MOSFET

Metal Oxide Semiconductor Field Effect Transistor

CoolMOS™ C3 800V

800V CoolMOS™ C3 Power Transistor
SPW55N80C3

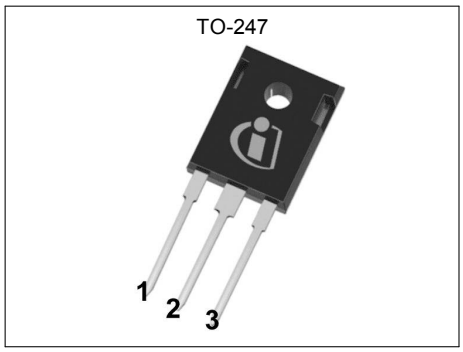
Data Sheet

Rev. 2.0
Final

Industrial & Multimarket

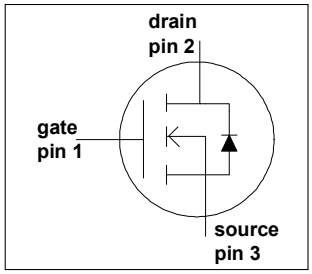
1 Description

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
RDS(on),max	0.085	Ω
Qg,typ	288	nC
ID,pulse	150	A
Eoss @ 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

Table of Contents

2 Maximum ratings

at T_j = 25°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°C
				34.7		T_C = 100°C
Pulsed drain current[2]	$I_{D,pulse}$			150	A	T_C = 25°C
Avalanche energy, single pulse	E_{AS}			2150	mJ	I_D = 9.5A, V_{DD} = 50V
Avalanche energy, repetitive	E_{AR}			3.26	mJ	I_D = 9.5A, V_{DD} = 50V
Avalanche current, repetitive	I_{AR}			9.5	A	
MOSFET dv/dt ruggedness	dv/dt			50	V/ns	V_{DS} = 0 ... 400V
Gate source voltage	V_{GS}	-20		20	V	static
		-30		30		AC (f > 1 Hz)
Power dissipation (non FullPAK) TO-247	P_{tot}			500.0	W	T_C = 25°C
Operating and storage temperature	T_j, T_{stg}	-55		150	°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°C
Diode pulse current	$I_{S,pulse}$			150	A	T_C = 25°C
Reverse diode dv/dt[3]	dv/dt			4	V/ns	V_{DS} = 0 ... 400V, $I_{SD} \le I_D$, T_j = 25°C
Maximum diode commutation speed	di_f/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 Rg

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°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°C
			150			V_{DS} = 800V, V_{GS} = 0V, T_j = 150°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°C
			0.199			V_{GS} = 10V, I_D = 32.6A, T_j = 150°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 ... 400V
Effective output capacitance, time related[2)]	$C_{o(tr)}$		277		pF	I_D = constant, V_{GS} = 0V, V_{DS} = 0 ... 400V
Turn-on delay time	$t_{d(on)}$		45		ns	V_{DD} = 400V, V_{GS} = 13V, I_D = 54.9A, R_G = 3.4Ω
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 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°C
Reverse recovery time	t_{rr}		1050		ns	V_R = 400V, I_F = 54.9A, dI_F/dt = 100A/µs
Reverse recovery charge	Q_{rr}		43		µC	
Peak reverse recovery current	I_{rrm}		78		A	

5 Electrical characteristics diagrams

Table 8

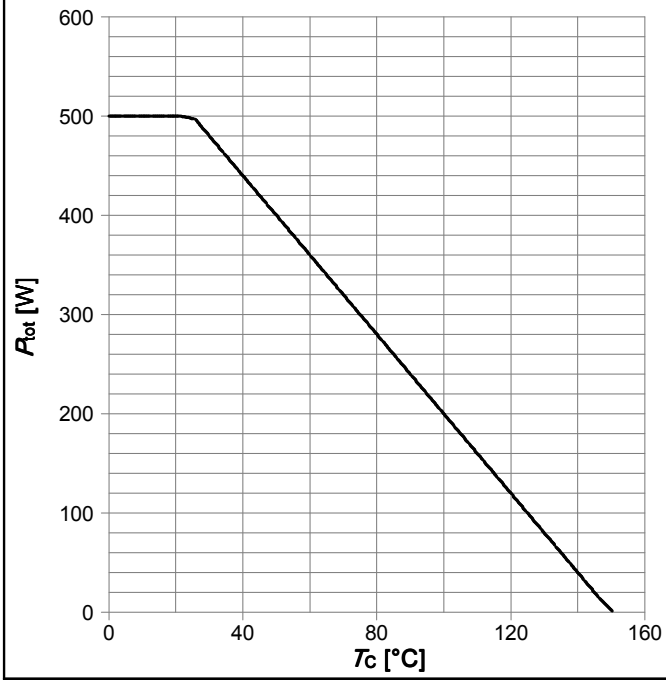
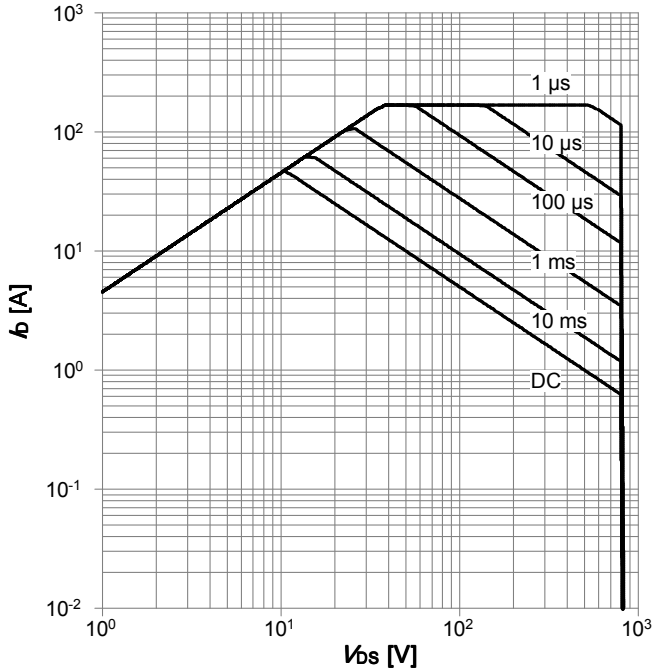
Power dissipation	Safe operating area
	
$P_{tot}=f(T_C)$	$I_D=f(V_{DS})$; VGS>7V; T_C=25 °C; D=0; parameter: t_p

Table 9

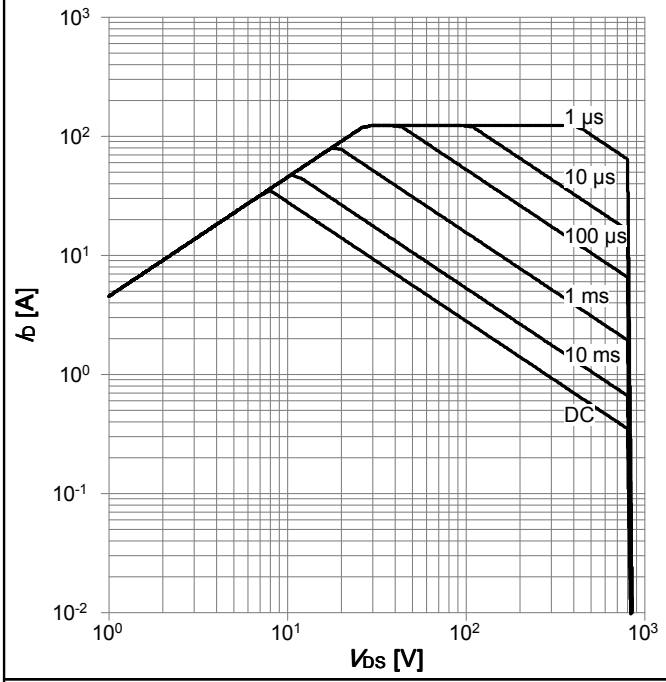
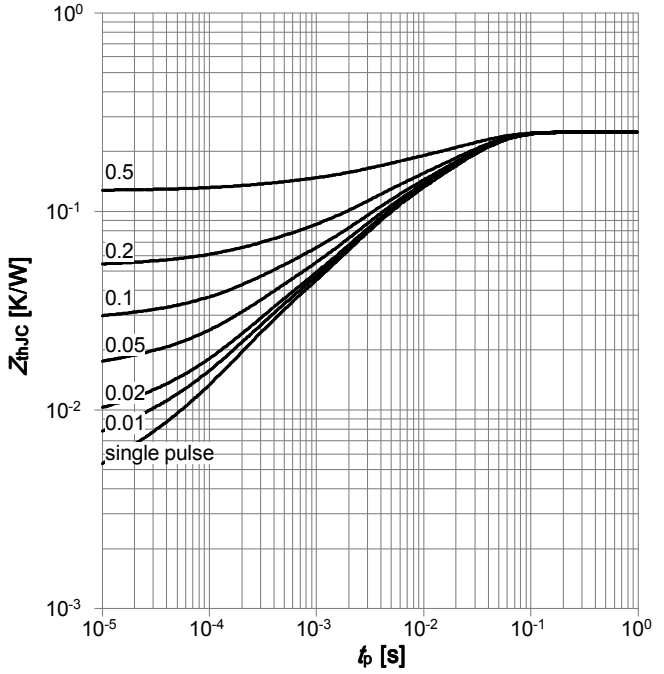
Safe operating area	Max. transient thermal impedance
	
$I_D=f(V_{DS})$;VGS>7V; T_C=80 °C; D=0; parameter: t_p	$Z_{thJC}=f(t_P)$; parameter: $D=t_p/T$

Table 10

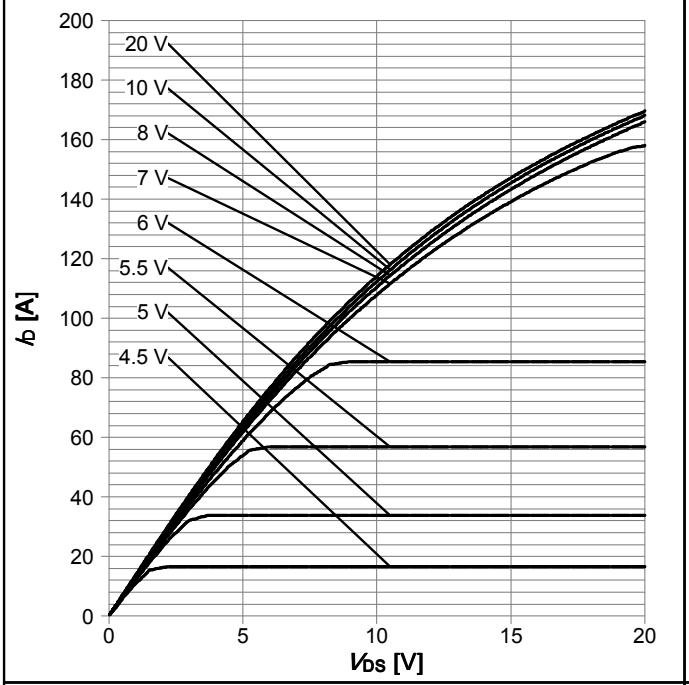
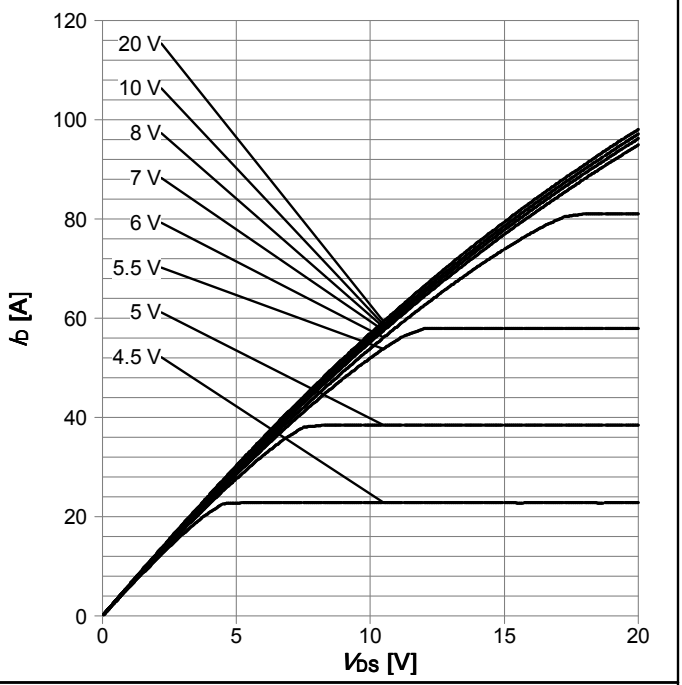
Typ. output characteristics	Typ. output characteristics
	
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}	$I_D=f(V_{DS})$; $T_j=125$ °C; parameter: V_{GS}

Table 11

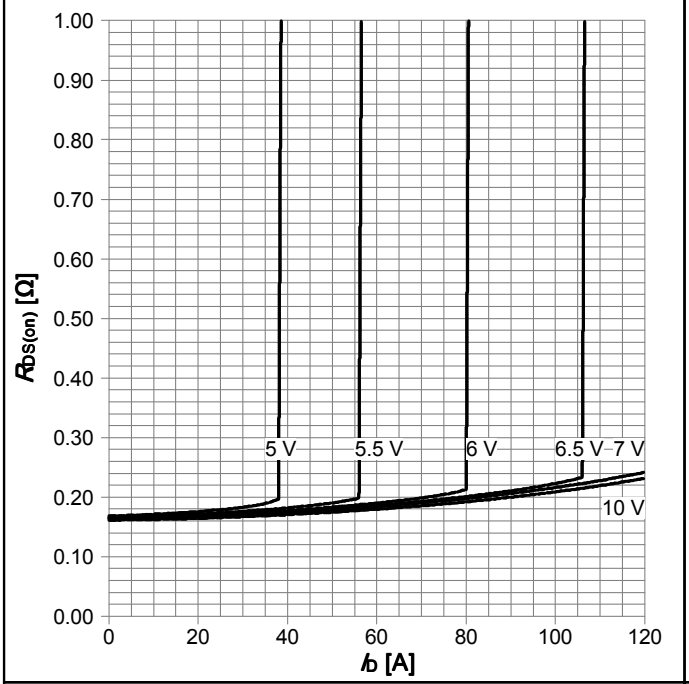
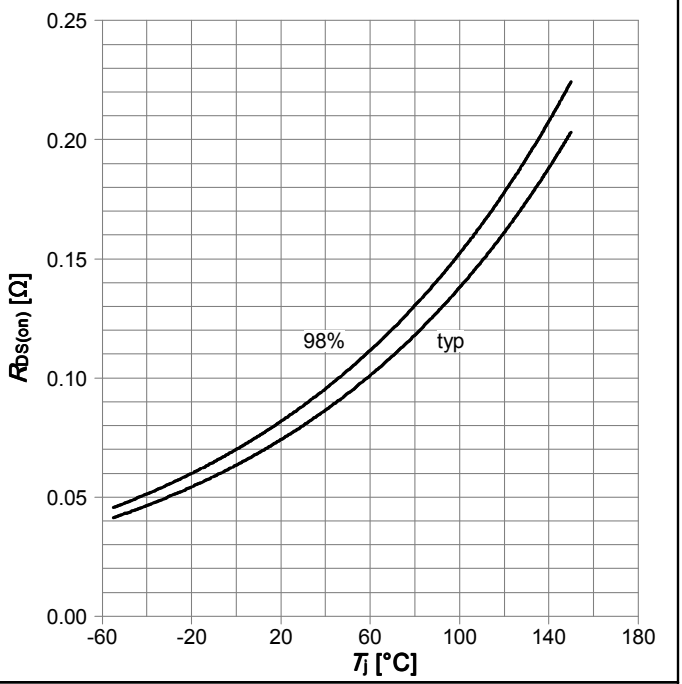
Typ. drain-source on-state resistance	Drain-source on-state resistance
	
$R_{DS(on)}=f(I_D)$; $T_j=125$ °C; parameter: V_{GS}	$R_{DS(on)}=f(T_j)$; $I_D=32.6$ A; $V_{GS}=10$ V

Table 12

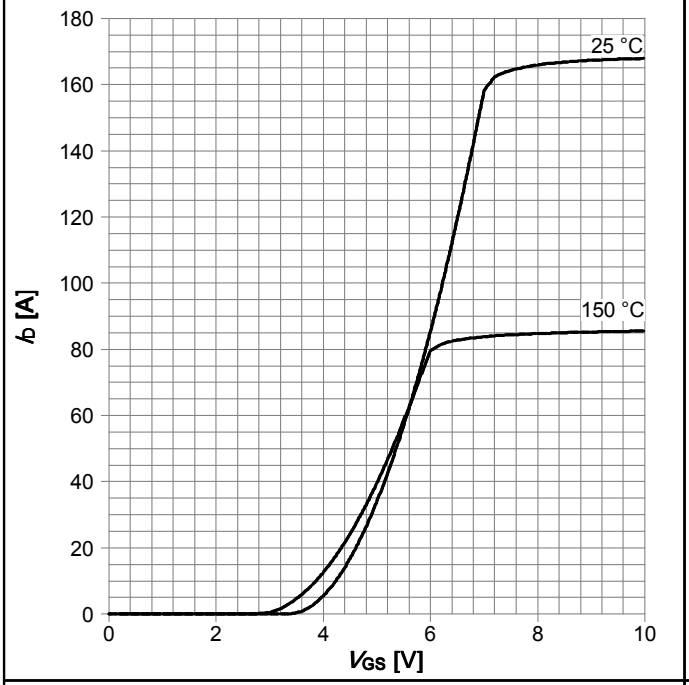
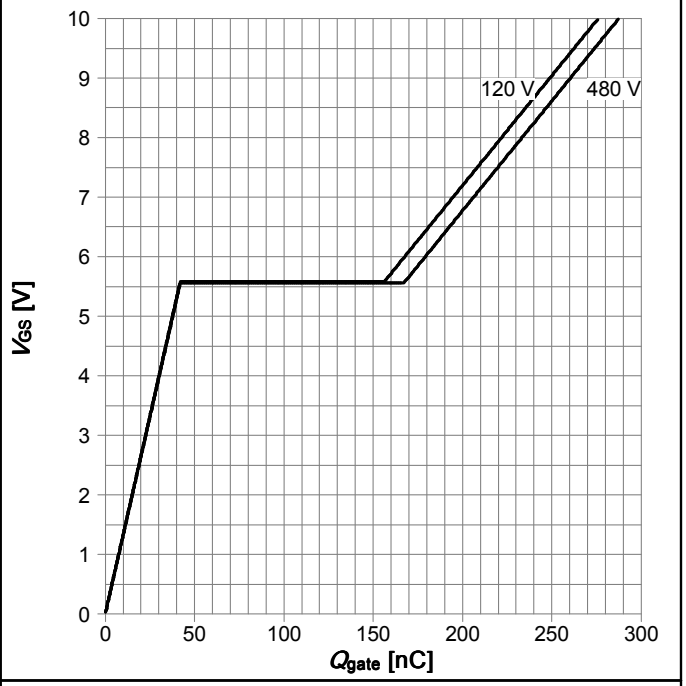
Typ. transfer characteristics	Typ. gate charge
	
I_D=f(V_{GS}); |V_{DS}|=20V;	V_{GS}=f(Q_{gate}); I_D=54.9 A pulsed; parameter: V_{DD}

Table 13

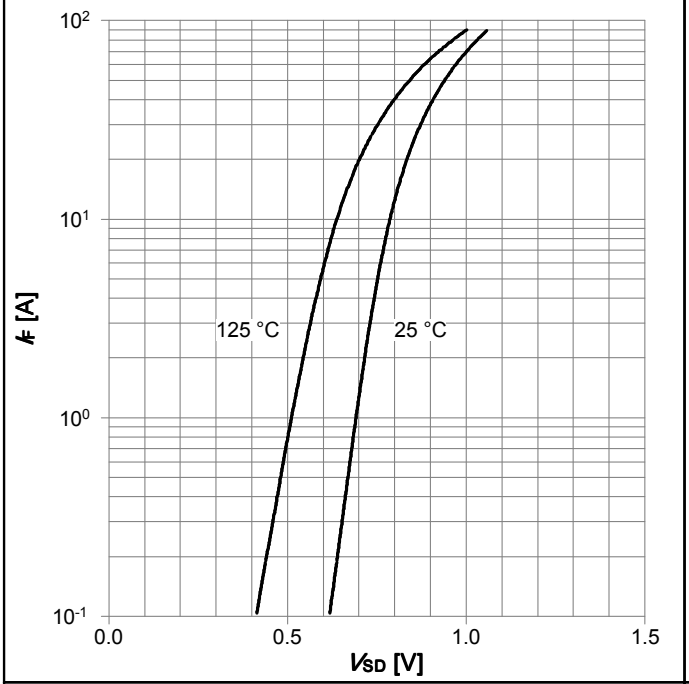
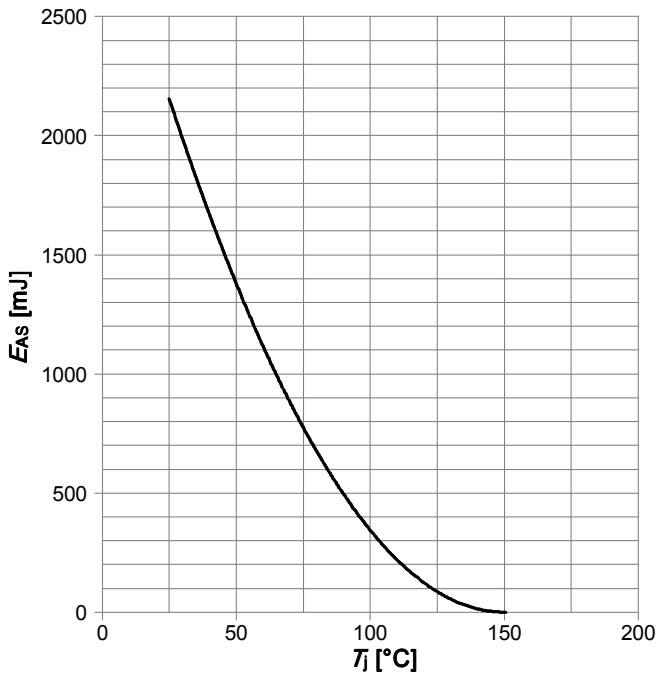
Forward characteristics of reverse diode	Avalanche energy
	
I_F=f(V_{SD}); parameter: T_j	E_{AS}=f(T_j); I_D=9.5 A; V_{DD}=50 V

Table 14

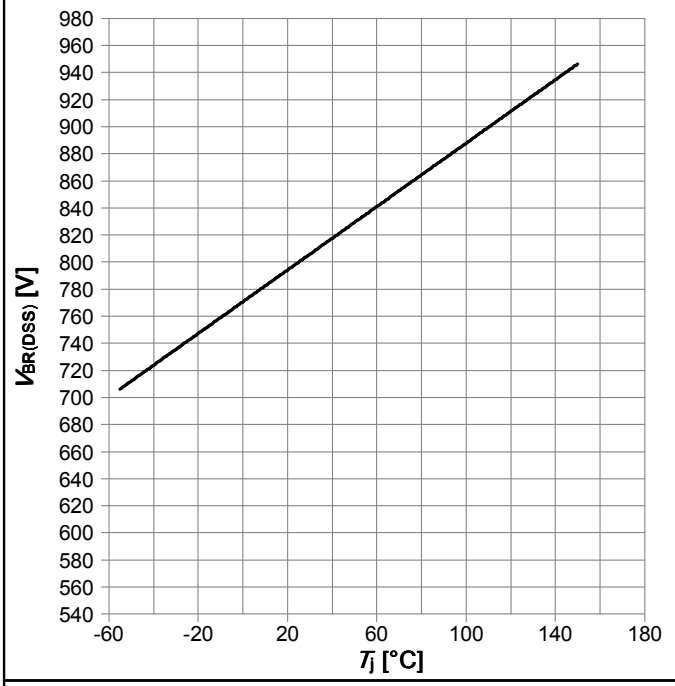
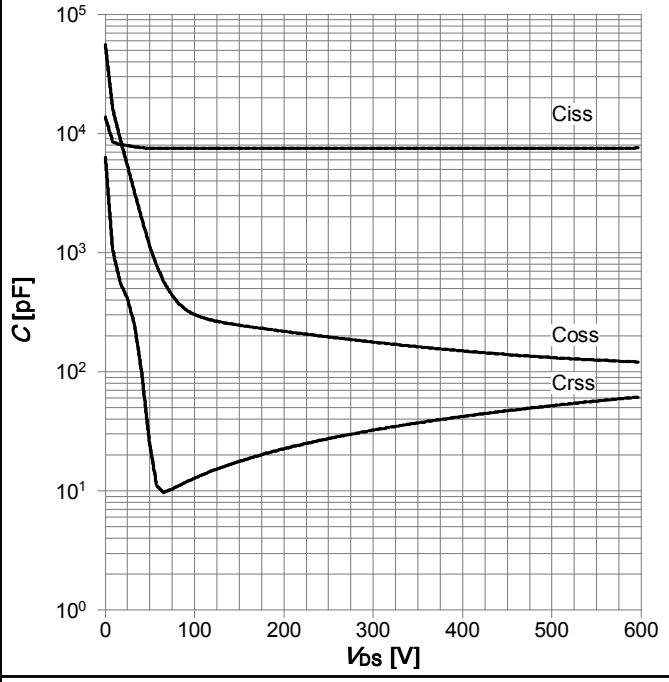
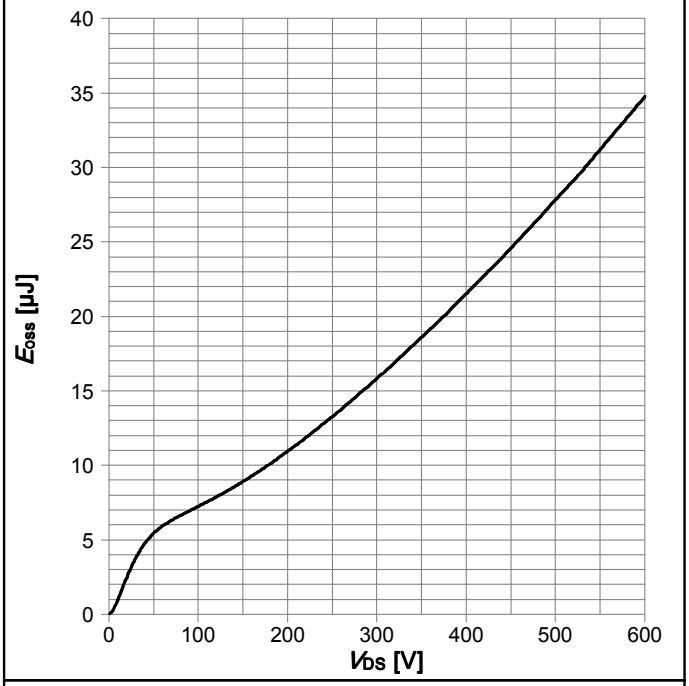
Drain-source breakdown voltage	Typ. capacitances
	
$V_{BR(DSS)}$=f(T_j); I_D=0.25 mA	C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Table 15

Typ. Coss stored energy

E_{oss}=f(V_{DS})

6 Test Circuits

Table 16 Diode_characteristics

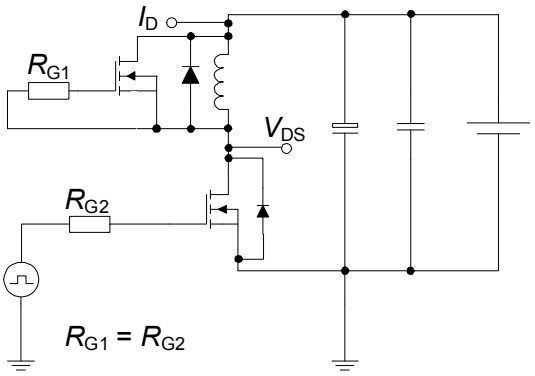
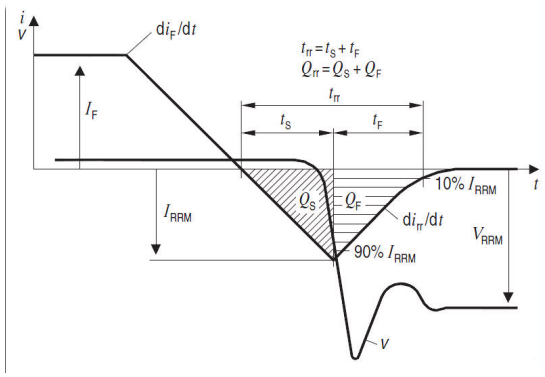
Test circuit for diode characteristics	Diode recovery waveform
	

Table 17 Switching_times

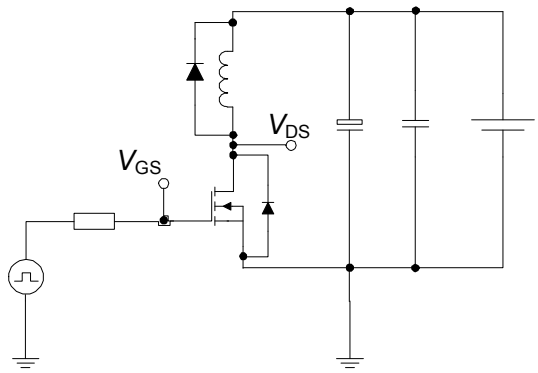
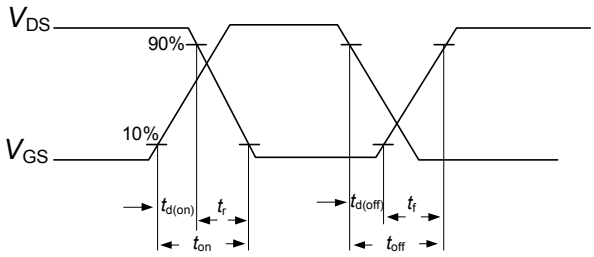
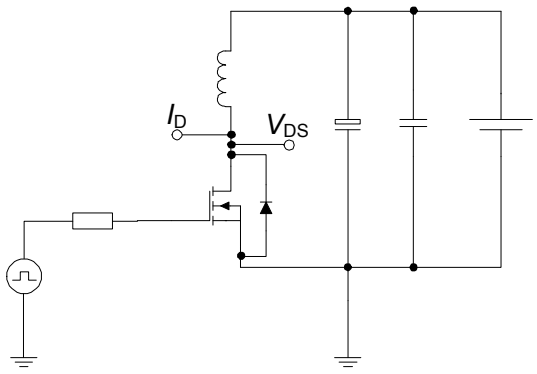
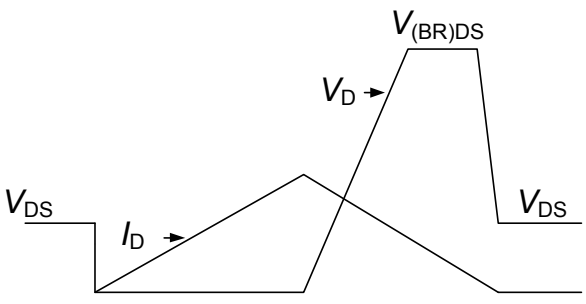
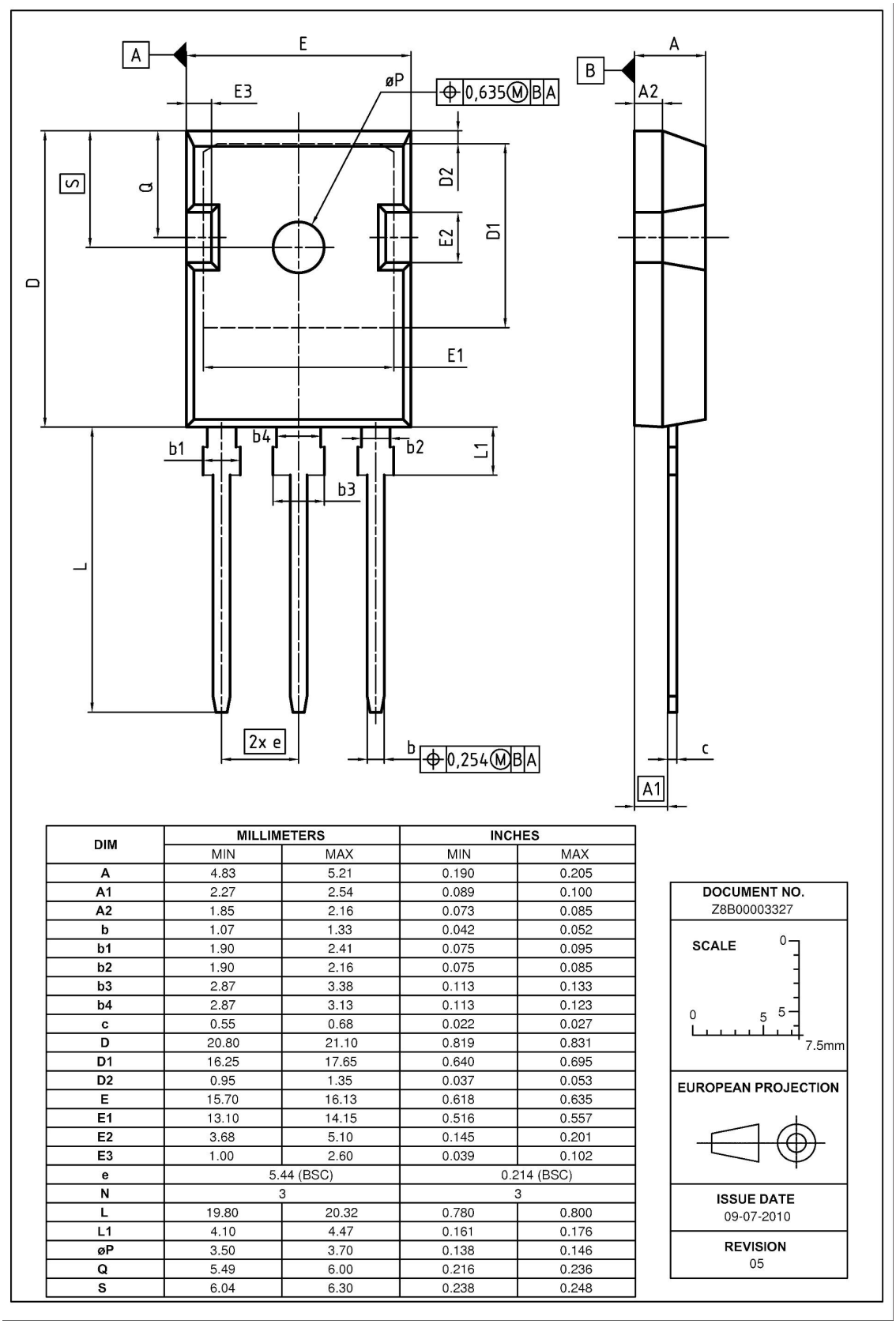
Switching times test circuit for inductive load	Switching times waveform
	

Table 18 Unclamped_inductive

Unclamped inductive load test circuit	Unclamped inductive waveform
	

7 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

DOCUMENT NO.
Z8B00003327

SCALE
0 5 5 7.5mm

EUROPEAN PROJECTION

ISSUE DATE
09-07-2010

REVISION
05

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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