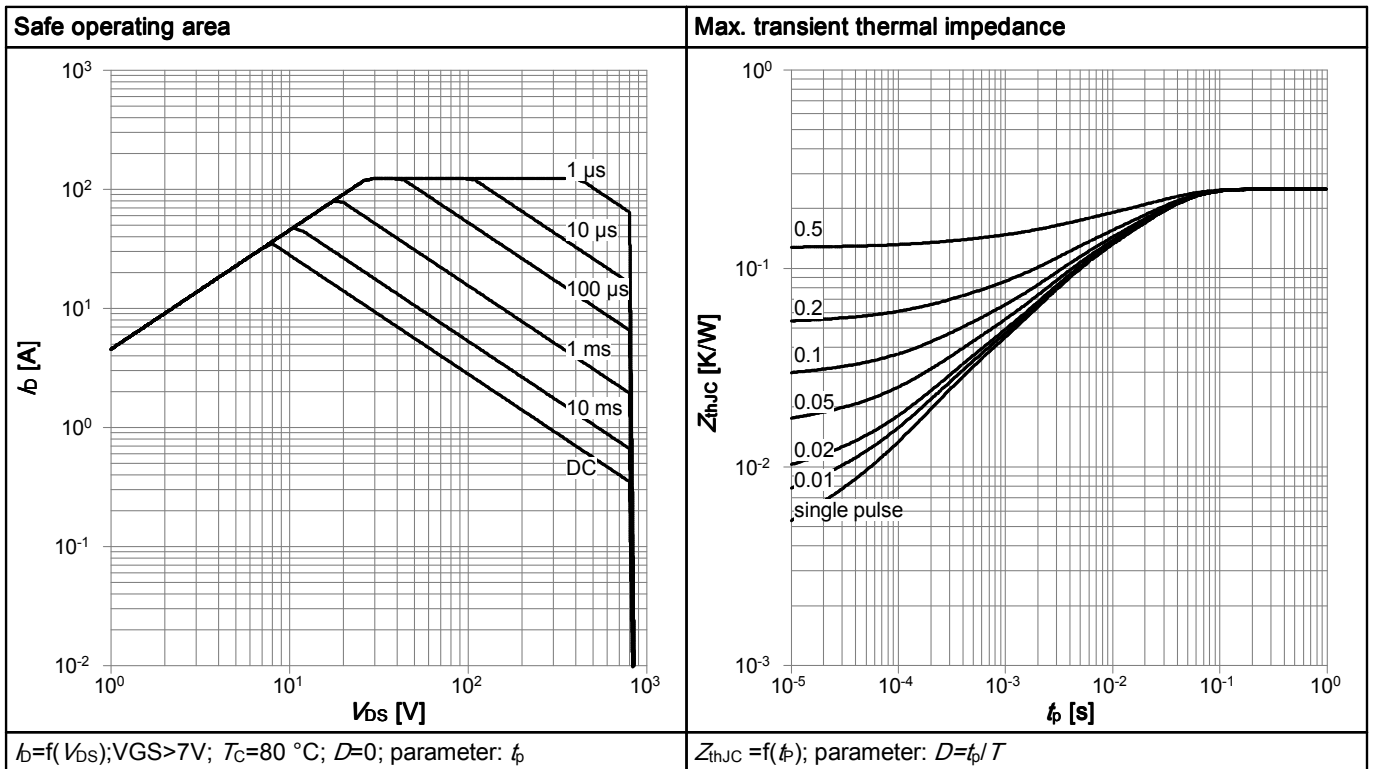




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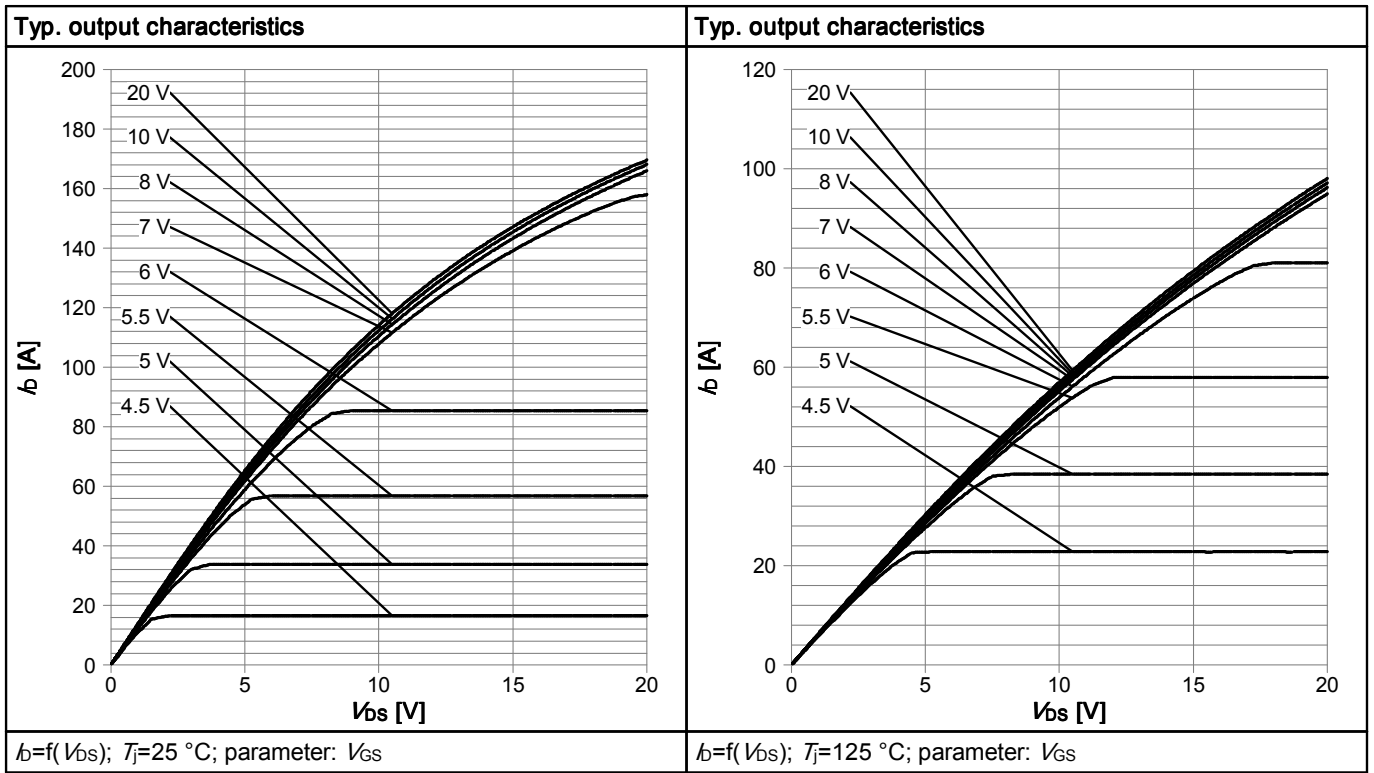


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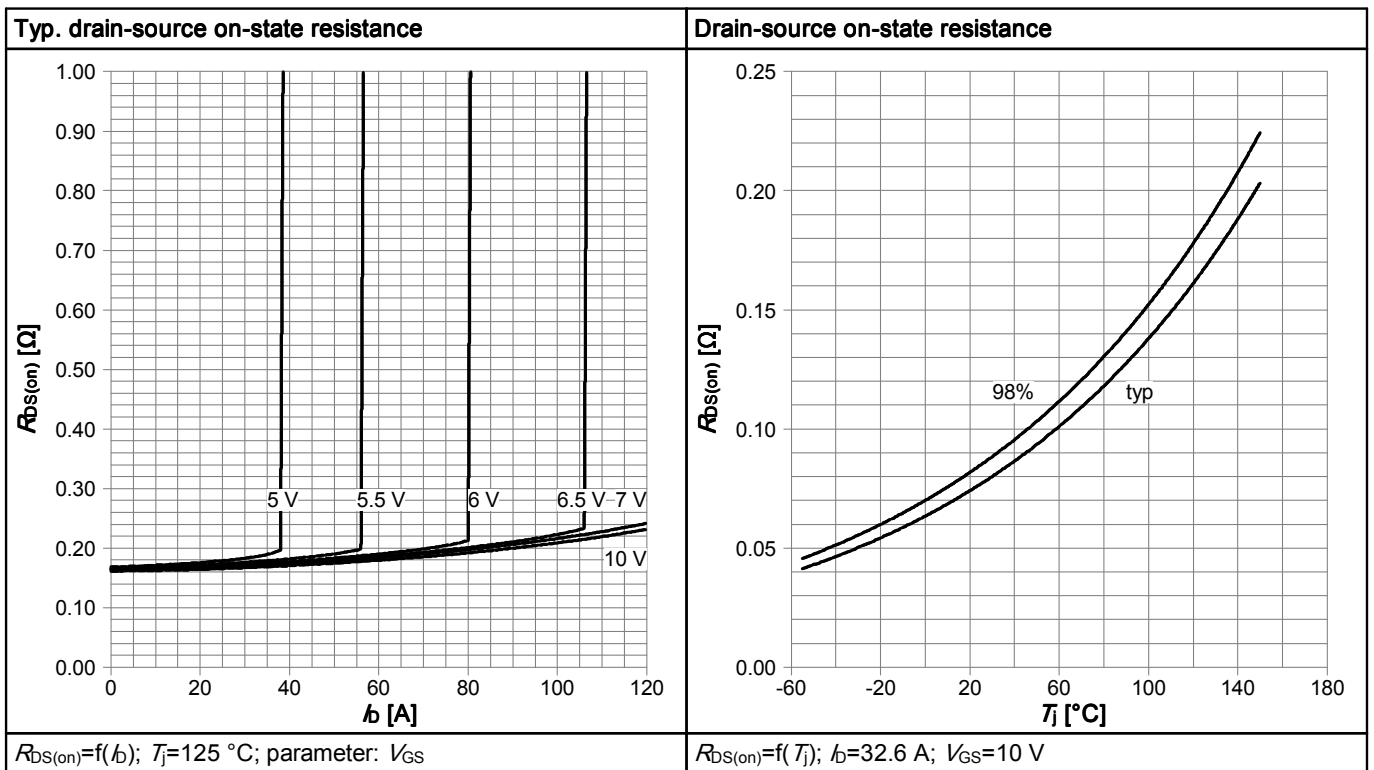


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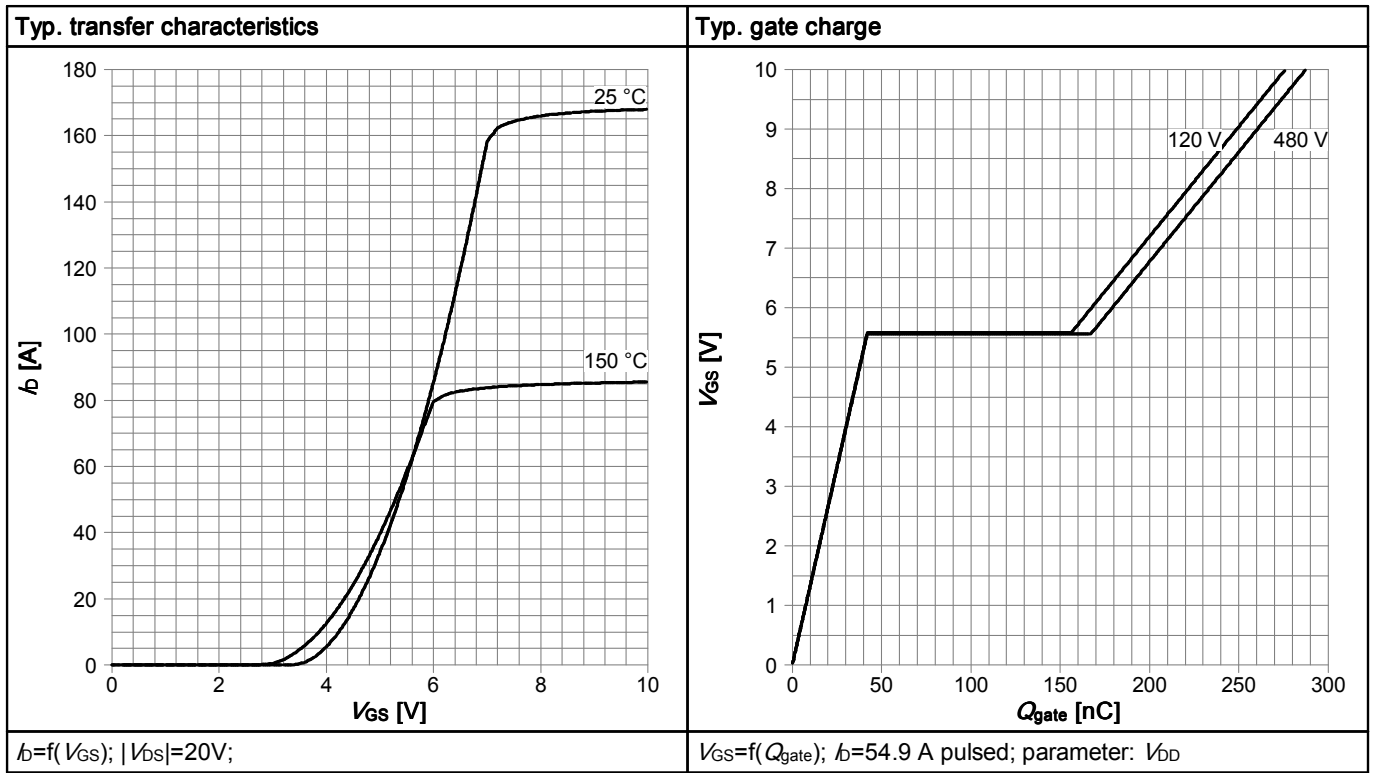


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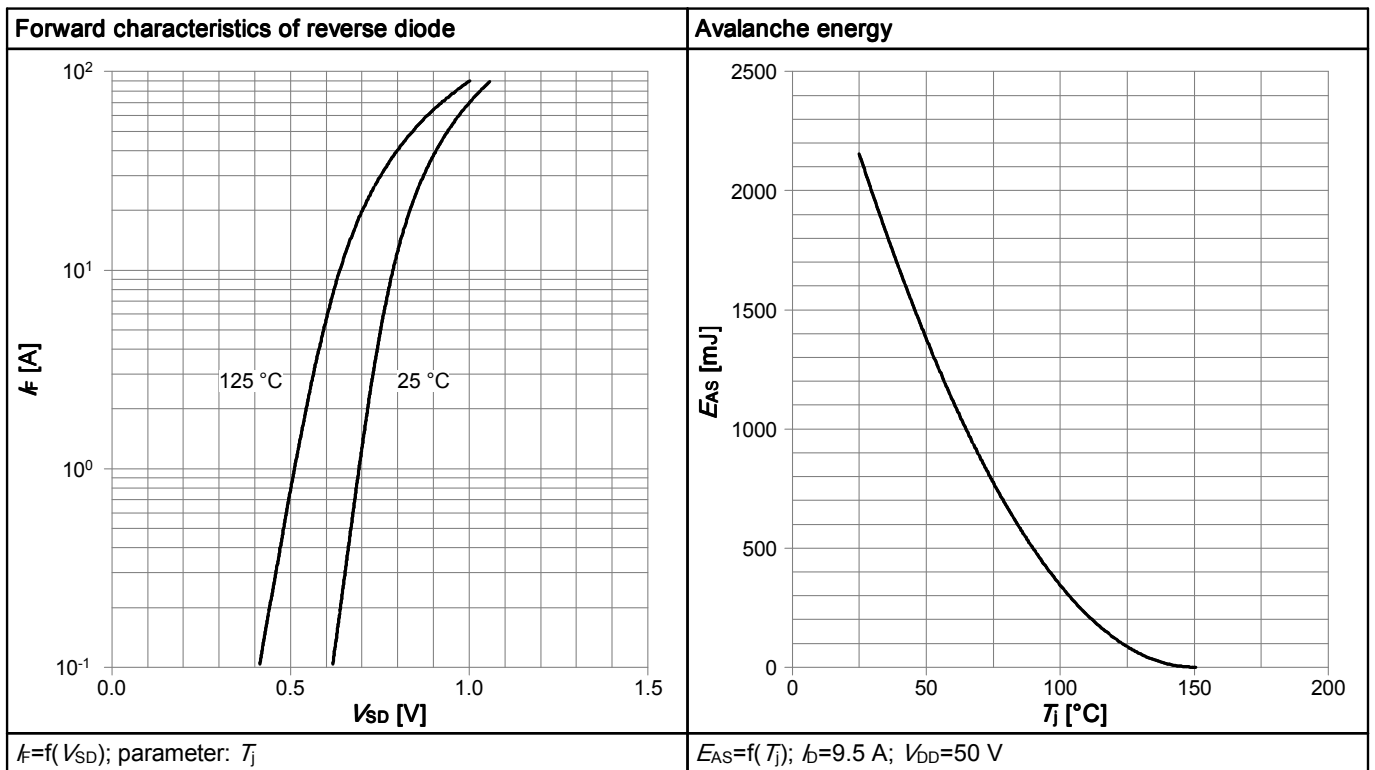


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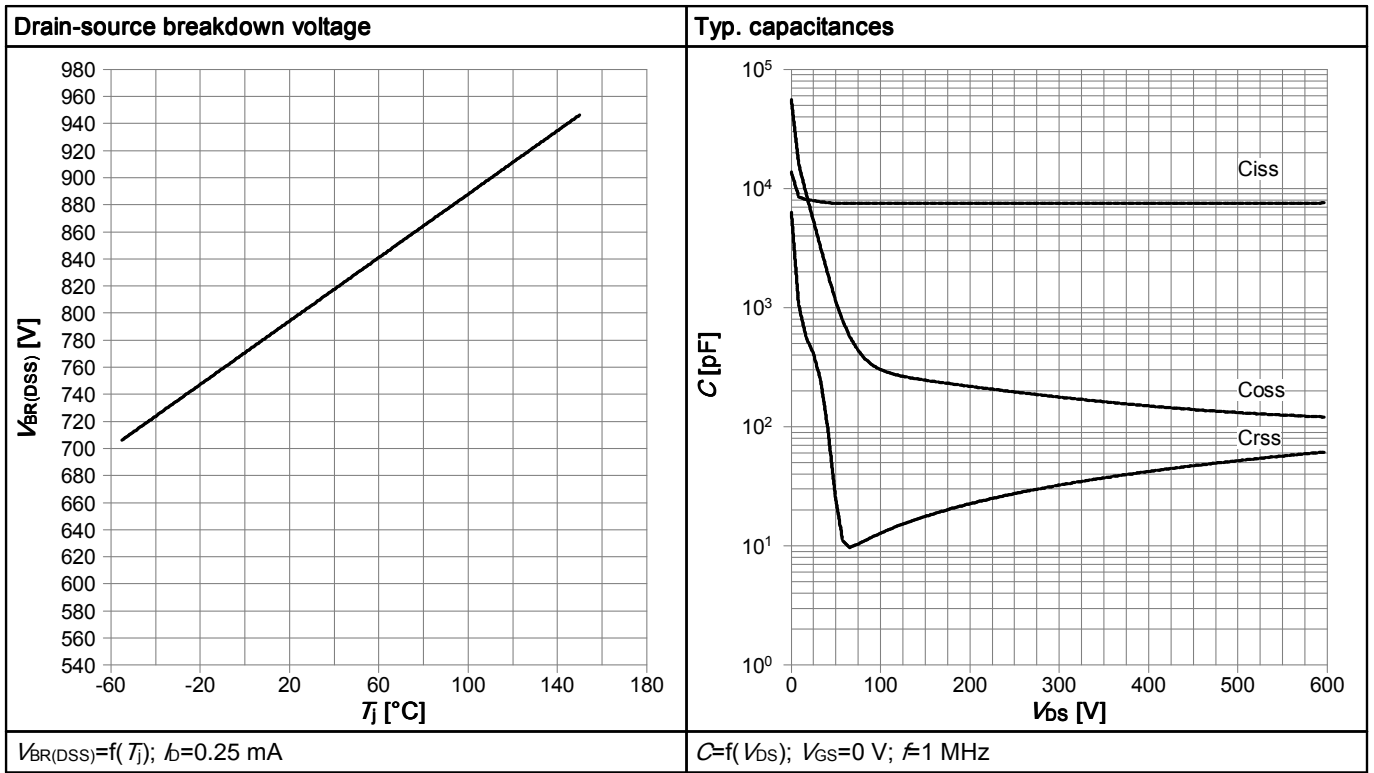
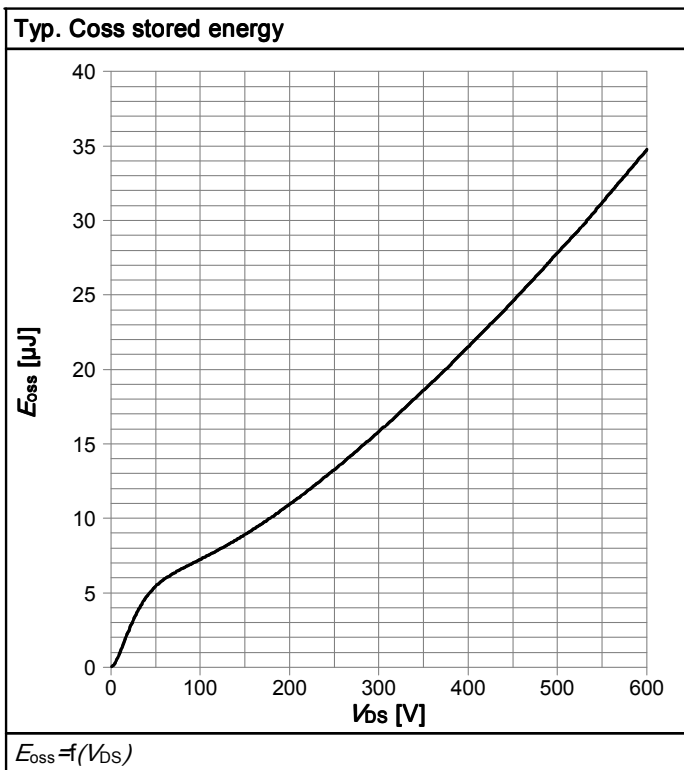
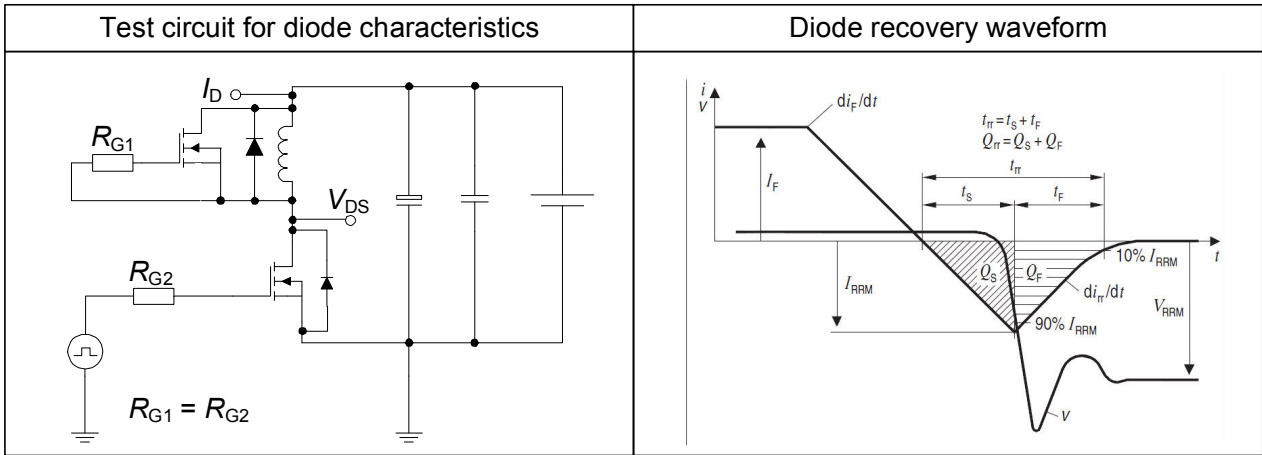


Table 15

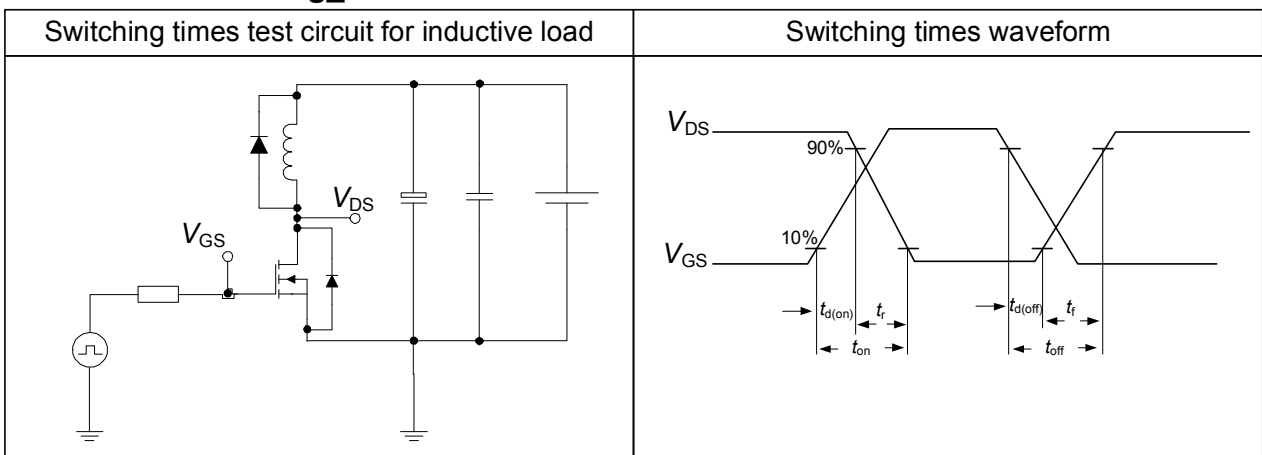


## 6 Test Circuits

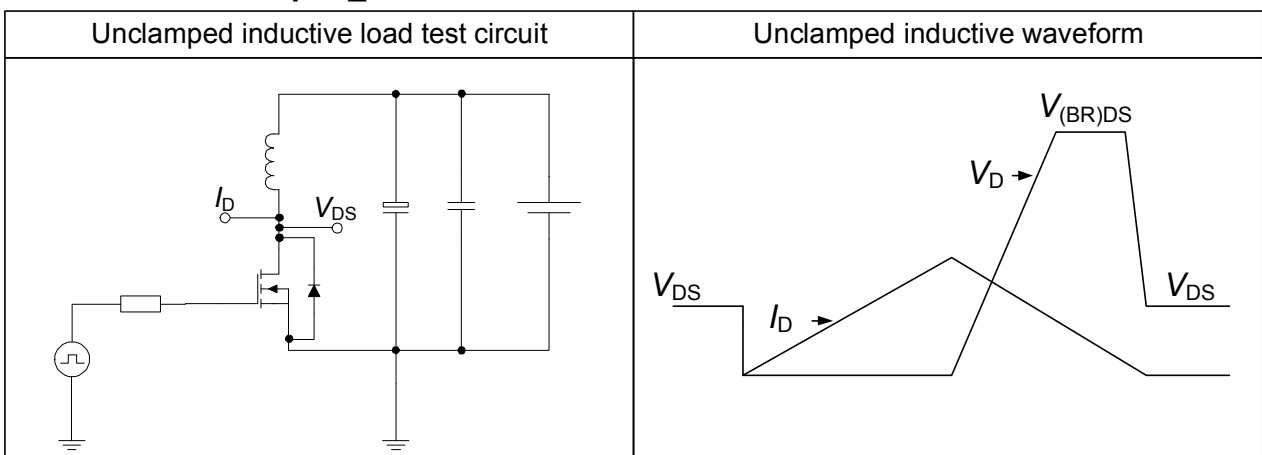
**Table 16 Diode\_characteristics**



**Table 17 Switching\_times**



**Table 18 Unclamped\_inductive**



7 Package Outlines

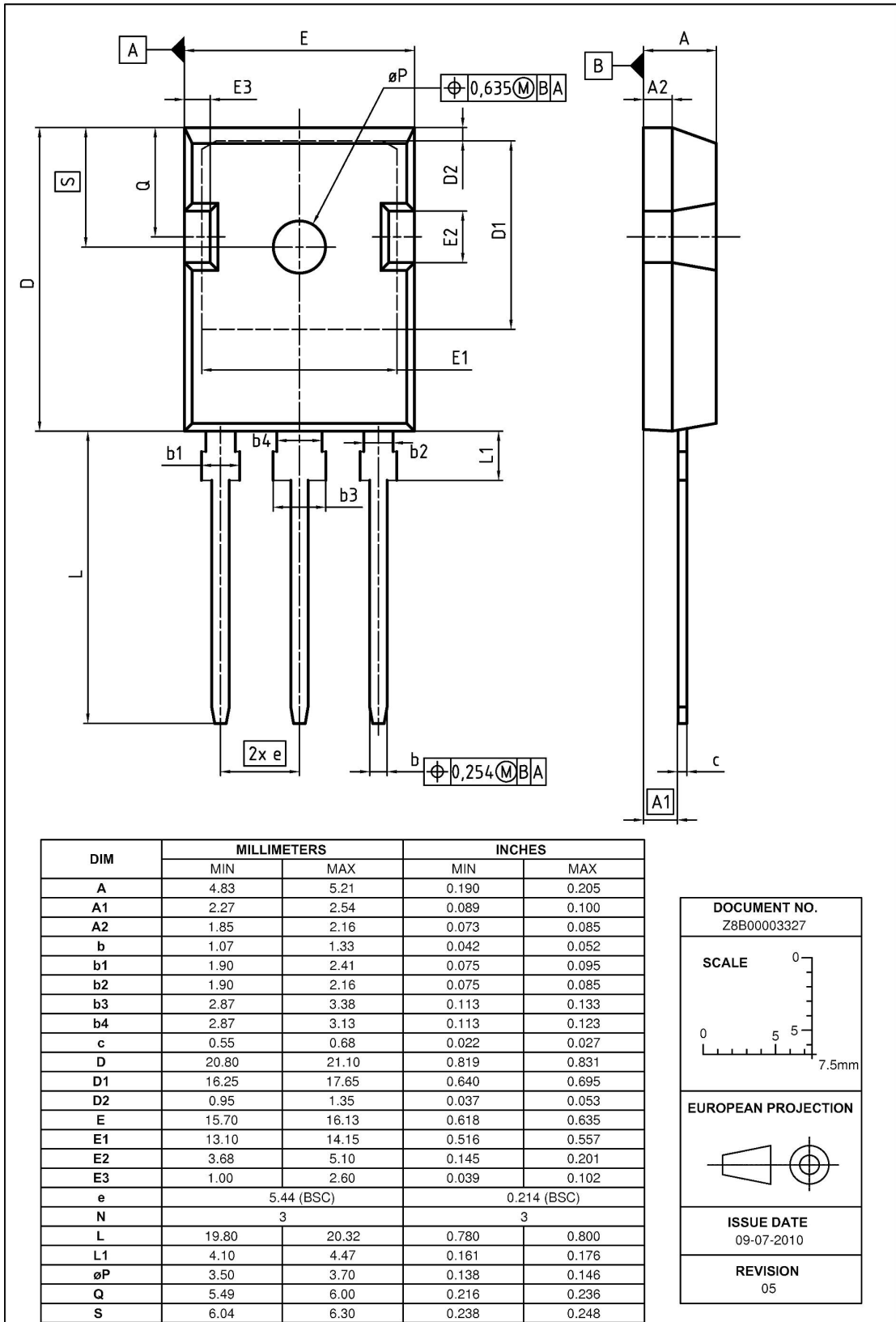


Figure 1 Outline PG-TO 247, dimensions in mm/inches

## 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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