International
IOR Rectifier

PD - 93844

IRF7901D1

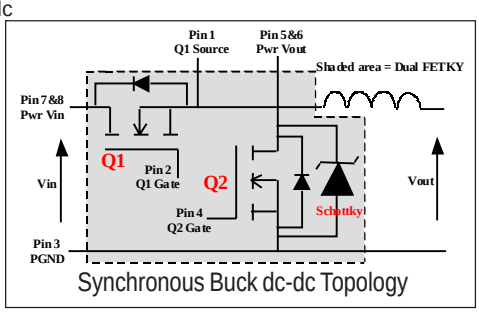
PROVISIONAL DATASHEET

Dual FETKY™

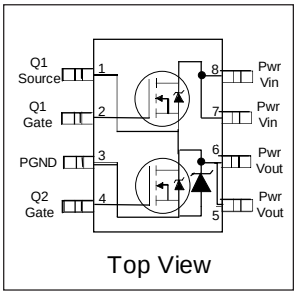
Co-Packaged Dual MOSFET Plus Schottky Diode

- Co-Packaged Dual N-channel HEXFET® Power MOSFET and Schottky Diode
- Ideal for Synchronous Buck dc-dc converters up to 5A peak output
- Low Conduction Losses
- Low Switching Losses
- Low V_F Schottky Rectifier

SO-8



Synchronous Buck dc-dc Topology



Top View

Description

The FETKY™ family of co-packaged MOSFETs and Schottky diodes offers the designer an innovative, board space saving solution for switching regulator and power management applications. Advanced HEXFET® Power MOSFETs combined with low forward drop Schottkys result in extremely efficient devices suitable for a wide variety of portable electronics applications.

The SO-8 has been modified through a customized leadframe for enhanced thermal characteristics and multiple-die capability making it ideal in a variety of power applications. With these improvements, multiple devices can be used in an application with dramatically reduced board space. Internal connections enable easier board layout design with reduced stray inductance.

Absolute Maximum Ratings

Parameter		Symbol	Q1 - Control FET	Q2 - Synch FET & Schottky	Units
Drain-Source Voltage		V_{DS}	30		V
Gate-Source Voltage		V_{GS}	±20		
Continuous Output Current ($V_{GS} \geq 4.5V$)⑤	T_L = 100°C	I_D	6.2		A
Pulsed Drain Current①		I_{DM}	48		
Power Dissipation	T_L = 100°C	P_D	2.0		W
Junction & Storage Temperature Range		T_J, T_{STG}	–55 to 150		°C
Schottky & Body Diode Average Forward Current④		I_F(AV)	TBD	TBD	A
Pulsed source Current		I_{SM}	TBD	TBD	

Thermal Resistance

Parameter	Symbol	Max.	Units
Maximum Junction-to-Ambient③	$R_{\theta JA}$	62.5	°C/W
Maximum Junction-to-Lead⑥	$R_{\theta JL}$	25.0	

Electrical Characteristics

		Q1 - Control FET			Q2 - Synch FET & Schottky				
Parameter		**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**	**Conditions**
Drain-to-Source Breakdown Voltage*	BV_{DSS}	30	–	–	30	–	–	V	V_{GS} = 0V, I_D = 250µA
Static Drain-Source on Resistance*	$R_{DS}(on)$		28.5	33		22	28	mΩ	V_{GS} = 4.5V, I_D = 5A②
Gate Threshold Voltage*	$V_{GS}(th)$	1.0			1.0			V	V_{DS} = V_{GS}, I_D = 250µA
Drain-Source Leakage Current*	I_{DSS}			30			30	µA	V_{DS} = 24V, V_{GS} = 0
				0.15			4.3	mA	V_{DS} = 24V, V_{GS} = 0, T_J = 125°C
Gate-Source Leakage Current*	I_{GSS}			±100			±100	nA	V_{GS} = ±20V
Total Gate Charge*	$Q_{G\ cont}$		7.6	9.9		15.9	20.7		V_{GS} = 5V, V_{Ds} = 16V, I_D = 5A
	$Q_{G\ synch}$		6.6	8.6		13.6	17.7		V_{GS} = 5V, V_{DS}=100mV, I_D=5A
Pre-Vth Gate-Source Charge	Q_{GS1}		2.0			5.5			V_{DS} = 16V, I_D = 5A
Post-Vth Gate-Source Charge	Q_{GS2}		0.5			0.9		nC	
Gate to Drain Charge	Q_{GD}		1.8			4.8			
Switch Charge* (Q_{gs2} + Q_{gd})	Q_{sw}		2.4	3.1		5.7	7.4		
Output Charge*	Q_{oss}		13.3	17.3		9.1	12.0		V_{DS} = 16V, V_{GS} = 0
Gate Resistance	R_G		3.4			4.3		Ω	

Body Diode & Schottky Diode Ratings and Characteristics

Parameter		**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Units**	**Conditions**
Diode Forward Voltage*	V_{SD}	-	-	-		0.48	0.52	V	I_S = 1A②, V_{GS} = 0V
Reverse Recovery Time	trr	-	-	-		TBD		ns	T_J = 25°C, I_s = 5.0A, V_{DS} = 16V
Reverse Recovery Charge	Qrr	-	-	-		TBD		nC	
Forward Turn-On Time	t_{on}	n/a			Intrinsic turn-on time is negligible (turn-on is dominated by L_s + L_D)				

① Repetitive rating; pulse width limited by max. junction temperature.
② Pulse width ≤ 300 µs; duty cycle ≤ 2%.
③ When mounted on 1 inch square copper board, t < 10 sec.
④ 50% Duty Cycle, Rectangular.
⑤ Combined Q1, Q2 I_{RMS} @ Pwr V_{out} pins. Switching or other losses will decrease RMS current capability
⑥ When mounted on IRNBPS2 design kit. Measured as device T_J to Pwr leads (V_{in} & V_{out})
* Devices are 100% tested to these parameters.

Typical Application

The performance of the new Dual FETKY™ has been tested in-circuit using IR's new IRNBPS2 "Dual Output Synchronous Buck Design Kit". The Dual FETKY is suitable for synchronous buck DC-DC converters operating up to 21V_{in} and 5A peak output current. Typical output voltages include 1.8V_{out}, 2.5V_{out}, 3.3V_{out} & 5.0V_{out}.

The Dual FETKY integrates all the power semiconductor devices for DC-DC conversion within one SO-8 package, see Figure 1. The high side control MOSFET (Q1) is optimized for low combined Q_{sw} and R_{DS}(on). The low side synchronous MOSFET (Q2) is optimized for low R_{DS}(on) and high Cdv/dt immunity. The ultra-low V_f schottky diode is internally connected in parallel with the synchronous MOSFET, for improved deadtime efficiency. For ease of circuit board layout, the Dual FETKY has been internally configured such that it represents a functional block for the power device portion of the synchronous buck DC-DC converter. This helps to minimize the external PCB traces compared to a discrete solution.

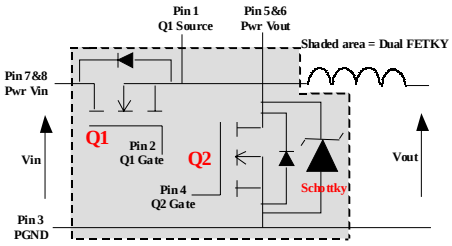


Figure 1. Synchronous Buck DC-DC converter using IR's new IRF7901D1 Dual FETKY™.

In-Circuit Efficiency

The in-circuit efficiency curves for the Dual FETKY are shown in Figure 2 & 3. The Dual FETKY can achieve up to 96.6% and 94.6% peak efficiency for the 5.0V and 3.3V applications respectively, with excellent maximum load efficiency.

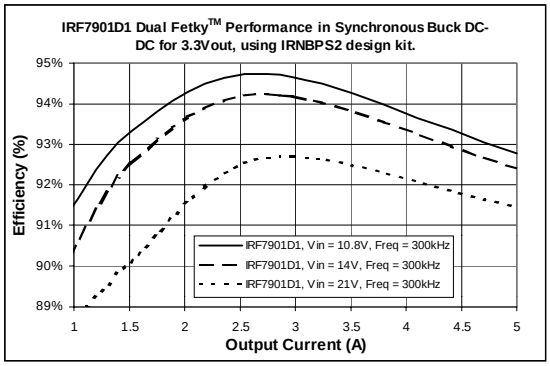


Figure 2. IRF7901D1 Dual FETKY™ electrical efficiency at 3.3Vout.

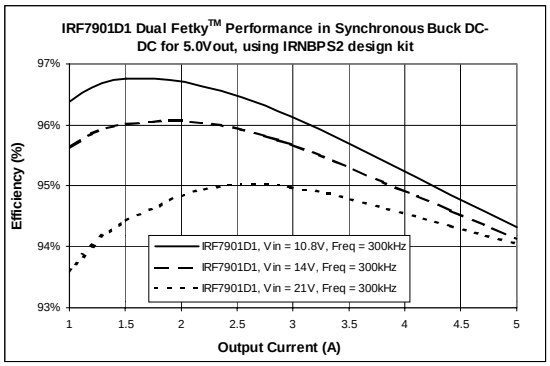
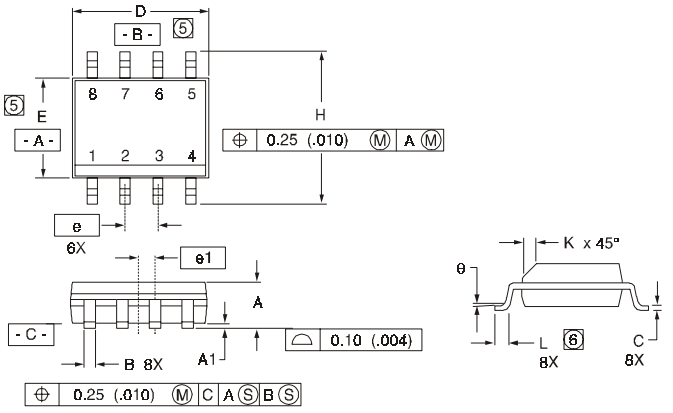


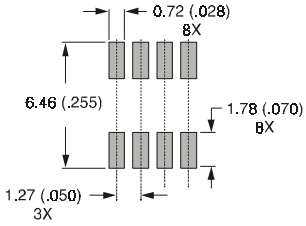
Figure 3. IRF7901D1 Dual FETKY™ electrical efficiency at 5.0Vout.

SO-8 Package Outline



	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
B	.014	.018	0.36	0.46
C	.0075	.0098	0.19	0.25
D	.189	.196	4.80	4.98
E	.150	.157	3.81	3.99
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.011	.019	0.28	0.48
L	.16	.050	0.41	1.27
θ	0°	8°	0°	8°

RECOMMENDED FOOTPRINT

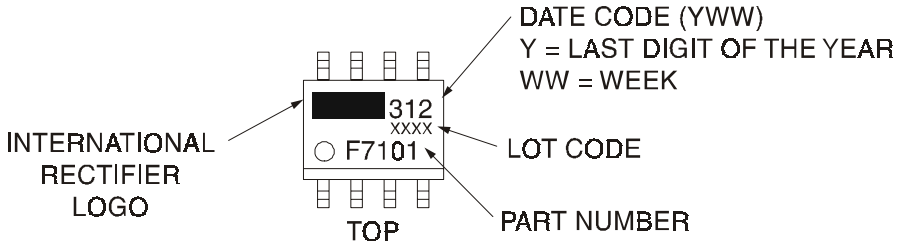


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS
   MOLD PROTRUSIONS NOT TO EXCEED 0.25 (.006).
6. DIMENSIONS IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE..

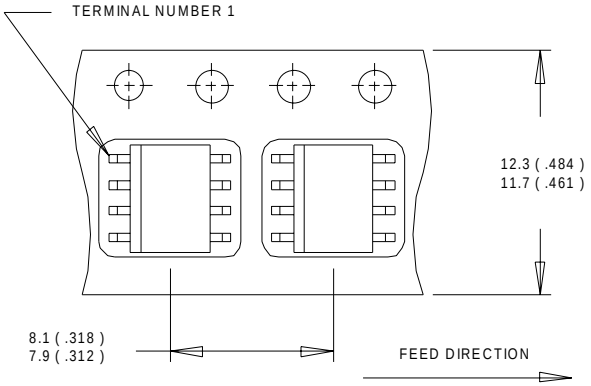
Part Marking Information

EXAMPLE: THIS IS AN IRF7101

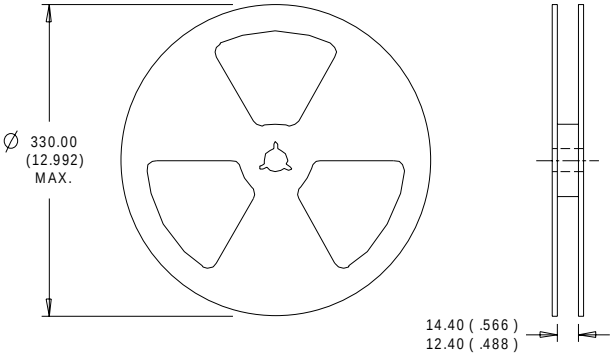


SO-8 Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

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