

$I_{F(AV)} = 12\text{Amp}$   
 $V_R = 60\text{V}$

**Major Ratings and Characteristics**

Characteristics	Values	Units
$I_{F(AV)}$ Rectangular waveform	12	A
$V_{RRM}$	60	V
$I_{FSM}$ @ tp = 5 $\mu$ s sine	320	A
$V_F$ @ 6 Apk, $T_J = 125^\circ\text{C}$ (per leg)	0.57	V
$T_J$ range	-55 to 150	$^\circ\text{C}$

**Description/ Features**

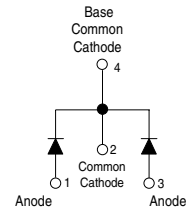
The 12CWQ06FN surface mount, center tap, Schottky rectifier series has been designed for applications requiring low forward drop and small foot prints on PC board. Typical applications are in disk drives, switching power supplies, converters, free-wheeling diodes, battery charging, and reverse battery 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)**



## Voltage Ratings

Partnumber	12CWQ06FN
$V_R$ Max. DC Reverse Voltage (V)	60
$V_{RWM}$ 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 12	A	50% duty cycle @ $T_C = 131^\circ\text{C}$ , rectangular wave form
$I_{FSM}$ Max. Peak One Cycle Non-Repetitive Surge Current * See Fig. 7	320 105	A	5 $\mu\text{s}$ Sine or 3 $\mu\text{s}$ Rect. pulse 10ms Sine or 6ms Rect. pulse Following any rated load condition and with rated $V_{RWM}$ applied
$E_{AS}$ Non-Repet. Avalan. Energy (Per Leg)	7	mJ	$T_J = 25^\circ\text{C}$ , $I_{AS} = 1.2$ Amps, $L = 10$ mH
$I_{AR}$ Repetitive Avalanche Current (Per Leg)	0.8	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)	0.61	V	@ 6A $T_J = 25^\circ\text{C}$
	0.79	V	@ 12A
	0.57	V	@ 6A $T_J = 125^\circ\text{C}$
	0.72	V	@ 12A
$I_{RM}$ Max. Reverse Leakage Current (Per Leg) * See Fig. 2 (1)	3	mA	$T_J = 25^\circ\text{C}$
	35	mA	$T_J = 125^\circ\text{C}$ $V_R = \text{rated } V_R$
$V_{F(TO)}$ Threshold Voltage	0.36	V	$T_J = T_J \text{ max.}$
$r_t$ Forward Slope Resistance	24.14	m $\Omega$	
$C_T$ Typ. Junction Capacitance (Per Leg)	360	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
Marking Device	12CWQ06FN		

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

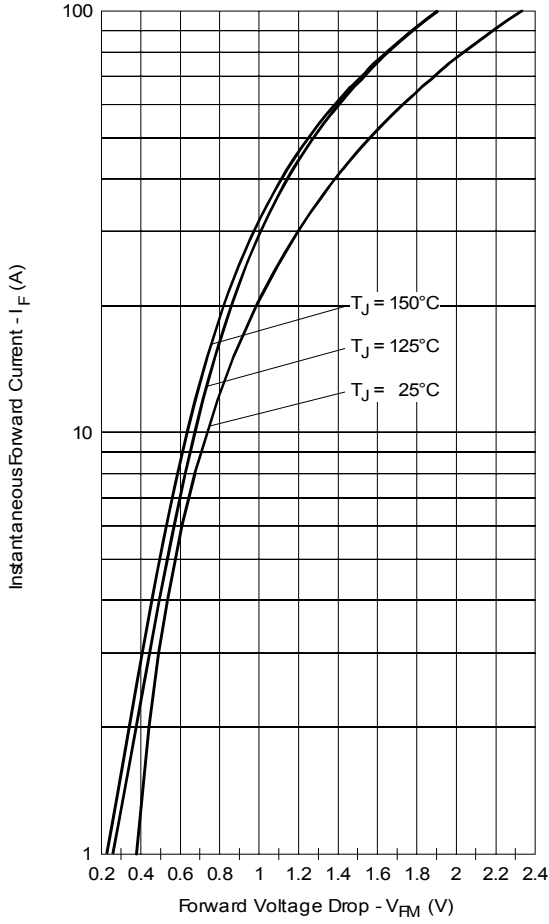


Fig. 1 - Max. Forward Voltage Drop Characteristics (Per Leg)

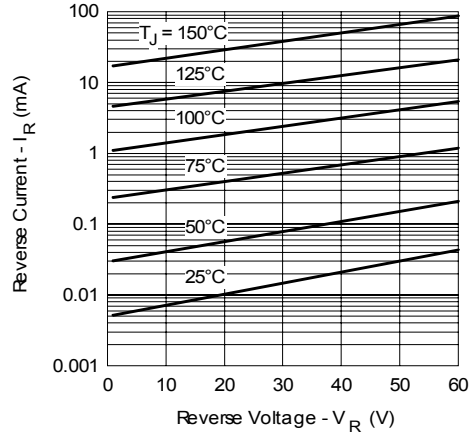


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (Per Leg)

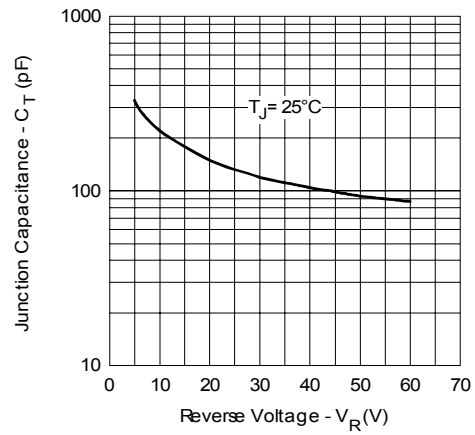


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

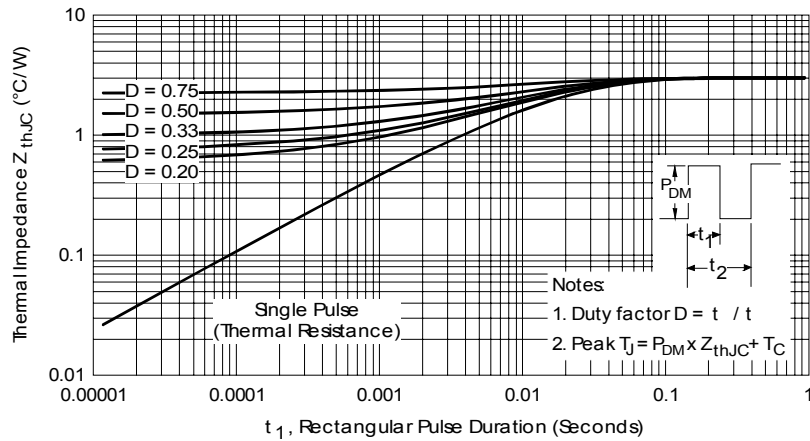


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

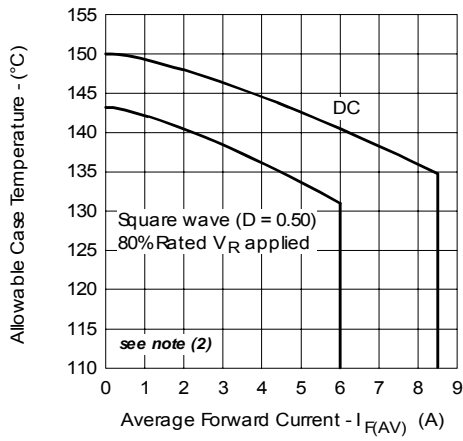


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current (Per Leg)

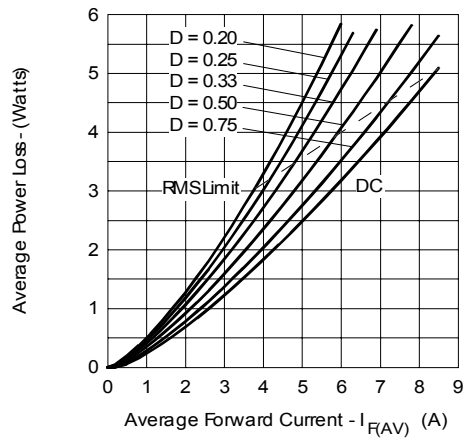


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

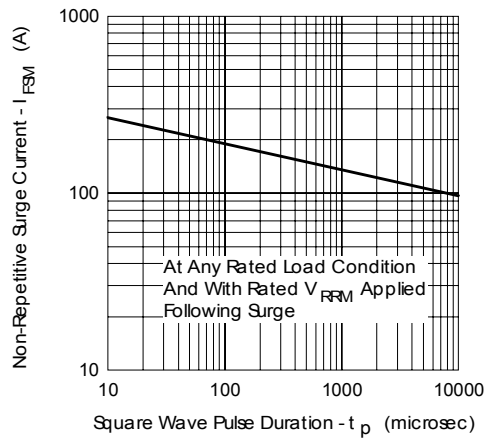


Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

(2) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;

$Pd$  = Forward Power Loss =  $I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);

$Pd_{REV}$  = Inverse Power Loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R @ V_{R1} = 80\%$  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.S.  
 4- DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.  
 5- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .004 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 .008 [0.15] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.  
 7- DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.  
 8- DATUM A & B TO BE DETERMINED AT DATUM PLANE H.  
 9- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

DIMENSIONS	MILLIMETERS		INCHES		NOMINAL
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.50	.086	.098	
A1	-	0.13	-	.005	
B	0.64	0.89	.025	.035	7
b1	0.65	0.79	.025	.031	7
b2	0.76	1.14	.030	.045	4
b3	4.90	5.46	.190	.210	7
c	0.46	0.61	.018	.024	7
c1	0.41	0.56	.016	.022	7
c2	0.46	0.89	.018	.035	6
D	5.97	6.22	.230	.245	6
D1	5.21	-	.205	-	6
E	6.35	6.73	.250	.265	6
E1	6.52	-	.270	-	6
e	2.29 BSC	.090 BSC			
H	8.40	10.41	.330	.410	
L	1.40	1.78	.055	.070	
L1	2.74 BSC	.108 REF.			
L2	0.01 BSC	.020 BSC			
L3	0.89	1.27	.035	.050	4
L4	-	1.02	-	.040	
L5	1.14	1.52	.045	.060	3
#1	0°	10°	0°	10°	
#1	0°	15°	0°	15°	
#2	25°	35°	25°	35°	

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

**IGBT & CoPAK**  
 1.- GATE  
 2.- COLLECTOR  
 3.- EMITTER  
 4.- COLLECTOR

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

Part Marking Information

EXAMPLE: THIS IS A 12CWQ06FN  
 LOT CODE 8024  
 ASSEMBLED ON WW 02, 2000

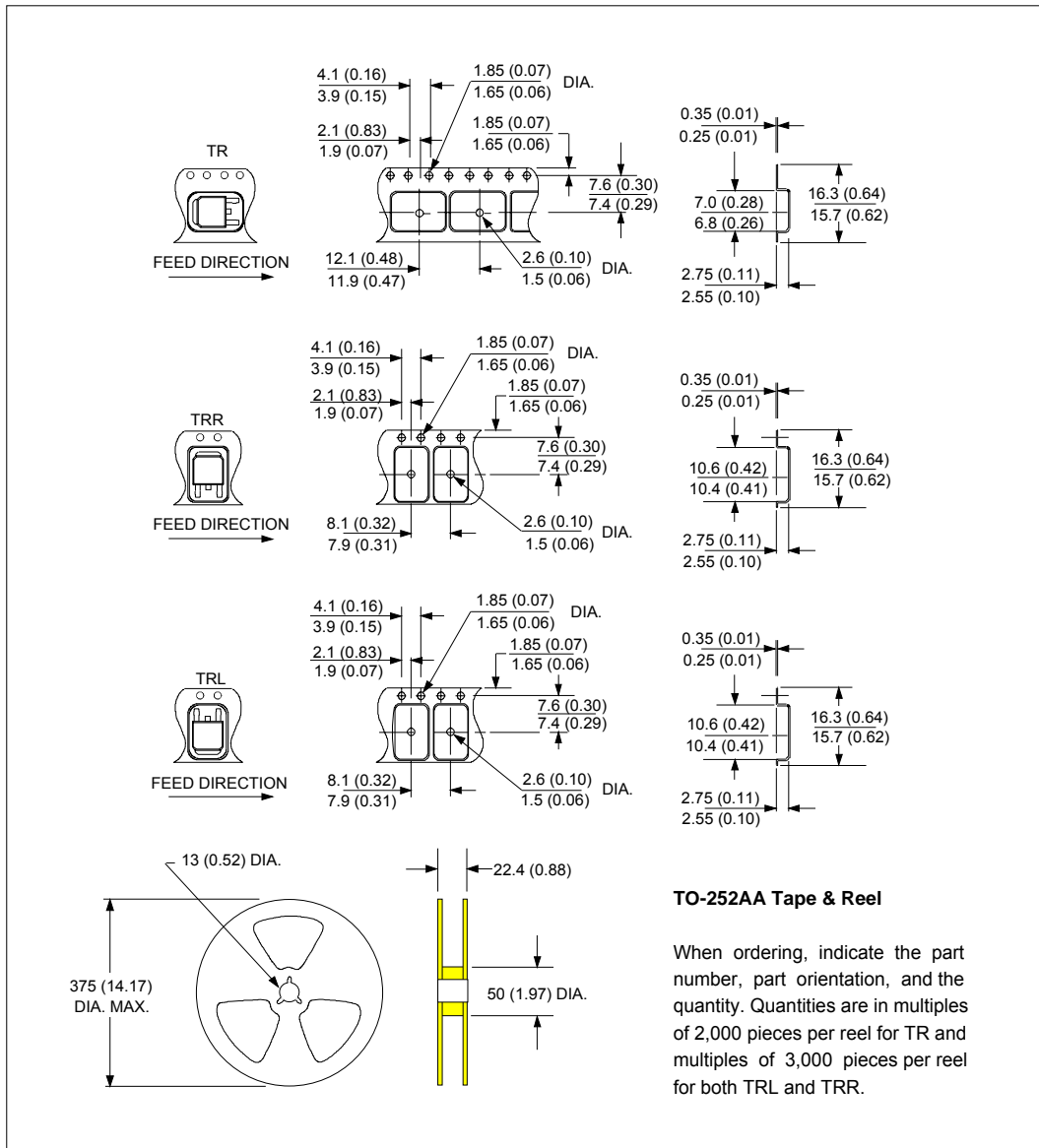
INTERNATIONAL  
 RECTIFIER  
 LOGO

ASSEMBLY  
 LOT CODE

PART NUMBER

DATE CODE  
 YEAR 0 = 2000  
 WEEK 02  
 X = SITE ID

Tape & Reel Information



Ordering Information Table

Device Code	
12	C
W	Q
06	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 (06 = 60V)
<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>

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12CWQ06FN
*****
* This model has been developed by      *
* Wizard SPICE MODEL GENERATOR (1999) *
* International Rectifier Corporation) *
* contains Proprietary Information     *
*****
* SPICE Model Diode is composed by a   *
* simple diode plus paralalled VCG2T  *
*****
.SUBCKT 12CWQ06FN ANO CAT
D1 ANO 1 DMOD (0.03191)
*Define diode model
.MODEL DMOD D(IS=8.95944674613071E-05A,N=1.03666612245428,BV=67V,
+ IBV=0.232083097618696A,RS= 0.00089348,CJO=2.04854724822182E-08,
+ VJ=1.34189135485872,XTI=2, EG=0.732501148466477)
*****
*Implementation of VCG2T
VX 1 2 DC 0V
R1 2 CAT TRES 1E-6
.MODEL TRES RES(R=1,TC1=52.5561105683715)
GP1 ANO CAT VALUE={-ABS(I(VX))*(EXP((( -3.507402E-03/52.55611)*(V(2,CAT)*1E6)/
(I(VX)+1E-6)-1))+1)*4.963732E-02*ABS(V(ANO,CAT))-1)}
*****
.ENDS 12CWQ06FN

Thermal Model Subcircuit
.SUBCKT 12CWQ06FN 5 1

CTHERM1 5 4 8.75E-04
CTHERM2 4 3 5.33E+01
CTHERM3 3 2 2.05E+02
CTHERM4 2 1 7.61E+02

RTHERM1 5 4 1.00E-07
RTHERM2 4 3 1.65E+00
RTHERM1 3 2 1.12E+00
RTHERM1 2 1 2.29E-01

.ENDS 12CWQ06FN
    
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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.





## Notice

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