

Data Sheet No. PD-2.058B

4855452 INTERNATIONAL RECTIFIER

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INTERNATIONAL RECTIFIER **IR**

T-23-09

## 40CDQ & 60CDQ SERIES AND SD241

### 40 and 60 Amp Dual Schottky Center Tap Rectifiers

#### Major Ratings and Characteristics

Characteristics	40CDQ	SD241	60CDQ	Units
I <sub>O</sub> Rectangular Waveform	40	60	60	A
	Sinusoidal Waveform	36	54	
I <sub>FSM</sub>	@ 50 Hz	380	475	A
	@ 60 Hz	400	500	
I <sup>2</sup> <sub>t</sub>	@ 50 Hz	730	1140	A <sup>2</sup> s
	@ 60 Hz	665	1040	
I <sup>2</sup> √t	10,325		16,130	A <sup>2</sup> √s
V <sub>RWM</sub>	20 - 45	35	20 - 45	V
C <sub>t</sub> @ -5V	1400			pF
T <sub>J</sub>	-55 to 175			°C

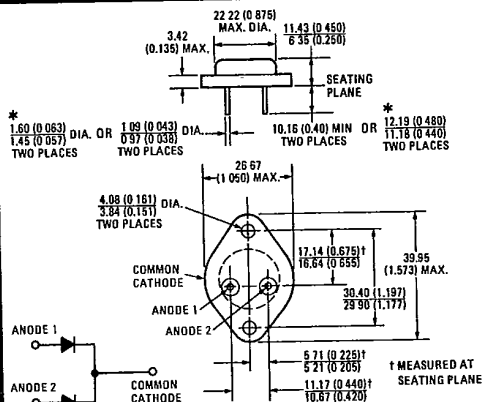
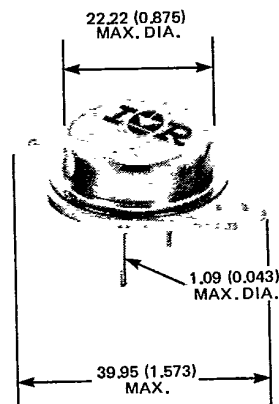
#### Description/Features

The 40CDQ and 60CDQ Dual Schottky Rectifier Series and SD241 employ the "830" process which results in a very low ratio of reverse leakage current to junction temperature. In addition to offering improvements in reliability and performance, they are rugged devices with a guaranteed repetitive peak reverse voltage capability, and excellent ability to withstand reverse energy transients. They can be used in both existing and new designs.

- 175°C T<sub>J</sub> operation
- 100% reverse energy tested (each junction)
- 400A and 500A surge, 60 Hz, one cycle (per junction)
- Extremely low reverse leakage: 10 mA @ 25°C
- No voltage derating of V<sub>RWM</sub> over temperature range
- A guaranteed repetitive peak reverse voltage capability for short pulses which is 20% above V<sub>RWM</sub>
- High power supply reliability
- Minimizes problem of thermal runaway
- TO-204AE (Modified TO-3) Case Style available (60CDQ series)
- Can be supplied to meet stringent military, aerospace and other high-reliability requirements.



#### CASE STYLE AND DIMENSIONS



Conforms to JEDEC Outline TO-204AA (TO-3)  
 \*Conforms to JEDEC Outline TO-204AE (Modified TO-3)  
 All Dimensions in Millimeters and (Inches)

40CDQ & 60CDQ Series and SD241  
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VOLTAGE RATINGS PER JUNCTION

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Part Numbers			$V_{RWM}$ - Max. Working Peak Reverse Voltage (V) ①	$V_{RRM}$ - Max. Repetitive Peak Reverse Voltage (V) ② ( $t_p = 200$ ns Max.)	$V_R$ - Max. Direct Reverse Voltage (V) ③
40CDQ020	—	60CDQ020	20	24	20
40CDQ030	—	60CDQ030	30	36	30
40CDQ035	SD241	60CDQ035	35 ③	42 ③	35
40CDQ040	—	60CDQ040	40	48	40
40CDQ045	—	60CDQ045	45	54	45

ELECTRICAL SPECIFICATIONS

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		40CDQ	SD241	60CDQ	Units	Conditions
$I_O$	Max. average output current from center tap circuit	40	60	60	A	180° conduction, rectangular waveform, $T_C = -40$ to 143°C for 40CDQ, $T_C = -40$ to 120°C for 60CDQ.
		36	54	54		180° conduction, sinusoidal waveform, $T_C = -40$ to 141°C for 40CDQ, $T_C = -40$ to 116°C for 60CDQ.
$I_{FSM}$	Max. peak one cycle, non-repetitive surge current, per junction	.380		475	A	50 Hz half cycle sine wave or 6 ms rectangular pulse, Following any rated load condition and with rated $V_{RWM}$ applied.
		400		500		
		455		570	A	60 Hz half cycle sine wave or 5 ms rectangular pulse, With $V_{RWM} = 0$ following surge, initial $T_J = 175^\circ\text{C}$ .
		475		595		
$I^2t$	Max. $I^2t$ for fusing, per junction	730		1140	$A^2s$	$t = 10$ ms. Rated $V_{RWM}$ following surge, initial $T_J = 175^\circ\text{C}$ .
		665		1040		
$I^2t$	Max. $I^2t$ for individual junction fusing, per junction	1030		1610	$A^2s$	$t = 10$ ms. $V_{RWM}$ following surge = 0, initial $T_J = 175^\circ\text{C}$ .
		940		1470		
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ for individual ① junction fusing, per junction	10,325		16,130	$A^2\sqrt{s}$	$t = 0.1$ to 10 ms, $T_J = 175^\circ\text{C}$ , $V_{RWM} = 0$ following surge.
$V_{FM}$	Max. peak forward voltage per junction	0.70	0.82	V	V	$T_J = 25^\circ\text{C}$ $I_{FM} = 20\text{A}$ peak for 40CDQ, $I_{FM} = 30\text{A}$ peak for 60CDQ and SD241 180° rectangular wave.
		0.91	1.09			$T_J = 25^\circ\text{C}$ Rated $I_F(AV)$ (40A peak for 40CDQ, 60A peak for 60CDQ and SD241) 180° rectangular wave.
		0.74	0.92			$T_J = 175^\circ\text{C}$
$I_{RM}$	Max. peak reverse current, per junction	10		mA	mA	$T_J = 25^\circ\text{C}$ $V_{RM} = \text{rated } V_{RWM}$
		20				$T_J = 125^\circ\text{C}$
$I_{RRM}$	Max. repetitive peak reverse current	2.0		A	A	$T_C = 25^\circ\text{C}$ , $t_p = 2$ $\mu\text{s}$ rectangular pulse, $f = 1$ kHz. ① see fig. 11 for test circuit.
$C_t$	Max. capacitance, per junction	1400		pF	pF	$T_C = 25^\circ\text{C}$ , $V_R = 5$ Vdc (Test signal in the range of 100 kHz to 1 MHz)
dv/dt	Max. rate of application of reverse voltage, per junction	1000		V/ $\mu\text{s}$	V/ $\mu\text{s}$	$T_C = 25^\circ\text{C}$ , $V_{RM} = \text{rated } V_{RWM}$

THERMAL-MECHANICAL SPECIFICATIONS

$T_J$	Max. operating junction temperature range	-55 to 175	°C	
$T_{stg}$	Max. storage temperature range	-55 to 175	°C	
$R_{thJC}$	Max. thermal resistance, junction-to-case, DC operation	1.4	deg. C/W	Based on power dissipated in one junction, both junctions operating.
	Max. composite thermal resistance, junction-to-case, DC operation	0.7		Based on power dissipated in both junctions.
$R_{thCS}$	Thermal resistance, case-to-sink	0.2	deg. C/W	Mounting surface flat, smooth and greased.
wt	Approximate weight	12.8 (0.45)	g (oz.)	
Case Style		TO-204AA (TO-3)	TO-204AE (Modified TO-3)	Terminals 1 and 2: Anodes 1 and 2 Case: Common Cathodes

①  $T_C = -55$  to  $172^\circ\text{C}$ , 180° conduction

②  $T_C = 0$  to  $172^\circ\text{C}$ , 180° conduction

③  $T_C = -55$  to  $162^\circ\text{C}$ .

④ For SD241 rated  $V_{RWM}$  and  $V_{RRM} = 45\text{V}$  @  $T_J = 25^\circ\text{C}$ ;  $= 35\text{V}$  @  $T_J = 150^\circ\text{C}$

⑤  $I^2t$  for time  $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$ .

⑥ For test circuit refer to Fig. 11.

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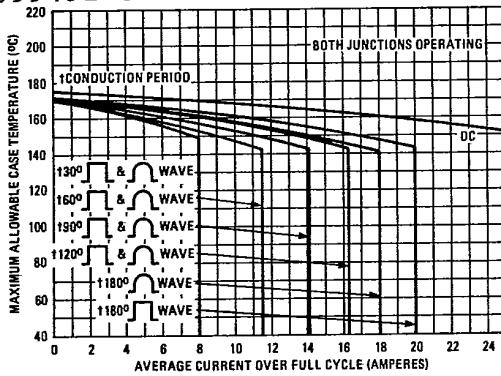


Fig. 1 - Maximum Allowable Case Temperature Vs. Average Forward Current, Per Junction (40CDQ Series)

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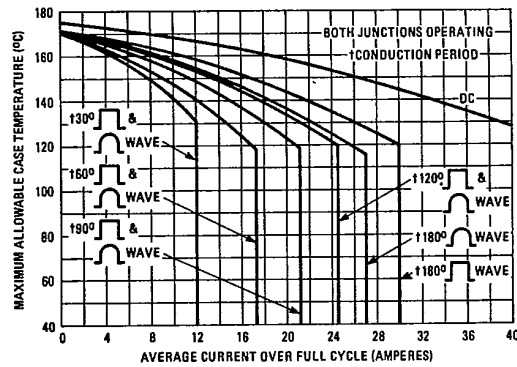


Fig. 2 - Maximum Allowable Case Temperature Vs. Average Forward Current, Per Junction (60CDQ Series and SD241)

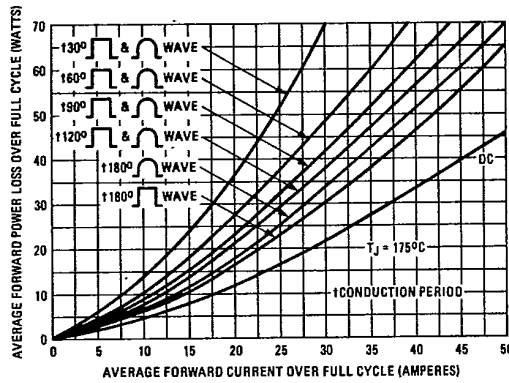


Fig. 3 - Maximum Forward Power Loss Vs. Average Forward Current, Per Junction (Both Series and SD241)

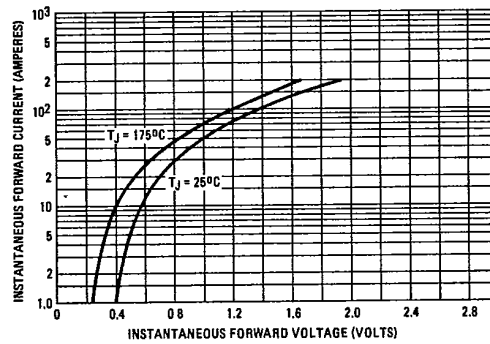


Fig. 4 - Maximum Instantaneous Forward Voltage Vs. Instantaneous Forward Current, Per Junction (Both Series and SD241)

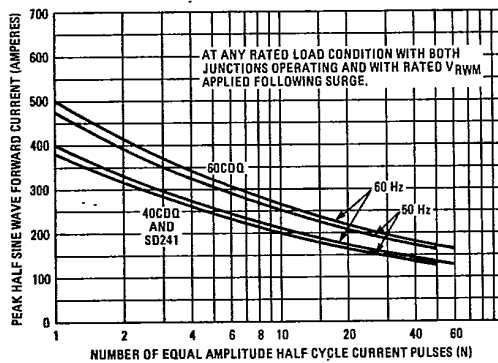


Fig. 5 - Maximum Non-Repetitive Surge Current Vs. Number of Cycles, Per Junction (Both Series and SD241)

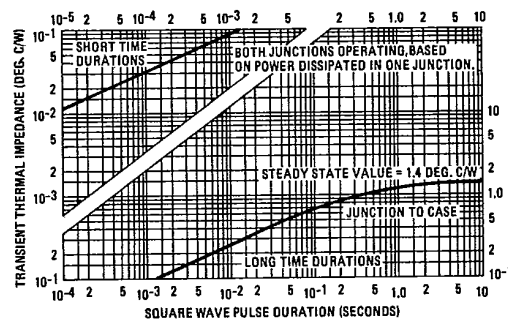


Fig. 6 - Maximum Transient Thermal Impedance, Junction-to-Case, Vs. Square Wave Pulse Duration, Per Junction (Both Series and SD241)

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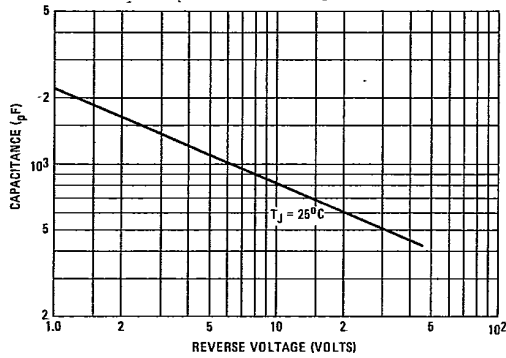


Fig. 7 - Typical Capacitance Vs. Reverse Voltage, Per Junction (Both Series and SD241)

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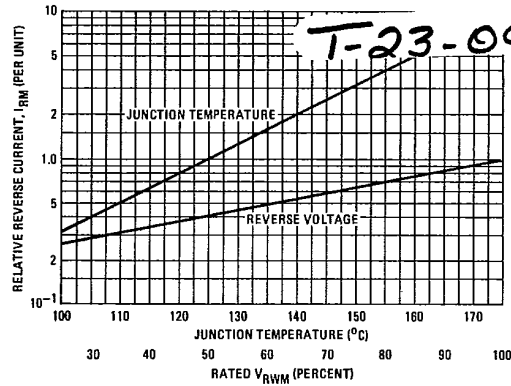


Fig. 8 - Typical Variation of Reverse Current Vs. Junction Temperature and Reverse Voltage, Per Junction (Both Series and SD241)

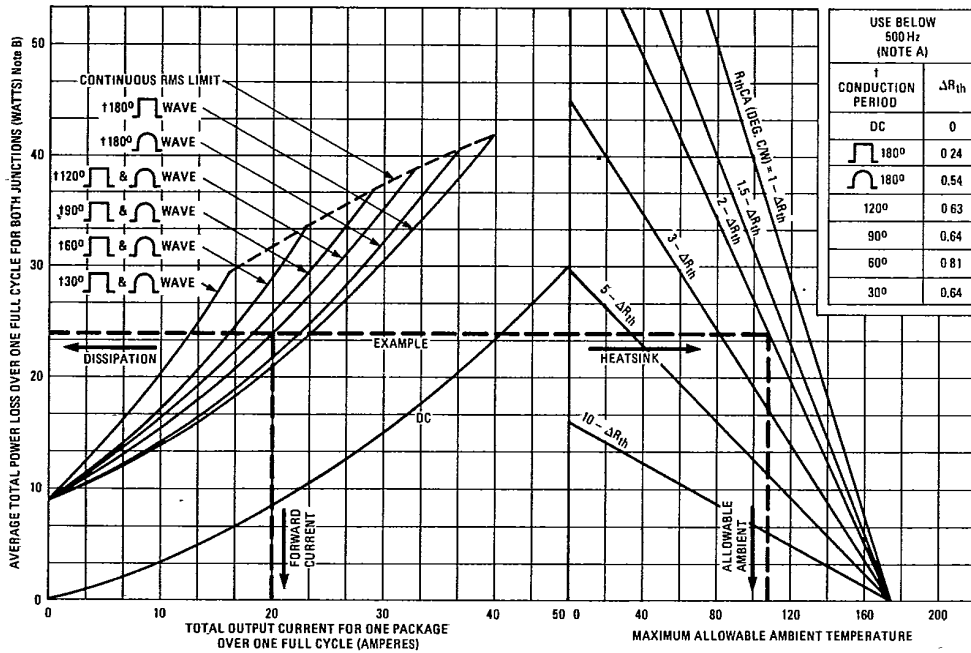


Fig. 9 - Thermal Nomogram (40CDQ Series)

Note A: Maximum allowable heatsink thermal resistance,  $R_{thSA}$ , equals the graph value minus  $\Delta R_{th}$  minus  $R_{thCS}$ . At frequencies above 5000 Hz,  $\Delta R_{th}$  becomes essentially zero and can be ignored.

Note B: The total power dissipation curves assume the worst case reverse conditions of half wave rectangular reverse voltage, full rated  $V_{RWM}$  and  $T_j = 175^\circ\text{C}$ . Lower reverse losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

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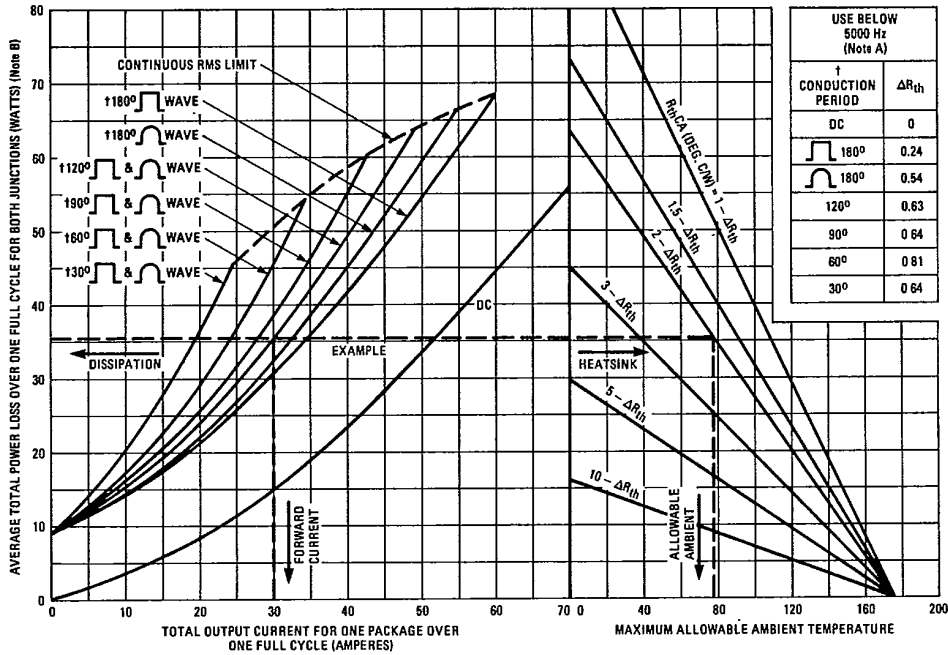


Fig. 10 – Thermal Nomogram (60CDQ Series and SD241)

- Note-A: Maximum allowable heatsink thermal resistance,  $R_{thSA}$ , equals the graph value minus  $\Delta R_{th}$  minus  $R_{thCS}$ . At frequencies above 5000 Hz,  $\Delta R_{th}$  becomes essentially zero and can be ignored.
- Note B: The total power dissipation curves assume the worst case reverse conditions of half wave rectangular reverse voltage, full rated  $V_{RWM}$  and  $T_J = 175^\circ\text{C}$ . Lower reverse losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

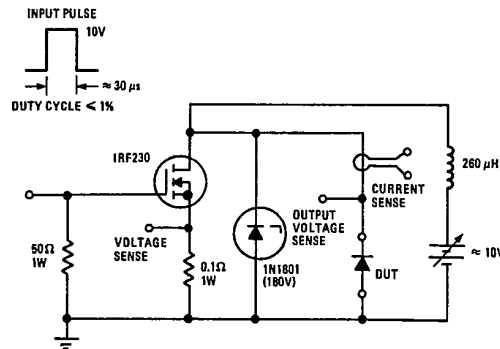


Fig. 11 –  $I_{RRM}$  Test Circuit