PD - 94365

International
IOR Rectifier

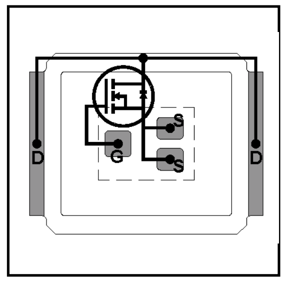
PROVISIONAL

IRF6604

DirectFET[TM] Power MOSFET

- Application Specific MOSFETs
- Ideal for CPU Core DC-DC Converters
- Low Conduction Losses
- Low Switching Losses
- Low Profile (<0.7 mm)
- Dual Sided Cooling Compatible
- Compatible with existing Surface Mount Techniques

V_{DSS}	$R_{DS(on)}$ max	I_D
30V	11.5mΩ@V_{GS} = 7.0V	16A
	13mΩ@V_{GS} = 4.5V	14A



DirectFET™ ISOMETRIC

Description

The IRF6604 combines the latest HEXFET® Power MOSFET Silicon technology with the advanced DirectFET[TM] packaging to achieve the lowest on-state resistance charge product in a package that has the footprint of an SO-8 and only 0.7 mm profile. The DirectFET package is compatible with existing layout geometries used in power applications, PCB assembly equipment and vapor phase, infra-red or convection soldering techniques. The DirectFET package allows dual sided cooling to maximize thermal transfer in power systems, IMPROVING previous best thermal resistance by 80%.

The IRF6604 balances both low resistance and low charge along with ultra low package inductance to reduce both conduction and switching losses. The reduced total losses make this product ideal for high efficiency DC-DC converters that power the latest generation of processors operating at higher frequencies. The IRF6604 has been optimized for parameters that are critical in synchronous buck converters including Rds(on) and gate charge to minimize losses in the control FET socket.

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain- Source Voltage	30	V
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	59	A
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	15	
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	12.5	
I_{DM}	Pulsed Drain Current ①	130	
P_D @T_A = 25°C	Power Dissipation	5.0	W
P_D @T_A = 70°C	Power Dissipation	3.2	
	Linear Derating Factor	40	mW/°C
V_{GS}	Gate-to-Source Voltage	±12	V
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient③	——	25	°C/W
$R_{\theta JA}$	Junction-to-Ambient④	——	12.5	
$R_{\theta JA}$	Junction-to-Ambient⑤	——	20	
$R_{\theta JC}$	Junction-to-Case⑥	——	3.0	
$R_{\theta J\text{-}PCB}$	Junction-to-PCB mounted	——	1.0	

Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	30	——	——	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.02	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	9.0	11.5	mΩ	V_{GS} = 7.0V, I_D = 16A ③
		——	10	13		V_{GS} = 4.5V, I_D = 14A ③
$V_{GS(th)}$	Gate Threshold Voltage	1.0	——	3.0	V	V_{DS} = V_{GS}, I_D = 250µA
I_{DSS}	Drain-to-Source Leakage Current	——	——	30	µA	V_{DS} = 24V, V_{GS} = 0V
		——	——	150		V_{DS} = 24V, V_{GS} = 0V, T_J = 100°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	100	nA	V_{GS} = 12 V
	Gate-to-Source Reverse Leakage	——	——	-100		V_{GS} = -12 V

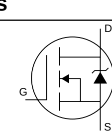
Dynamic @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	TBA	——	——	S	V_{DS} = 16V, I_D = 15A
Q_g	Total Gate Charge Cont FET	——	20	30	nC	V_{GS} = 5.0V, V_{DS} = 16V, I_D = 15A
Q_g	Total Gate Charge Sync FET	——	17	——		V_{GS} = 5.0V, V_{DS} < 100mV
Q_{gs1}	Pre-Vth Gate-Source Charge	——	5.4	——		V_{DS} = 16V, I_D = 15A
Q_{gs2}	Post-Vth Gate-Source Charge	——	1.4	——		
Q_{gd}	Gate to Drain Charge	——	7.0	10		
Q_{oss}	Output Charge	——	12	——		V_{DS} = 16V, V_{GS} = 0V
R_g	Gate Resistance	——	2.0	——	Ω	
$t_{d(on)}$	Turn-On Delay Time	——	TBA	——	ns	V_{DD} = 16V
t_r	Rise Time	——	TBA	——		I_D = 15A
$t_{d(off)}$	Turn-Off Delay Time	——	TBA	——		V_{GS} = 5.0V
t_f	Fall Time	——	TBA	——		Clamped Inductive Load
C_{iss}	Input Capacitance	——	TBA	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	TBA	——		V_{DS} = 16V ③
C_{rss}	Reverse Transfer Capacitance	——	TBA	——		f = 1.0MHz

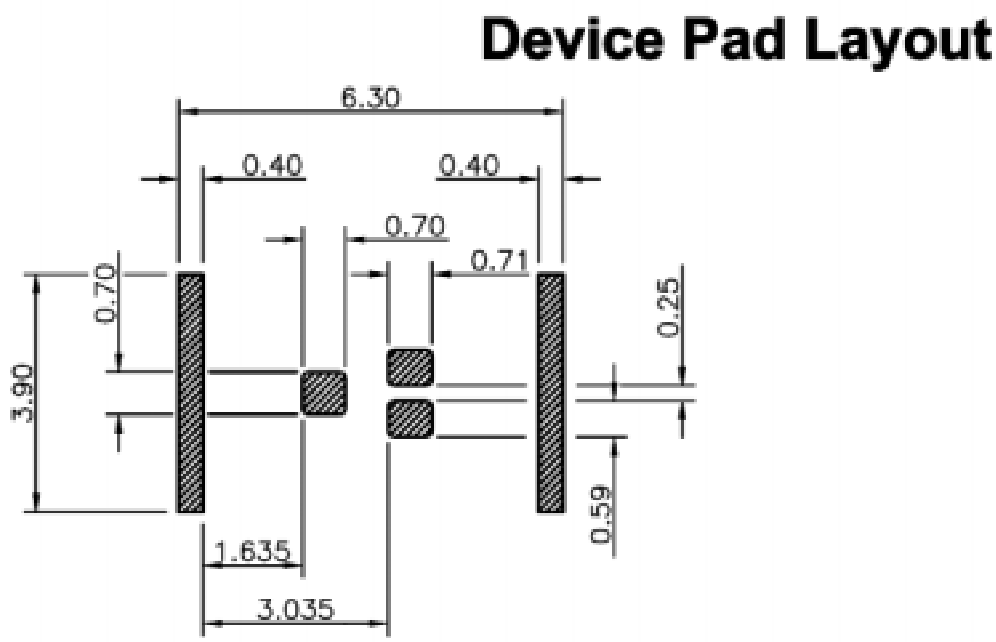
Avalanche Characteristics

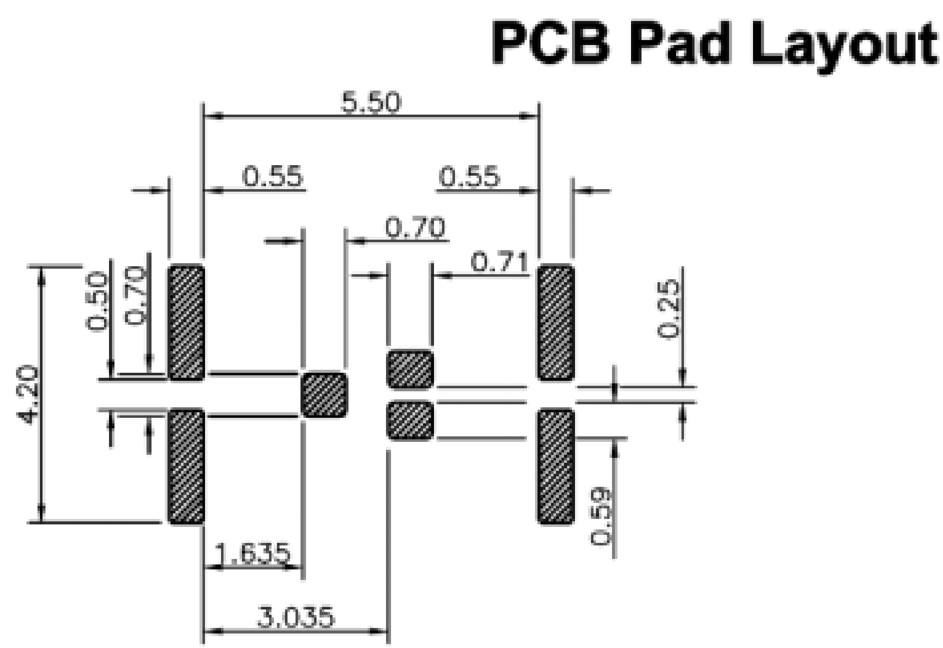
Symbol	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	——	164	mJ
I_{AR}	Avalanche Current①	——	TBA	A

Diode Characteristics

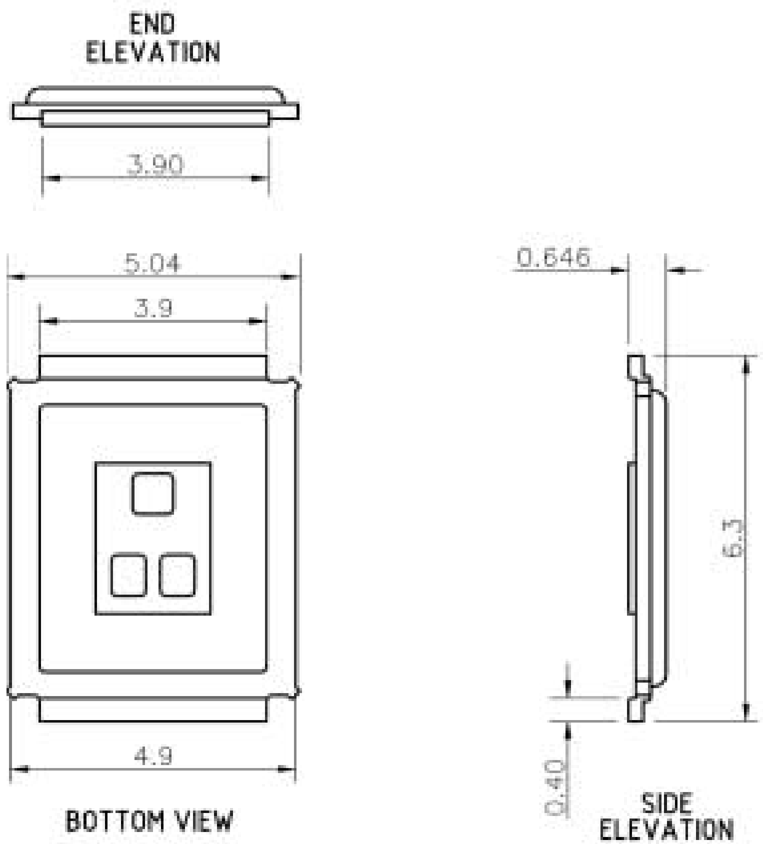
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	15	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	130		
V_{SD}	Diode Forward Voltage	——	——	1.2	V	T_J = 25°C, I_S = 15A, V_{GS} = 0V ③
		——	TBA	——		T_J = 125°C, I_S = 15A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	——	TBA	TBA	ns	T_J = 25°C, I_F = 15A, V_R= 16V
Q_{rr}	Reverse Recovery Charge	——	41	50	nC	di/dt = 700A/µs ③
$Q_{rr(s)}$	Reverse Recovery Charge (with Parallel Schottky)	——	TBA	TBA	nC	di/dt = 100A/µs V_{DS} = 16V, V_{GS} = 0V, I_S = 15A

DirectFET™ Pad Layout





DirectFET™ Outline Dimension



Notes:

① Repetitive rating; pulse width limited by max. junction temperature.
② Pulse width ≤ 400µs; duty cycle ≤ 2%.
③ Surface mounted on 1 in square Cu board
④ Used double sided cooling, mounting pad
⑤ Mounted on minimum footprint full size board with metalized back and with small clip heatsink
⑥ T_C measured with thermal couple mounted to top (Drain) of part.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Consumer market.
Qualification Standards can be found on IR's Web site.

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