

ISC015N04NM5ATMA1 Datasheet

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DiGi Electronics Part Number	ISC015N04NM5ATMA1-DG
Manufacturer	Infineon Technologies
Manufacturer Product Number	ISC015N04NM5ATMA1
Description	40V 1.5M OPTIMOS MOSFET SUPERS08
Detailed Description	N-Channel 40 V 33A (Ta), 206A (Tc) 3W (Ta), 115W (Tc) Surface Mount PG-TDSON-8 FL



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Purchase and inquiry

Manufacturer Product Number:

ISC015N04NM5ATMA1

Series:

OptiMOS™-5

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

40 V

Drive Voltage (Max Rds On, Min Rds On):

7V, 10V

Vgs(th) (Max) @ Id:

3.4V @ 60µA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 175°C (Tj)

Supplier Device Package:

PG-TDSON-8 FL

Base Product Number:

ISC015N

Manufacturer:

Infineon Technologies

Product Status:

Active

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

33A (Ta), 206A (Tc)

Rds On (Max) @ Id, Vgs:

1.5mOhm @ 50A, 10V

Gate Charge (Qg) (Max) @ Vgs:

67 nC @ 10 V

Input Capacitance (Ciss) (Max) @ Vds:

4800 pF @ 20 V

Power Dissipation (Max):

3W (Ta), 115W (Tc)

Mounting Type:

Surface Mount

Package / Case:

8-PowerTDFN

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

MOSFET

OptiMOS™ 5 Power-Transistor, 40 V

Features

- Battery powered application
- LV motor drives
- Very low on-resistance $R_{DS(on)}$
- 100% avalanche tested
- Superior thermal resistance
- N-channel
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- 175 °C rated

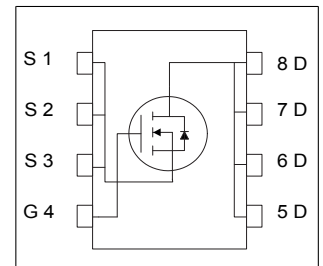
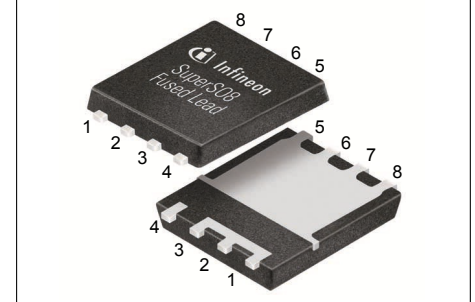
Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	40	V
$R_{DS(on),max}$	1.5	m Ω
I_D	206	A
Q_{oss}	54	nC
$Q_G(0V..10V)$	51	nC

TDSON-8 FL (enlarged source interconnection)



Type / Ordering Code	Package	Marking	Related Links
ISC015N04NM5	TDSON-8 FL	15N04NM5	-



OptiMOS™ 5 Power-Transistor, 40 V

ISC015N04NM5

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OptiMOS™ 5 Power-Transistor, 40 V

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1 Maximum ratings

at $T_A=25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D	-	-	206 145 188 133 33	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=7\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=7\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{THJA}=50\text{ °C/W}^2)$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	824	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ⁴⁾	E_{AS}	-	-	220	mJ	$I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	115 3.0	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{THJA}=50\text{ °C/W}^2)$
Operating and storage temperature	T_j , T_{stg}	-55	-	175	°C	IEC climatic category; DIN IEC 68-1: 55/175/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	-	1.3	°C/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	20	°C/W	-
Device on PCB, 6 cm ² cooling area	R_{thJA}	-	-	50	°C/W	-

¹⁾ Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher Tcase please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

³⁾ See Diagram 3 for more detailed information

⁴⁾ See Diagram 13 for more detailed information

OptiMOS™ 5 Power-Transistor, 40 V

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3 Electrical characteristics

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

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	40	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2.2	-	3.4	V	$V_{DS}=V_{GS}$, $I_D=60\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1 100	μA	$V_{DS}=40\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=40\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	1.2 1.4	1.5 1.8	m Ω	$V_{GS}=10\text{ V}$, $I_D=50\text{ A}$ $V_{GS}=7\text{ V}$, $I_D=50\text{ A}$
Gate resistance	R_G	-	0.9	1.3	Ω	-
Transconductance	g_{fs}	-	210	-	S	$ V_{DS} \geq 2 I_D /R_{DS(on)max}$, $I_D=50\text{ A}$

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	3700	4800	pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1\text{ MHz}$
Output capacitance ¹⁾	C_{oss}	-	1690	2200	pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance ¹⁾	C_{rss}	-	130	230	pF	$V_{GS}=0\text{ V}$, $V_{DS}=20\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	10	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	5	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	20	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	6	-	ns	$V_{DD}=20\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$

Table 6 Gate charge characteristics²⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	16	-	nC	$V_{DD}=20\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	11	-	nC	$V_{DD}=20\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge ¹⁾	Q_{gd}	-	9	14	nC	$V_{DD}=20\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	15	-	nC	$V_{DD}=20\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ¹⁾	Q_g	-	51	67	nC	$V_{DD}=20\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	4.2	-	V	$V_{DD}=20\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$	-	46	-	nC	$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge	Q_{oss}	-	54	-	nC	$V_{DD}=20\text{ V}$, $V_{GS}=0\text{ V}$

¹⁾ Defined by design. Not subject to production test.

²⁾ See "Gate charge waveforms" for parameter definition



OptiMOS™ 5 Power-Transistor, 40 V

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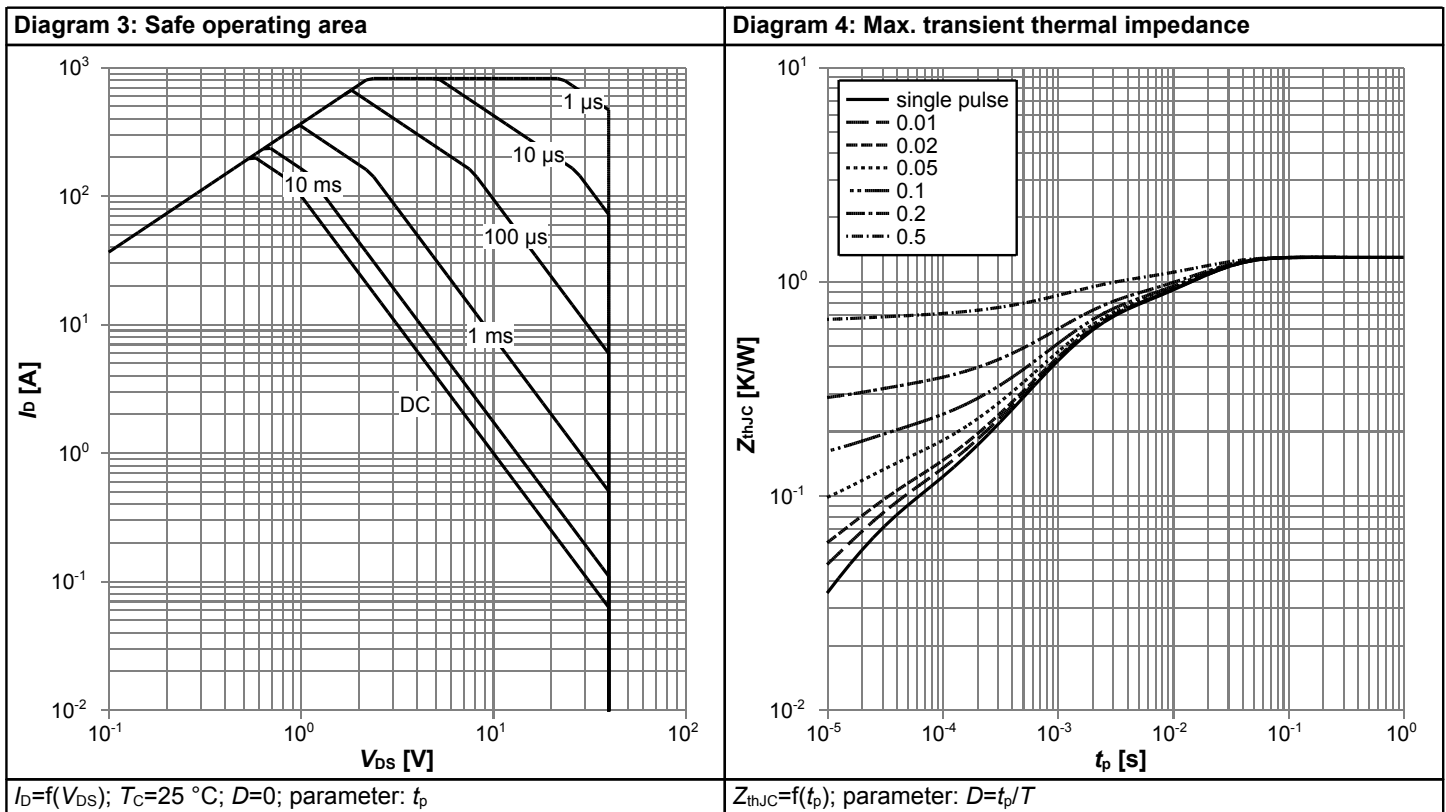
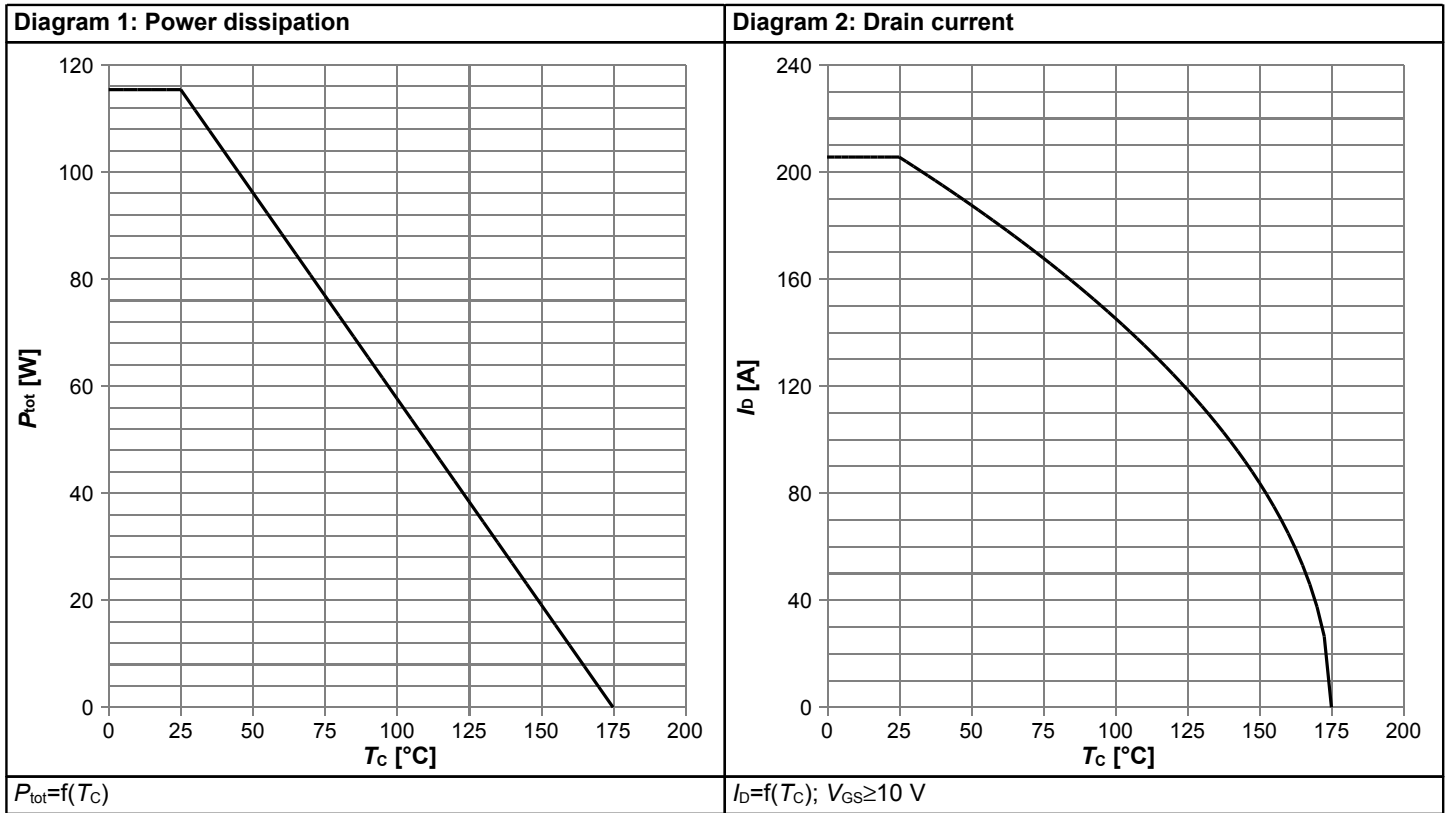
Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	115	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	824	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.84	1	V	$V_{GS}=0\text{ V}, I_F=50\text{ A}, T_j=25\text{ °C}$
Reverse recovery time	t_{rr}	-	21	-	ns	$V_R=20\text{ V}, I_F=50\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}	-	59	-	nC	$V_R=20\text{ V}, I_F=50\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$



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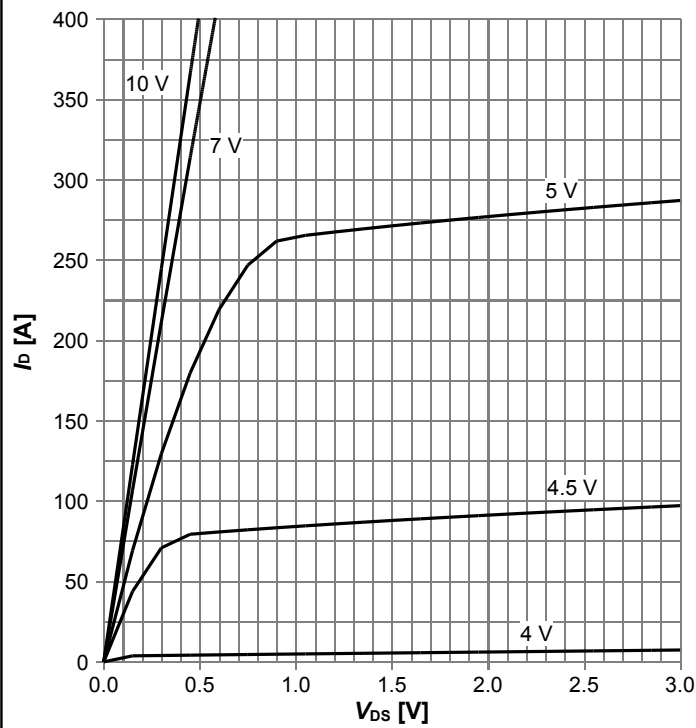
4 Electrical characteristics diagrams





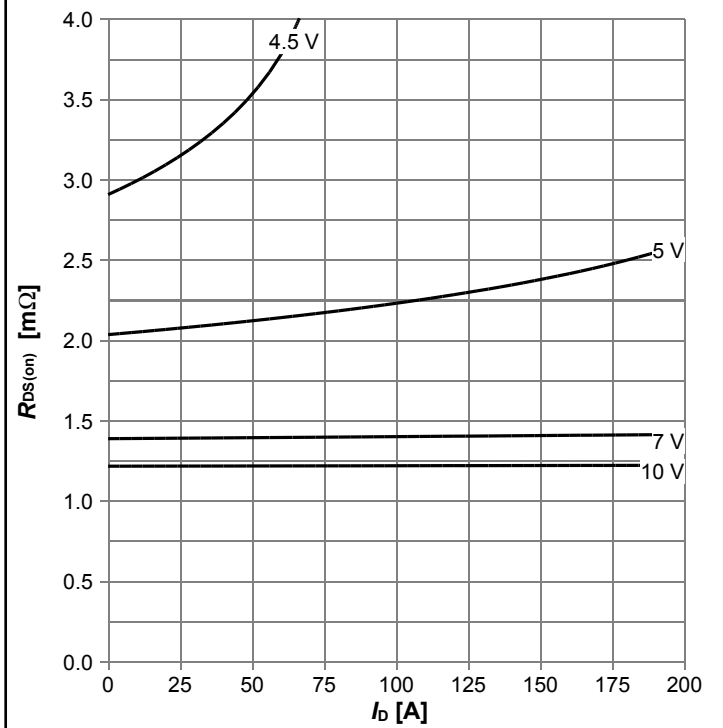
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Diagram 5: Typ. output characteristics



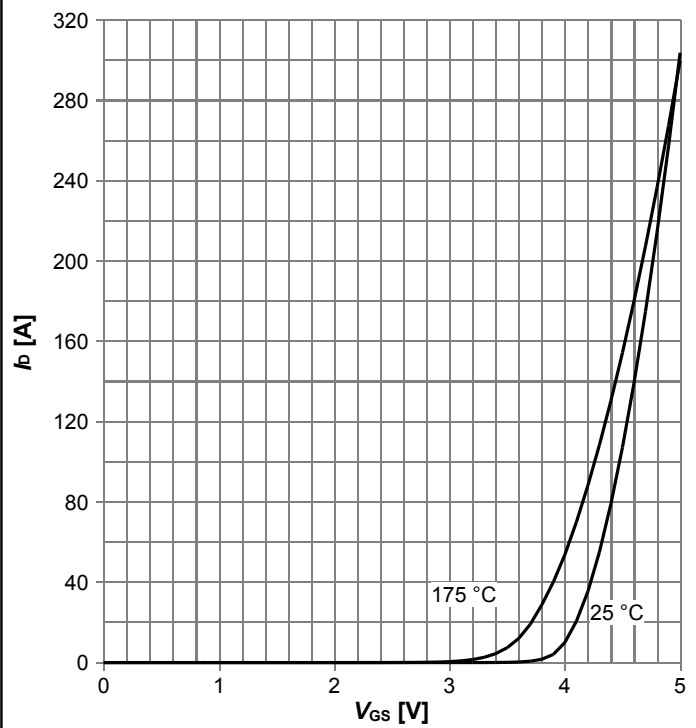
$I_D=f(V_{DS}), T_j=25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



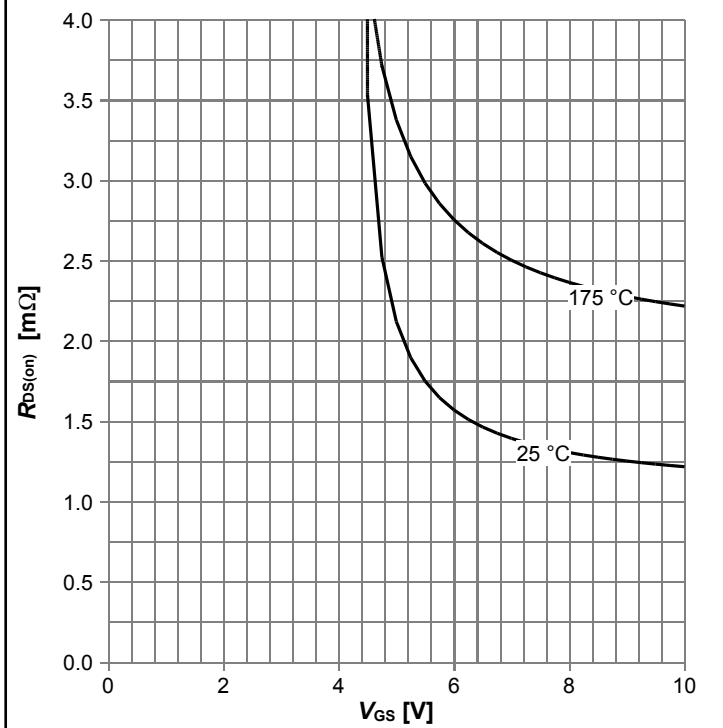
$R_{DS(on)}=f(I_D), T_j=25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



$I_D=f(V_{GS}), |V_{DS}|>2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. drain-source on resistance

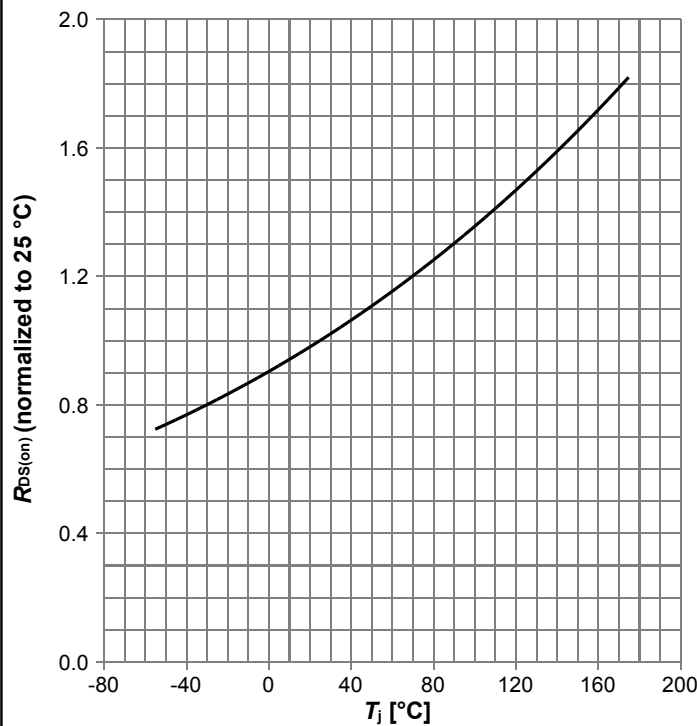


$R_{DS(on)}=f(V_{GS}), I_D=50\text{ A};$ parameter: T_j



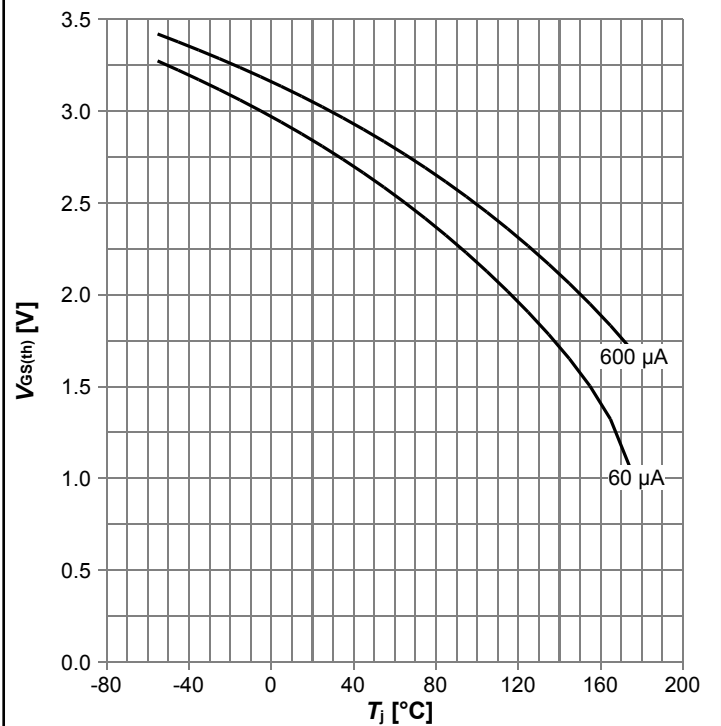
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Diagram 9: Normalized drain-source on resistance



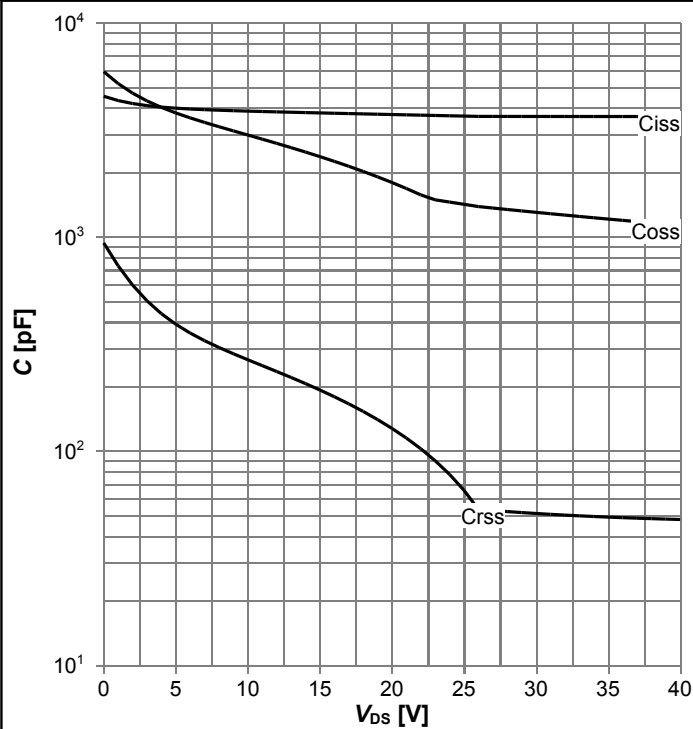
$R_{DS(on)}=f(T_j)$, $I_D=50\text{ A}$, $V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



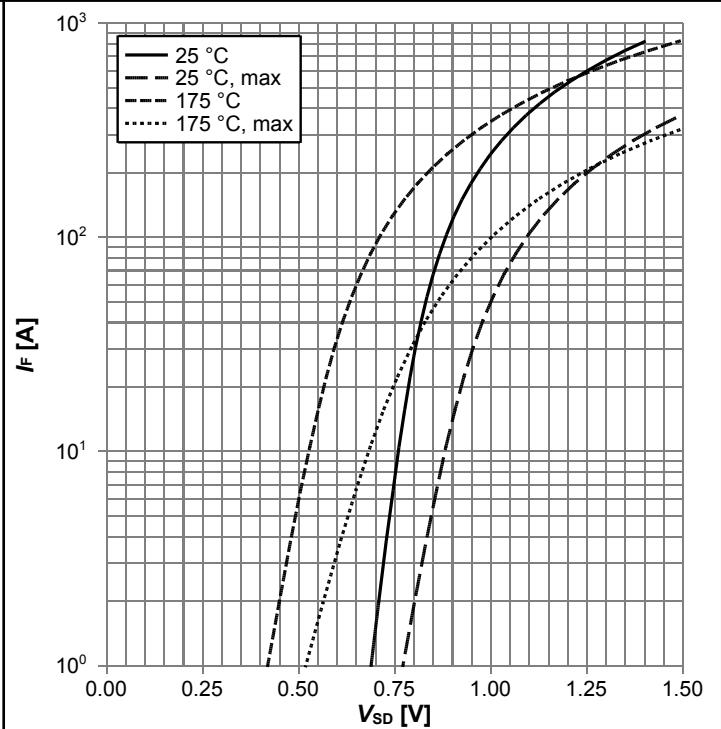
$V_{GS(th)}=f(T_j)$, $V_{GS}=V_{DS}$; parameter: I_D

Diagram 11: Typ. capacitances



$C=f(V_{DS})$; $V_{GS}=0\text{ V}$; $f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



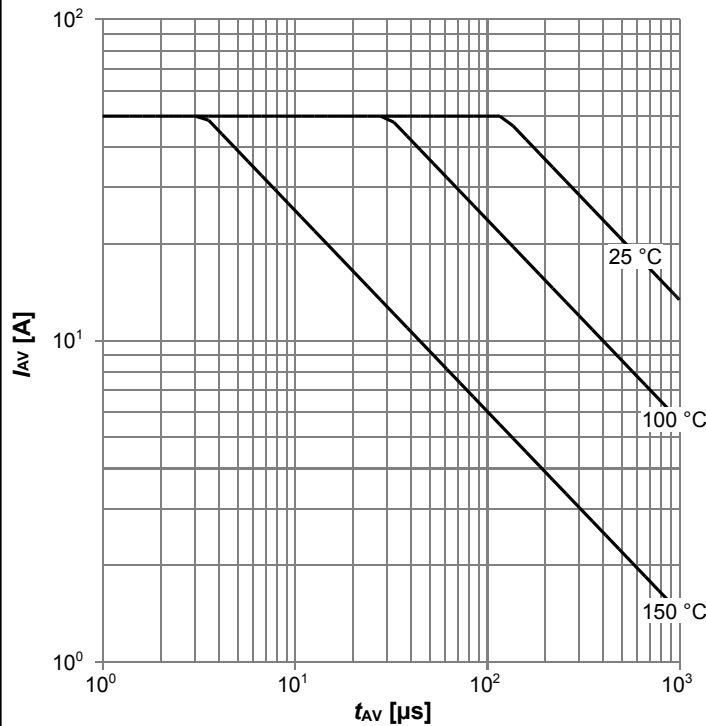
$I_F=f(V_{SD})$; parameter: T_j



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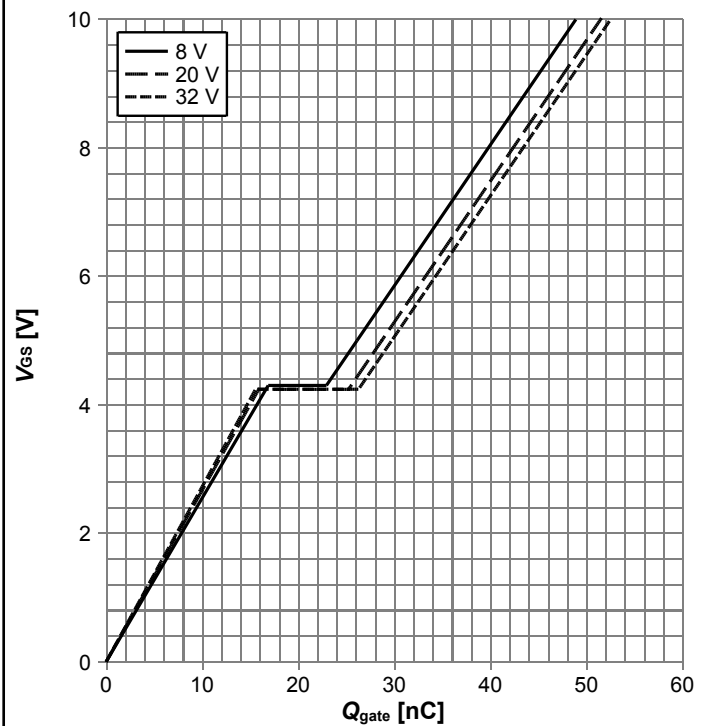
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Diagram 13: Avalanche characteristics



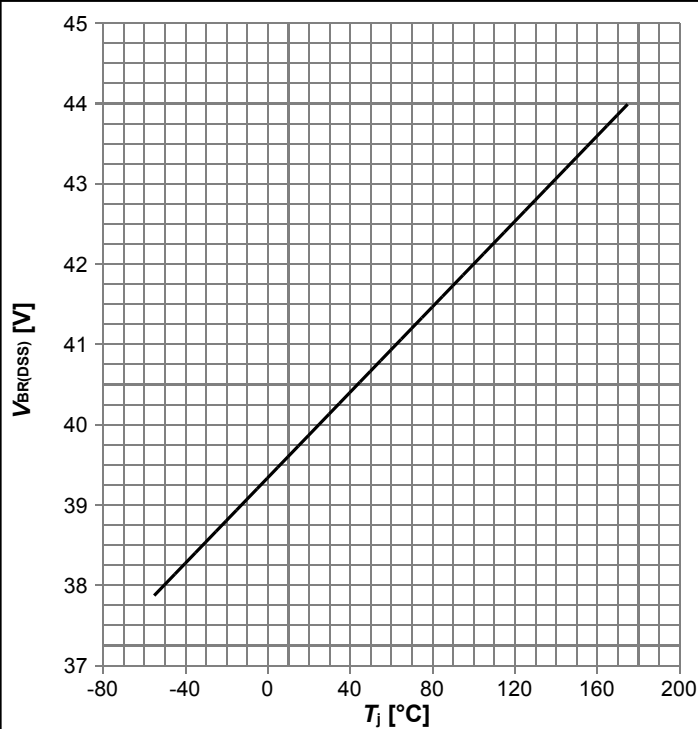
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



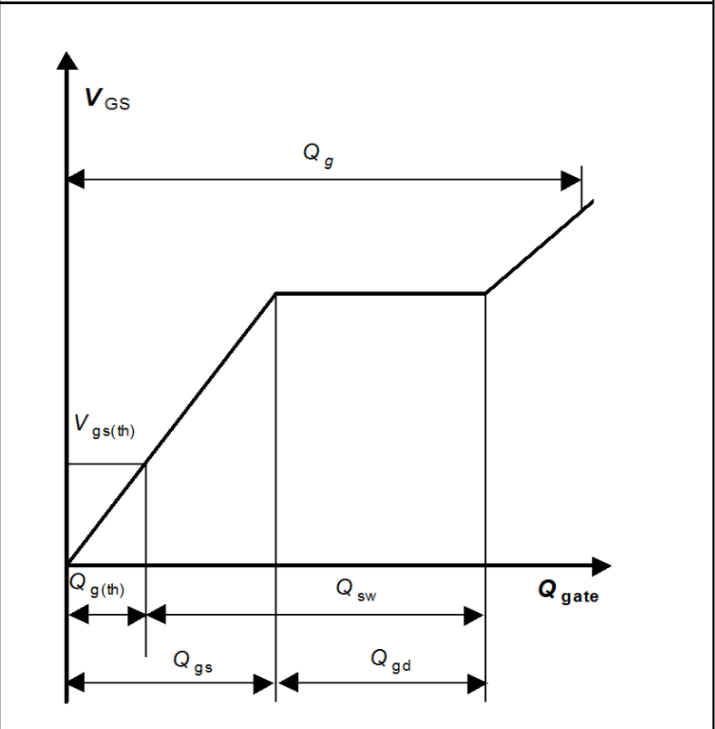
$V_{GS}=f(Q_{gate}), I_D=50 \text{ A pulsed}, T_j=25 \text{ °C}$; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage



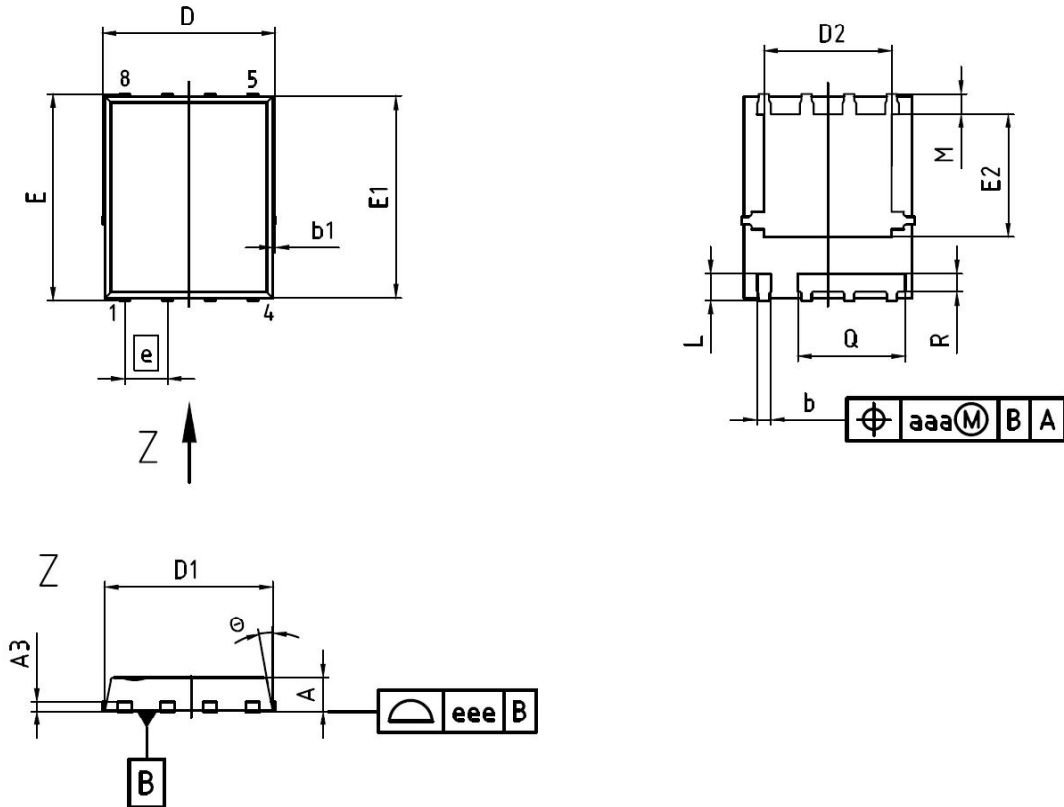
$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$

Diagram Gate charge waveforms



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5 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.10	0.035	0.043
A3	0.25 (REF)		0.011 (REF)	
b	0.34	0.54	0.013	0.021
b1	0.02	0.22	0.001	0.009
D	5.15 (BSC)		0.203 (BSC)	
D1	5.00 (BSC)		0.197 (BSC)	
D2	3.70	4.40	0.146	0.173
E	6.15 (BSC)		0.242 (BSC)	
E1	6.00 (BSC)		0.236 (BSC)	
E2	3.40	3.80	0.134	0.150
e	1.27 (BSC)		0.050 (BSC)	
N	8		8	
L	0.74	0.84	0.029	0.033
M	0.45	0.66	0.018	0.026
phi	8.5°	12°	8.5°	12°
Q	3.15	3.25	0.124	0.128
R	0.48	0.58	0.019	0.023
aaa	0.25		0.010	
eee	0.08		0.003	

DOCUMENT NO.
Z8B00162237

SCALE

EUROPEAN PROJECTION

ISSUE DATE
02-08-2011

REVISION
01

Figure 1 Outline TDSON-8 FL, dimensions in mm/inches



OptiMOS™ 5 Power-Transistor, 40 V

ISC015N04NM5

Revision History

ISC015N04NM5

Revision: 2020-03-22, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2020-01-22	Release of final version
2.1	2020-03-22	Update condition Id pulse, Features and footnotes

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