

International IOR Rectifier

48CTQ060SPbF 48CTQ060-1PbF

SCHOTTKY RECTIFIER

40 Amp

$$I_{F(AV)} = 40\text{Amp}$$

$$V_R = 60\text{V}$$

Major Ratings and Characteristics

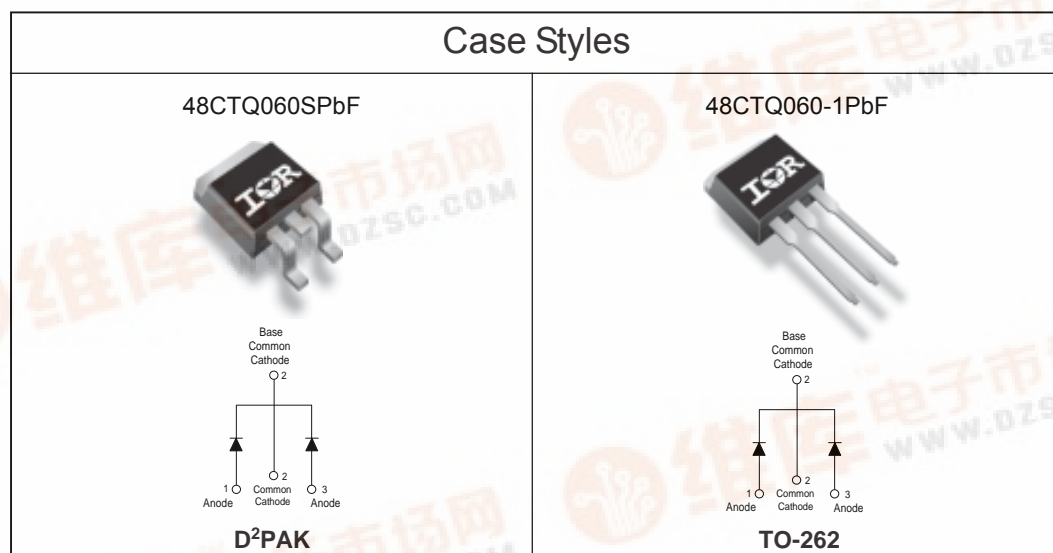
Characteristics	Values	Units
$I_{F(AV)}$ Rectangular waveform	40	A
V_{RRM}	60	V
I_{FSM} @ $t_p = 5 \mu\text{s}$ sine	1000	A
V_F @ $20\text{Apk}, T_J = 125^\circ\text{C}$ (per leg)	0.58	V
T_J range	-55 to 150	$^\circ\text{C}$

Description/ Features

This center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 150°C junction temperature. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- 150°C T_J operation
- Center tap configuration
- Low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Lead-Free ("PbF" suffix)

Case Styles



48CTQ060SPbF, 48CTQ060-1PbF
Bulletin PD-21039 rev. A 07/06



Voltage Ratings

Parameters	48CTQ060SPbF 48CTQ060-1PbF
V_R Max. DC Reverse Voltage (V)	60
V_{RWM} Max. Working Peak Reverse Voltage (V)	

Absolute Maximum Ratings

Parameters	Values	Units	Conditions
$I_{F(AV)}$ Max. Average Forward Current (Per Leg) * See Fig. 5 (Per Device)	20 40	A	50% duty cycle @ $T_C = 111^\circ\text{C}$, rectangular wave form
I_{FSM} Max. Peak One Cycle Non-Repetitive Surge Current (Per Leg) * See Fig. 7	1000 260	A	5 μs Sine or 3 μs Rect. pulse 10ms Sine or 6ms Rect. pulse Following any rated load condition and with rated V_{RRM} applied
E_{AS} Non-Repetitive Avalanche Energy (Per Leg)	13	mJ	$T_J = 25^\circ\text{C}$, $I_{AS} = 1.50$ Amps, $L = 11.5$ mH
I_{AR} Repetitive Avalanche Current (Per Leg)	1.50	A	Current decaying linearly to zero in 1 μsec Frequency limited by T_J max. $V_A = 1.5 \times V_R$ typical

Electrical Specifications

Parameters	Values	Units	Conditions
V_{FM} Max. Forward Voltage Drop (Per Leg) * See Fig. 1 (1)	0.61	V	@ 20A $T_J = 25^\circ\text{C}$
	0.83	V	@ 40A
	0.58	V	@ 20A $T_J = 125^\circ\text{C}$
	0.75	V	@ 40A
I_{RM} Max. Reverse Leakage Current (Per Leg) * See Fig. 2 (1)	2	mA	$T_J = 25^\circ\text{C}$
	89	mA	$T_J = 125^\circ\text{C}$ $V_R = \text{rated } V_R$
$V_{F(TO)}$ Threshold Voltage	0.37	V	$T_J = T_J \text{ max.}$
r_t Forward Slope Resistance	8.26	m Ω	
C_T Max. Junction Capacitance (Per Leg)	1220	pF	$V_R = 5V_{DC}$ (test signal range 100Khz to 1Mhz) 25°C
L_S Typical Series Inductance (Per Leg)	8.0	nH	Measured lead to lead 5mm from package body
dv/dt Max. Voltage Rate of Change	10000	V/ μs	(Rated V_R)

(1) Pulse Width < 300 μs , Duty Cycle <2%

Thermal-Mechanical Specifications

Parameters	Values	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 Junction to Case (Per Leg)	2.0	$^\circ\text{C/W}$	DC operation
R_{thJC} Max. Thermal Resistance Junction to Case (Per Package)	1.0	$^\circ\text{C/W}$	DC operation
R_{thCS} Typical Thermal Resistance, Case to Heatsink	0.50	$^\circ\text{C/W}$	Mounting surface, smooth and greased (only for TO-220)
wt Approximate Weight	2 (0.07)	g (oz.)	
T Mounting Torque	Min.	6 (5)	Kg-cm (lbf-in)
	Max.	12 (10)	
Marking Device	48CTQ060S	Case style D ² Pak	
	48CTQ060-1	Case style TO-262	

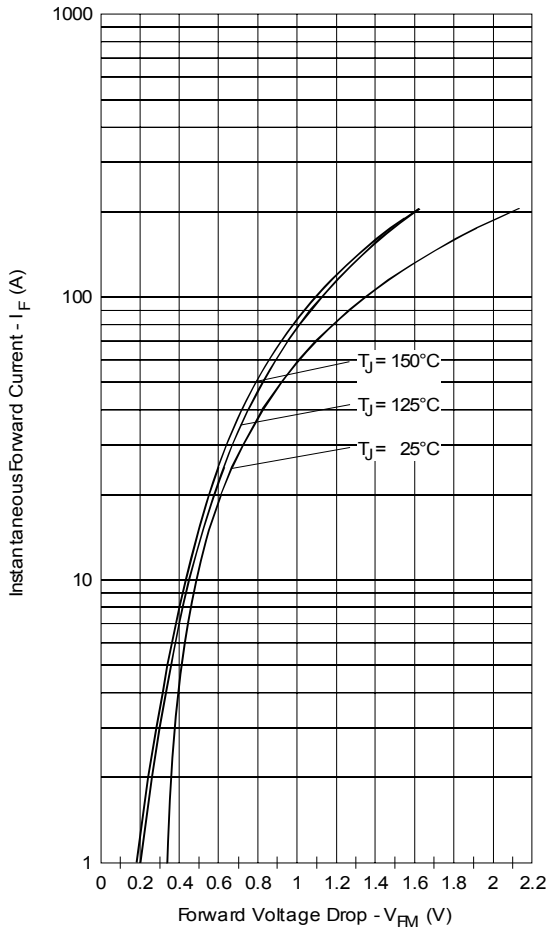


Fig. 1 - Max. Forward Voltage Drop Characteristics (Per Leg)

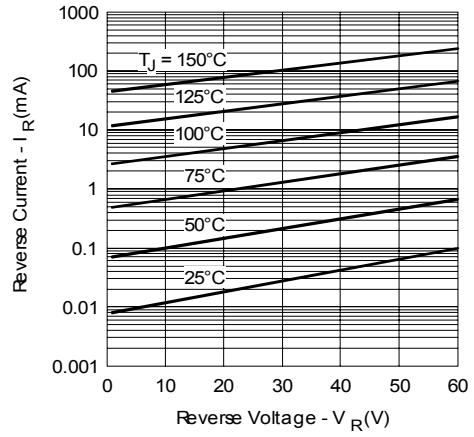


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (Per Leg)

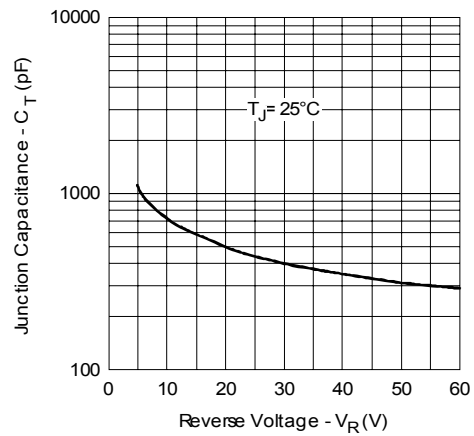


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

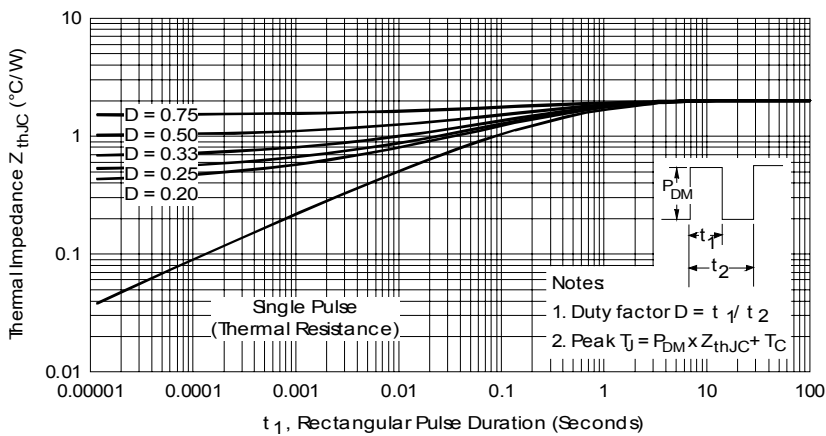


Fig. 4 - Max. Thermal Impedance Z_{thJC} Characteristics (Per Leg)

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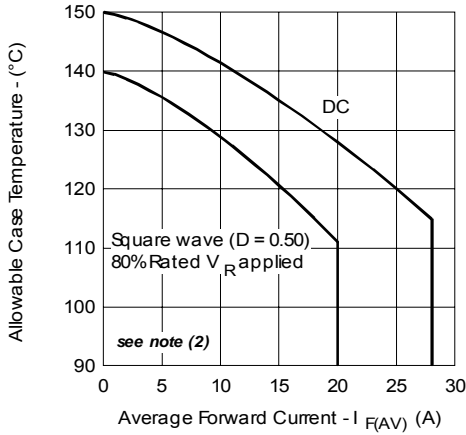


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current (Per Leg)

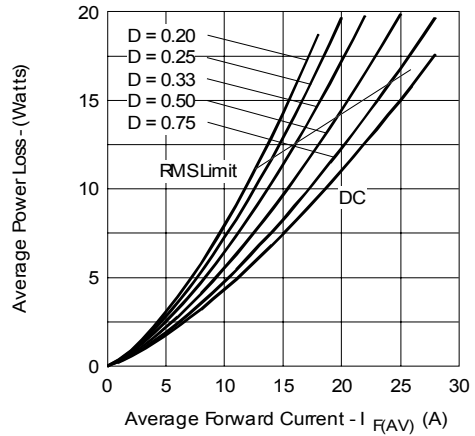


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

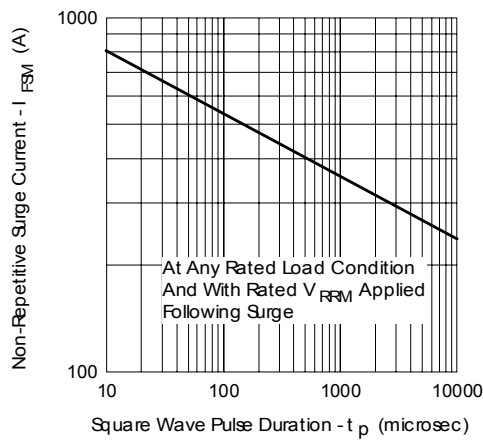


Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

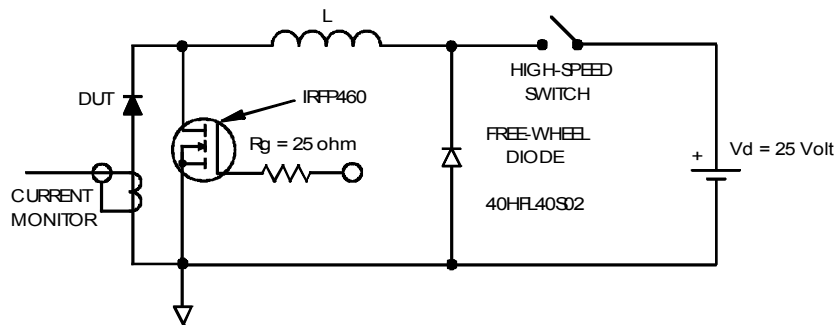


Fig. 8 - Unclamped Inductive Test Circuit

(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);

$Pd_{REV} = \text{Inverse Power Loss} = V_{R1} \times I_{R1} (1 - D); I_{R1} @ V_{R1} = 10V$

Outlines Table

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
5. CONTROLLING DIMENSIONS: INCH.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	4
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	4
c2	1.14	1.65	.045	.065	
D	8.51	9.65	.335	.380	3
D1	6.86	-	.270	-	
E	9.65	10.67	.380	.420	3
E1	6.22	-	.245	-	
e	2.54 BSC	-	.100 BSC	-	
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	-	1.65	-	.065	
L2	1.27	1.78	.050	.070	
L3	0.25 BSC	-	.010 BSC	-	
L4	4.78	6.28	.188	.208	
m	17.78	-	.700	-	
m1	8.89	-	.350	-	
n	11.43	-	.450	-	
o	2.08	-	.082	-	
p	3.81	-	.150	-	
R	0.51	0.71	.020	.028	
θ	90°	93°	90°	93°	

LEAD ASSIGNMENTS

HEXFET
1.- GATE
2, 4.- DRAIN
3.- SOURCE

IGBTs, CoPACK
1.- GATE
2, 4.- COLLECTOR
3.- EMITTER

DIODES
1.- ANODE *
2, 4.- CATHODE
3.- ANODE

* PART DEPENDENT.

Conform to JEDEC outline D²Pak (SMD-220)
Dimensions in millimeters and (inches)

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
6. CONTROLLING DIMENSION: INCH.
7.- OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max.), b(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	2.03	3.02	.080	.119	
b	0.51	0.99	.020	.039	5
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.58	9.65	.330	.380	3
D1	6.86	-	.270	-	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	-	.245	-	4
e	2.54 BSC	-	.100 BSC	-	
L	13.46	14.10	.530	.555	
L1	-	1.65	-	.065	4
L2	3.56	3.71	.140	.146	

LEAD ASSIGNMENTS

HEXFET
1.- GATE
2.- DRAIN
3.- SOURCE
4.- DRAIN

IGBTs, CoPACK
1.- GATE
2.- COLLECTOR
3.- EMITTER
4.- COLLECTOR

Modified JEDEC outline TO-262
Dimensions in millimeters and (inches)

48CTQ060SPbF, 48CTQ060-1PbF

Bulletin PD-21039 rev.A 07/06



Part Marking Information

D²PAK

EXAMPLE: THIS IS A 48CTQ060S
 LOT CODE 8024
 ASSEMBLED ON WW 02, 2000

Note: "P" in assembly line position indicates "Lead-Free"

TO-262

EXAMPLE: THIS IS A 48CTQ060-1
 LOT CODE 1789
 ASSEMBLED ON WW 19, 2002

Note: "P" in assembly line position indicates "Lead-Free"

Tape & Reel Information

SECTION Y-Y

Ao	10.50	+/- 0.1
Bo	15.80	+/- 0.1
B2	10.25	+/- 0.1
Ko	4.90	+/- 0.1
F	11.50	+/- 0.1
P1	16.00	+/- 0.1
W	24.00	+/- 0.3

NOTES:

- 1.0 SPROCKET HOLE PITH CUMULATIVE TOLERANCE ±.02
- 2.0 CAMBER NOT TO EXCEED 1mm in 100mm
- 3.0 MATERIAL: CONDUCTIVE BLACK STYRENIC ALLOY
- 4.0 Ko MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER
- 5.0 MEASURED FROM CENTRELINE OF SPROCKET HOLE TO CENTRELINE OF POCKET
- 6.0 VENDOR: (OPTIONAL)
- 7.0 MUST ALSO MEET REQUIREMENTS OF EIA STANDAR #EIA-481A TAPING OF SURFACE MOUNT COMPONENTS FOR AUTOMATIC PLACEMENT
- 8.0 SURFACE RESISTIVITY OF MOLDED MATL. MUST MEASURE LESS OR EQUAL TO 10⁶ OHMS PER SQUARE, MEASURED IN ACCORDANCE TO PROCEDURE GIVEN IN ASTM D-257 & ASTM D-991
- 9.0 TOTAL LENGTH PER REEL MUST BE 45 METERS
- 10.0 Ⓢ CRITICAL

Dimensions in millimeters and (inches)

Ordering Information Table

Device Code	
48	C
T	Q
060	S
TRL	PbF
①	②
③	④
⑤	⑥
⑦	⑧

1	-	Current Rating (40A)
2	-	Circuit Configuration C = Common Cathode
3	-	T = TO-220
4	-	Schottky "Q" Series
5	-	Voltage Rating (060 = 60V)
6	-	• S = D ² Pak • -1= TO-262
7	-	• none = Tube (50 pieces) • TRL = Tape & Reel (Left Oriented - for D ² Pak only) • TRR = Tape & Reel (Right Oriented - for D ² Pak only)
8	-	• none = Standard Production • PbF = Lead-Free

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