

# **MOSFET**

# **StrongIRFET™ 2 Power-Transistor**

#### **Features**

- Optimized for a wide range of applications
  N-Channel, normal level
  100% avalanche tested

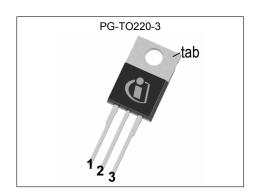
- Pb-free lead plating; RoHS compliant
  Halogen-free according to IEC61249-2-21

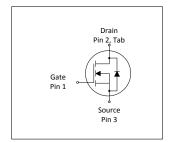
#### **Product validation**

Qualified according to JEDEC Standard

Table 1 **Key Performance Parameters** 

Parameter	Value	Unit
$V_{ t DS}$	100	V
$R_{ extsf{DS(on),max}}$	5.0	mΩ
I <sub>D</sub>	110	A
Qoss	67	nC
<b>Q</b> <sub>G</sub>	51	nC











Type / Ordering Code	ode Package		Related Links
IPP050N10NF2S	PG-TO220-3	050N10NS	-

# StrongIRFET<sup>TM</sup> 2 Power-Transistor IPP050N10NF2S



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## StrongIRFET<sup>™</sup> 2 Power-Transistor IPP050N10NF2S



1 Maximum ratings at  $T_A$ =25 °C, unless otherwise specified

Table 2 Maximum ratings

Davamatan	O h l	Values				
Parameter	Symbol	Min.	Тур.	Max.	Unit	Note / Test Condition
Continuous drain current <sup>1)</sup>	I <sub>D</sub>	- - -	- - -	110 85 78 19.4	A	$V_{GS}$ =10 V, $T_{C}$ =25 °C $V_{GS}$ =10 V, $T_{C}$ =100 °C $V_{GS}$ =6 V, $T_{C}$ =100 °C $V_{GS}$ =10 V, $T_{A}$ =25 °C, $R_{thJA}$ =40°C/W <sup>2)</sup>
Pulsed drain current <sup>3)</sup>	I <sub>D,pulse</sub>	-	-	440	Α	<i>T</i> <sub>A</sub> =25 °C
Avalanche energy, single pulse <sup>4)</sup>	E <sub>AS</sub>	-	-	100	mJ	$I_{\rm D}$ =80 A, $R_{\rm GS}$ =25 $\Omega$
Gate source voltage	V <sub>GS</sub>	-20	-	20	V	-
Power dissipation	P <sub>tot</sub>	-	-	150 3.8	W	T <sub>C</sub> =25 °C T <sub>A</sub> =25 °C, R <sub>thJA</sub> =40 °C/W <sup>2)</sup>
Operating and storage temperature	T <sub>j</sub> , T <sub>stg</sub>	-55	-	175	°C	-

#### 2 Thermal characteristics

Table 3 Thermal characteristics

Doromotor	Cumbal	Values			Unit	Note / Toot Condition	
Parameter	Symbol	Min.	Тур.	Max.	Oilit	Note / Test Condition	
Thermal resistance, junction - case	R <sub>thJC</sub>	-	-	1	°C/W	-	
Thermal resistance, junction - ambient, 6 cm² cooling area²)		-	-	40	°C/W	-	
Thermal resistance, junction - ambient, minimal footprint	R <sub>thJA</sub>	_	-	62	°C/W	-	

<sup>&</sup>lt;sup>1)</sup> Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature as specified. For other case temperatures please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.  $^{2)}$  Device on 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm $^{2}$  (one layer, 70  $\mu$ m 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

# StrongIRFET<sup>™</sup> 2 Power-Transistor IPP050N10NF2S



### **Electrical characteristics**

at  $T_j$ =25 °C, unless otherwise specified

Table 4 **Static characteristics** 

Barranadari	0		Values				
Parameter	Symbol	Min.	n. Typ. Max.		Unit	Note / Test Condition	
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	100	-	-	V	V <sub>GS</sub> =0 V, I <sub>D</sub> =1 mA	
Gate threshold voltage	$V_{\rm GS(th)}$	2.2	3	3.8	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =84 μA	
Zero gate voltage drain current	I <sub>DSS</sub>	-	0.1 10	1 100	μΑ	V <sub>DS</sub> =100 V, V <sub>GS</sub> =0 V, T <sub>j</sub> =25 °C V <sub>DS</sub> =100 V, V <sub>GS</sub> =0 V, T <sub>j</sub> =125 °C	
Gate-source leakage current	I <sub>GSS</sub>	-	10	100	nA	V <sub>GS</sub> =20 V, V <sub>DS</sub> =0 V	
Drain-source on-state resistance <sup>1)</sup>	R <sub>DS(on)</sub>	-	4.5 5.4	5.0 6.2	mΩ	V <sub>GS</sub> =10 V, I <sub>D</sub> =60 A V <sub>GS</sub> =6 V, I <sub>D</sub> =30 A	
Gate resistance	R <sub>G</sub>	-	1.7	-	Ω	-	
Transconductance <sup>2)</sup>	<b>g</b> fs	57	-	-	S	V <sub>DS</sub>  ≥2  I <sub>D</sub>   R <sub>DS(on)max</sub> , I <sub>D</sub> =60 A	

Table 5 **Dynamic characteristics** 

Parameter	Ol	Values			11	Nata (Tast Oanskiisa	
Parameter	Symbol	Min.	Тур.	Max.	Unit	Note / Test Condition	
Input capacitance	C <sub>iss</sub>	-	3600	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =50 V, f=1 MHz	
Output capacitance	Coss	-	570	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =50 V, f=1 MHz	
Reverse transfer capacitance	C <sub>rss</sub>	-	25	-	pF	V <sub>GS</sub> =0 V, V <sub>DS</sub> =50 V, f=1 MHz	
Turn-on delay time	$t_{\sf d(on)}$	-	14	-	ns	$V_{\rm DD}$ =50 V, $V_{\rm GS}$ =10 V, $I_{\rm D}$ =60 A, $R_{\rm G,ext}$ =1.6 $\Omega$	
Rise time	t <sub>r</sub>	-	47	-	ns	$V_{\rm DD}$ =50 V, $V_{\rm GS}$ =10 V, $I_{\rm D}$ =60 A, $R_{\rm G,ext}$ =1.6 $\Omega$	
Turn-off delay time	$t_{ m d(off)}$	-	25	-	ns	$V_{\rm DD}$ =50 V, $V_{\rm GS}$ =10 V, $I_{\rm D}$ =60 A, $R_{\rm G,ext}$ =1.6 $\Omega$	
Fall time	t <sub>f</sub>	-	9	-	ns	$V_{\rm DD}$ =50 V, $V_{\rm GS}$ =10 V, $I_{\rm D}$ =60 A, $R_{\rm G,ext}$ =1.6 $\Omega$	

Gate charge characteristics<sup>3)</sup> Table 6

Doromotor	Cymbal	Values			11:4	Nata / Tast Canditian	
Parameter	Symbol	Min.	Тур.	Max.	Unit	Note / Test Condition	
Gate to source charge	Q <sub>gs</sub>	-	17	-	nC	$V_{DD}$ =50 V, $I_{D}$ =60 A, $V_{GS}$ =0 to 10 V	
Gate charge at threshold	$Q_{g(th)}$	-	11	-	nC	$V_{DD}$ =50 V, $I_{D}$ =60 A, $V_{GS}$ =0 to 10 V	
Gate to drain charge	$Q_{ m gd}$	-	11	-	nC	$V_{DD}$ =50 V, $I_{D}$ =60 A, $V_{GS}$ =0 to 10 V	
Switching charge	Q <sub>sw</sub>	-	17	-	nC	V <sub>DD</sub> =50 V, I <sub>D</sub> =60 A, V <sub>GS</sub> =0 to 10 V	
Gate charge total <sup>2)</sup>	Qg	-	51	76	nC	$V_{DD}$ =50 V, $I_{D}$ =60 A, $V_{GS}$ =0 to 10 V	
Gate plateau voltage	V <sub>plateau</sub>	-	4.7	-	V	$V_{DD}$ =50 V, $I_{D}$ =60 A, $V_{GS}$ =0 to 10 V	
Output charge	Qoss	-	67	-	nC	V <sub>DS</sub> =50 V, V <sub>GS</sub> =0 V	

<sup>&</sup>lt;sup>1)</sup> R<sub>DS(on)</sub> is specified at a distance of 1.8 mm distance to the package body; mounting at a larger distance increases the overall package resistance of approximately 0.04 mOhm/mm per leg.
<sup>2)</sup> Defined by design. Not subject to production test.
<sup>3)</sup> See "Gate charge waveforms" for parameter definition

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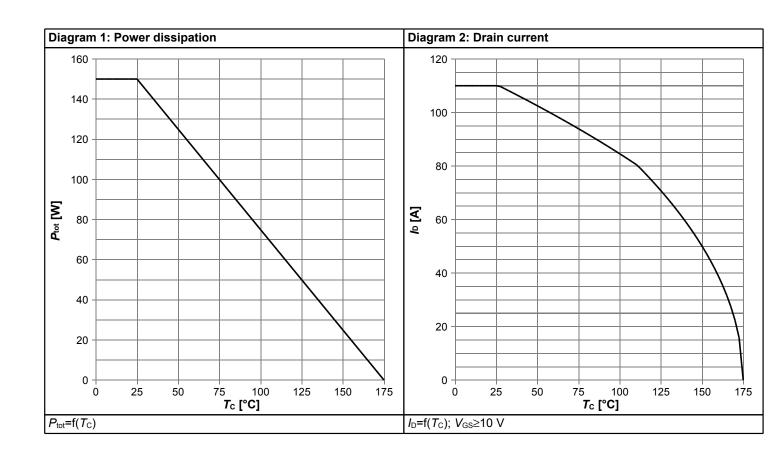


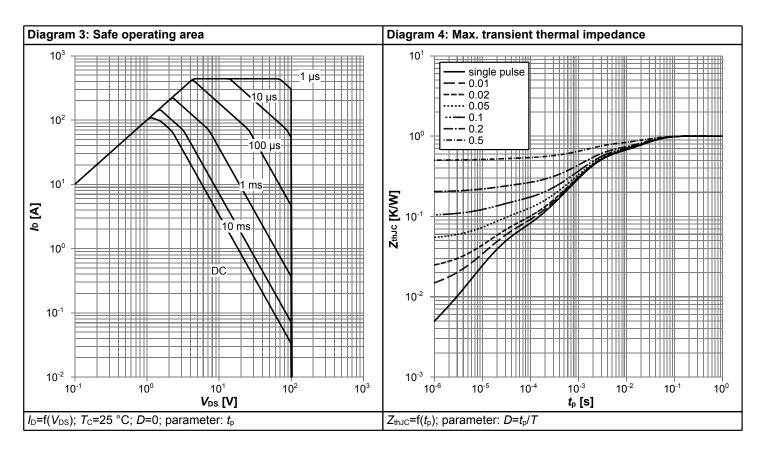
### Table 7 Reverse diode

<b>D</b>	Or made al		Values			Note (Tool Condition	
Parameter	Symbol	Min.	Тур.	Max.	Unit	Note / Test Condition	
Diode continuous forward current	Is	-	-	94	Α	<i>T</i> <sub>C</sub> =25 °C	
Diode pulse current	I <sub>S,pulse</sub>	-	-	440	Α	<i>T</i> <sub>C</sub> =25 °C	
Diode forward voltage	<b>V</b> <sub>SD</sub>	-	0.92	1.2	V	V <sub>GS</sub> =0 V, I <sub>F</sub> =60 A, T <sub>j</sub> =25 °C	
Reverse recovery time	<i>t</i> <sub>rr</sub>	-	37	-	ns	$V_R$ =50 V, $I_F$ =60 A, $di_F/dt$ =500 A/ $\mu$ s	
Reverse recovery charge	Qrr	-	247	-	nC	V <sub>R</sub> =50 V, I <sub>F</sub> =60 A, di <sub>F</sub> /dt=500 A/μs	

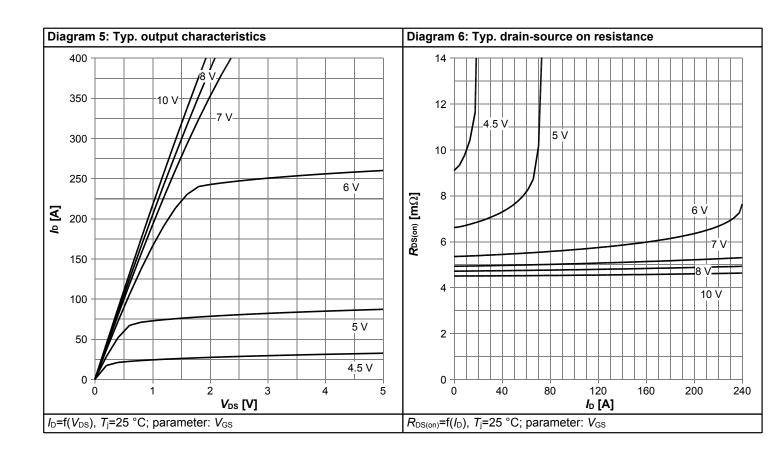


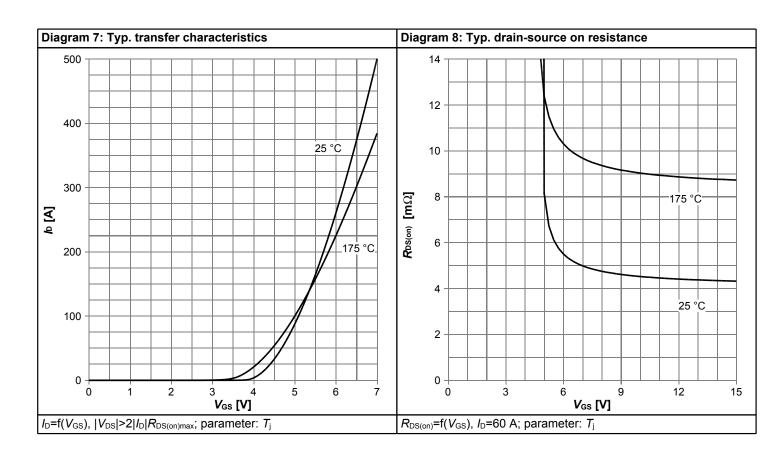
# 4 Electrical characteristics diagrams



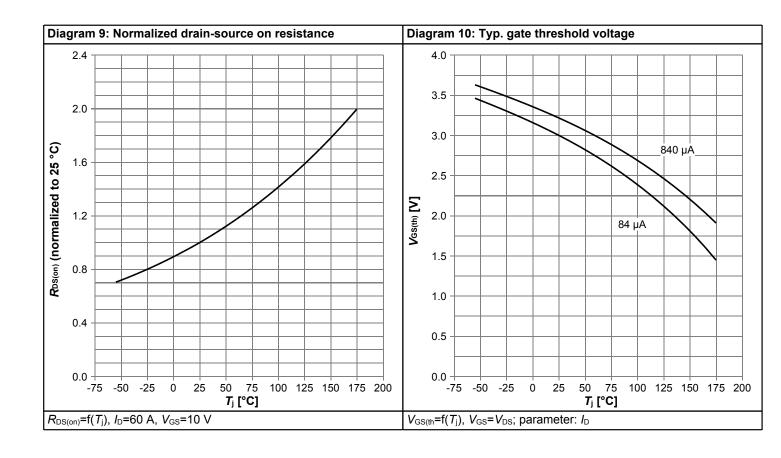


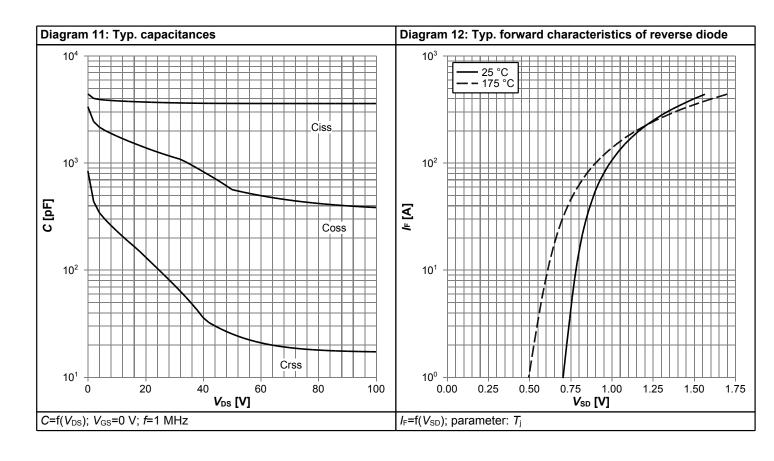




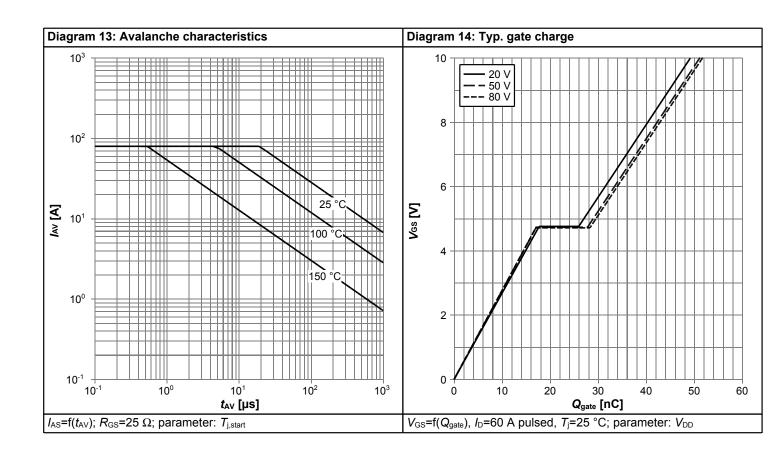


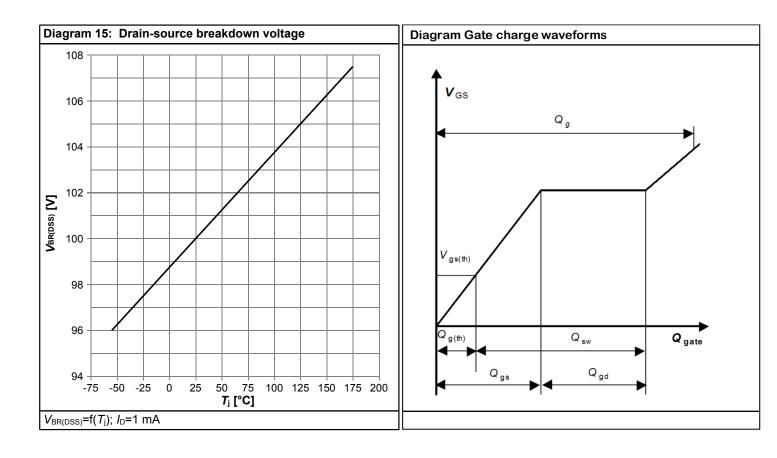














# 5 Package Outlines

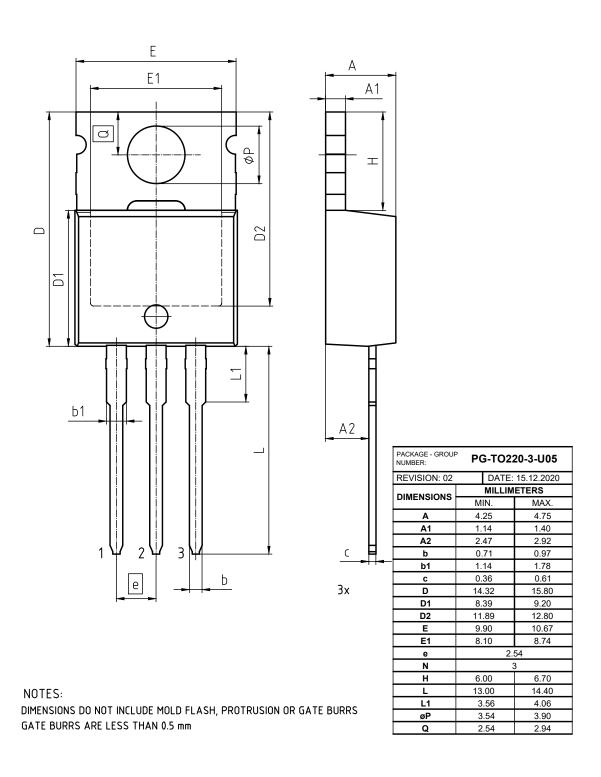


Figure 1 Outline PG-TO220-3, dimensions in mm

# StrongIRFET<sup>™</sup> 2 Power-Transistor IPP050N10NF2S



#### **Revision History**

IPP050N10NF2S

Revision: 2022-06-15, Rev. 2.1

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Revision	Date	Subjects (major changes since last revision)
2.0	2020-12-18	Release of final version
2.1	2022-06-15	Skip condition "Operating and storage tempt.", update trr and Qrr, footnotes, Diagram 12 and Avalanche Energy.

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Final Data Sheet 11 Rev. 2.1, 2022-06-15