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Bulletin PD-20546 rev. I 05/06

# International **IR** Rectifier

## 12CWQ04FN

SCHOTTKY RECTIFIER

12 Amp

$$I_{F(AV)} = 12\text{Amp}$$

$$V_R = 40\text{V}$$

### Major Ratings and Characteristics

Characteristics	Values	Units
$I_{F(AV)}$ Rectangular waveform	12	A
$V_{RRM}$	40	V
$I_{FSM}$ @ tp = 5 $\mu$ s sine	550	A
$V_F$ @ 6 Apk, $T_J = 125^\circ\text{C}$ (per leg)	0.48	V
$T_J$ range	-55 to 150	$^\circ\text{C}$

### Description/ Features

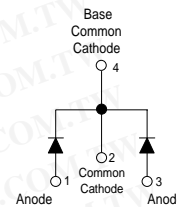
The 12CWQ04FN surface mount, center tap, Schottky rectifier series has been designed for applications requiring low forward drop and small foot prints on PC board. Typical applications are in disk drives, switching power supplies, converters, free-wheeling diodes, battery charging, and reverse battery protection.

- Popular D-PAK outline
- Center tap configuration
- Small foot print, surface mountable
- Low forward voltage drop
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability

### Case Styles



D-PAK (TO-252AA)



## 12CWQ04FN

Bulletin PD-20546 rev.1 05/06

International  
**IR** Rectifier

### Voltage Ratings

Part number	12CWQ04FN
$V_R$ Max. DC Reverse Voltage (V)	40
$V_{RWM}$ Max. Working Peak Reverse Voltage (V)	

### Absolute Maximum Ratings

Parameters	12CWQ...	Units	Conditions
$I_{F(AV)}$ Max. Average Forward (Per Leg) Current* See Fig. 5 (Per Device)	6	A	50% duty cycle @ $T_C = 134^\circ\text{C}$ , rectangular wave form
	12		
$I_{FSM}$ Max. Peak One Cycle Non-Repetitive Surge Current * See Fig. 7	550	A	5 $\mu\text{s}$ Sine or 3 $\mu\text{s}$ Rect. pulse
	90		10ms Sine or 6ms Rect. pulse
$E_{AS}$ Non-Repet. Avalan. Energy (Per Leg)	9	mJ	$T_J = 25^\circ\text{C}$ , $I_{AS} = 1.5$ Amps, $L = 8$ mH
$I_{AR}$ Repetitive Avalanche Current (Per Leg)	1.2	A	Current decaying linearly to zero in 1 $\mu\text{sec}$ Frequency limited by $T_J$ max. $V_A = 1.5 \times V_R$ typical

### Electrical Specifications

Parameters	12CWQ...	Units	Conditions
$V_{FM}$ Max. Forward Voltage Drop (Per Leg) * See Fig. 1 (1)	0.53	V	@ 6A
	0.68	V	@ 12A
	0.48	V	@ 6A
	0.64	V	@ 12A
$I_{RM}$ Max. Reverse Leakage Current (Per Leg) * See Fig. 2 (1)	3	mA	$T_J = 25^\circ\text{C}$
	40	mA	$T_J = 125^\circ\text{C}$
$V_{F(TO)}$ Threshold Voltage	0.28	V	$T_J = T_J$ max.
$r_t$ Forward Slope Resistance	25.58	m $\Omega$	
$C_T$ Typ. Junction Capacitance (Per Leg)	405	pF	$V_R = 5V_{DC}$ (test signal range 100Khz to 1Mhz) $25^\circ\text{C}$
$L_S$ Typical Series Inductance (Per Leg)	5.0	nH	Measured lead to lead 5mm from package body

(1) Pulse Width < 300 $\mu\text{s}$ , Duty Cycle < 2%

### Thermal-Mechanical Specifications

Parameters	12CWQ...	Units	Conditions
$T_J$ Max. Junction Temperature Range (*)	-55 to 150	$^\circ\text{C}$	
$T_{stg}$ Max. Storage Temperature Range	-55 to 150	$^\circ\text{C}$	
$R_{thJC}$ Max. Thermal Resistance (Per Leg) Junction to Case (Per Device)	3.0	$^\circ\text{C/W}$	DC operation * See Fig. 4
	1.5		
wt Approximate Weight	0.3 (0.01)	g (oz.)	
Case Style	D-Pak		Similar to TO-252AA
Device Marking	12CWQ04FN		

(\*)  $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  thermal runaway condition for a diode on its own heatsink

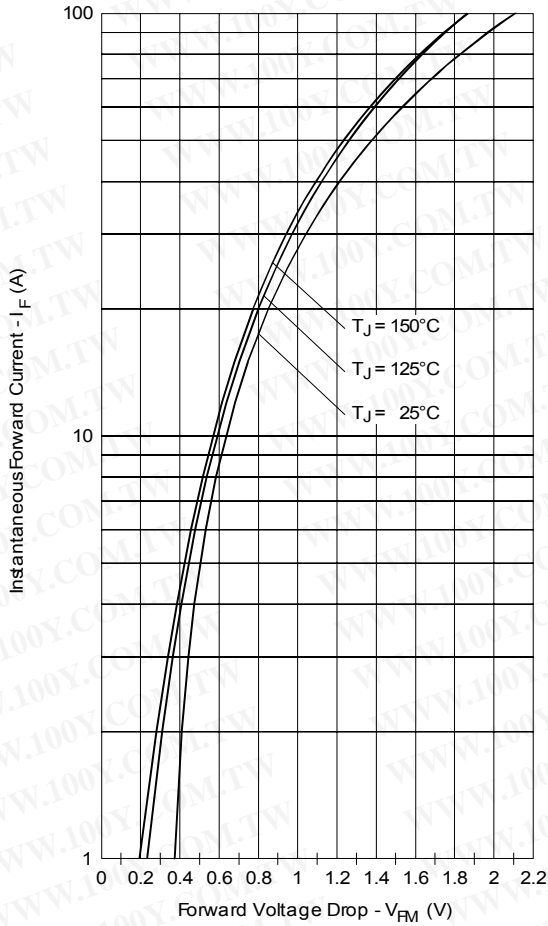


Fig. 1 - Max. Forward Voltage Drop Characteristics (Per Leg)

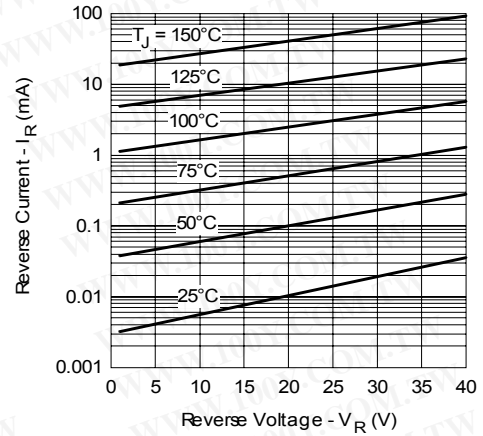


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (Per Leg)

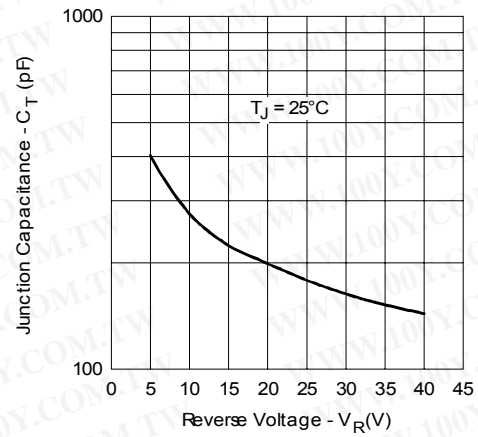


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

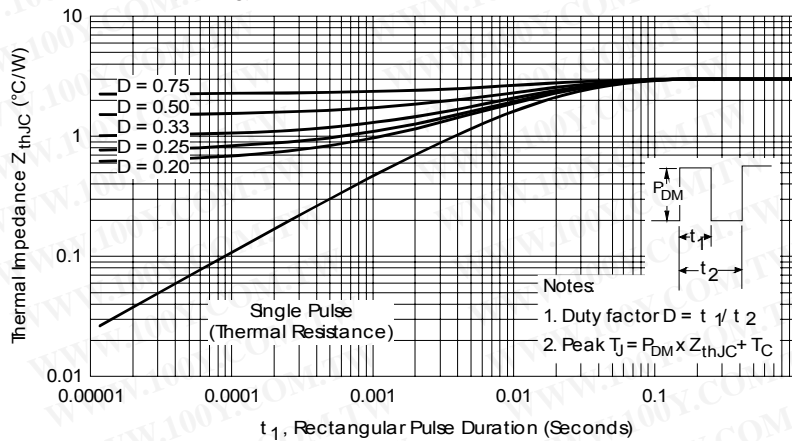


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

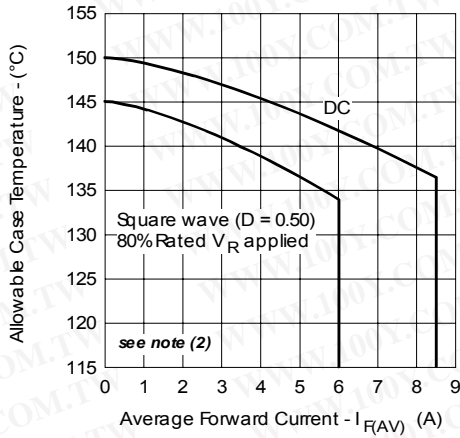


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current (Per Leg)

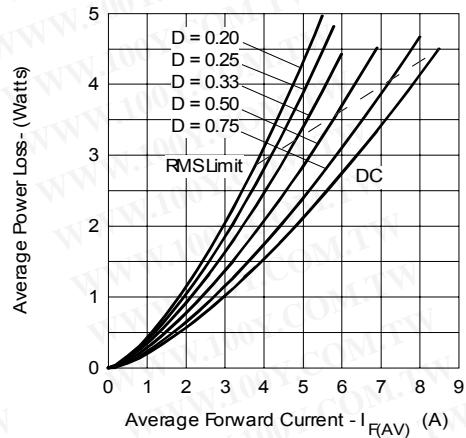


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

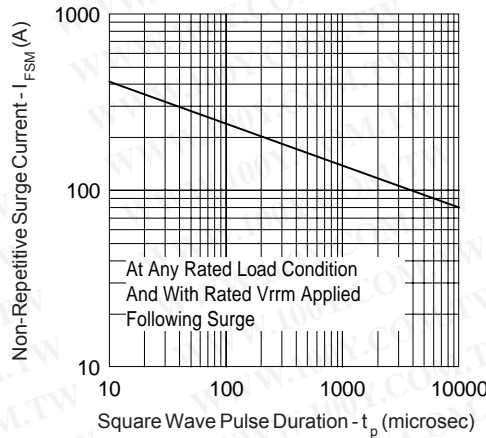


Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

(2) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;  
 $Pd = \text{Forward Power Loss} = I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);  
 $Pd_{REV} = \text{Inverse Power Loss} = V_{R1} \times I_R (1 - D); I_R @ V_{R1} = 80\% \text{ rated } V_R$



Outline Table

**NOTES:**  
 1- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994  
 2- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS]  
 3- LEAD DIMENSION UNCONTROLLED IN L.A.  
 4- DIMENSION D1, E1, L3 & R3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.  
 5- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .003 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.  
 6- DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .009 [0.15] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.  
 7- DIMENSION S1 & S2 APPLIED TO BASE METAL ONLY.  
 8- DATUM A & B TO BE DETERMINED AT DATUM PLANE A.  
 9- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

SYMBOL	DIMENSIONS				UNITS
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	.086	.094	
A1	—	.13	—	.005	
B	0.64	0.89	.025	.035	7
B1	0.65	0.79	.025	.031	
B2	0.76	1.14	.030	.045	
B3	4.90	6.46	.190	.210	4
C	0.46	0.61	.018	.024	7
C1	0.41	0.56	.016	.022	
C2	0.46	0.89	.018	.035	
D	5.97	6.22	.235	.245	6
D1	5.21	—	.205	—	4
E	6.35	6.73	.250	.265	6
E1	4.52	—	.170	—	4
F	2.29	BSC	.090	BSC	
H	9.40	10.41	.370	.410	
L	1.40	1.78	.055	.070	
L1	2.74	BSC	1.08	REF.	
L2	0.53	BSC	.020	BSC	4
L3	0.89	1.27	.035	.050	
L4	1.14	1.02	.040	.040	
L5	1.14	1.52	.045	.060	3
#	0°	10°	0°	10°	
#1	0°	15°	0°	15°	
#2	25°	35°	25°	35°	

**LEAD ASSIGNMENTS**  
 1- GATE  
 2- DRAIN  
 3- SOURCE  
 4- DRAIN

**MARKINGS**  
 1- GATE & C/PK  
 2- COLLECTOR  
 3- EMITTER  
 4- COLLECTOR

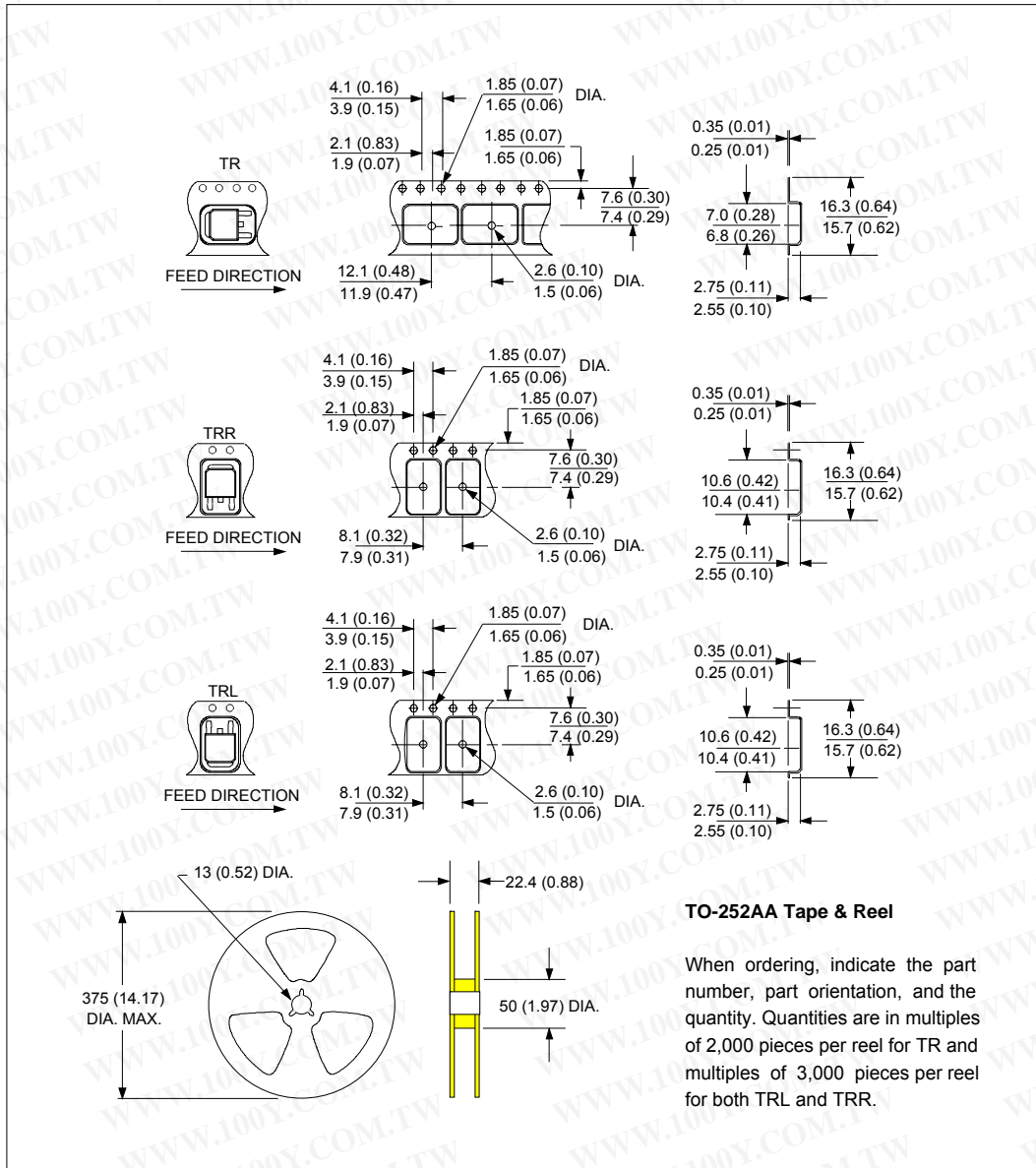
**Modified JEDEC outline TO-252AA**  
 Dimensions in millimeters and (inches)

Marking Information

EXAMPLE: THIS IS A 12CWQ04FN  
 LOT CODE 8024  
 ASSEMBLED ON WW 02, 2000

INTERNATIONAL RECTIFIER LOGO  
 ASSEMBLY LOT CODE  
 PART NUMBER  
 DATE CODE  
 YEAR 0 = 2000  
 WEEK 02  
 X = SITE ID

Tape & Reel Information



**TO-252AA Tape & Reel**

When ordering, indicate the part number, part orientation, and the quantity. Quantities are in multiples of 2,000 pieces per reel for TR and multiples of 3,000 pieces per reel for both TRL and TRR.

Ordering Information Table

Device Code	12	C	W	Q	04	FN	TRL	-
	①	②	③	④	⑤	⑥	⑦	⑧
<b>1</b>	-	Current Rating (12A)						
<b>2</b>	-	Center Tap Configuration						
<b>3</b>	-	Package Identifier						
		W = D-Pak						
<b>4</b>	-	Schottky "Q" Series						
<b>5</b>	-	Voltage Rating (04 = 40V)						
<b>6</b>	-	FN = TO-252AA						
<b>7</b>	-	<ul style="list-style-type: none"> <li>• none = Tube (50 pieces)</li> <li>• TR = Tape &amp; Reel</li> <li>• TRL = Tape &amp; Reel (Left Oriented)</li> <li>• TRR = Tape &amp; Reel (Right Oriented)</li> </ul>						
<b>8</b>	-	<ul style="list-style-type: none"> <li>• none = Standard Production</li> <li>• PbF = Lead-Free</li> </ul>						

Data and specifications subject to change without notice.  
 This product has been designed and qualified for AEC Q101 Level.  
 Qualification Standards can be found on IR's Web site.