Data Sheet No. PD-2.058B

4855452 INTERNATIONAL RECTIFIER 55C 05097 D

INTERNATIONAL RECTIFIER IOR

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_O	Rectangular Waveform	40	60	60	A
	Sinusoidal Waveform	36	54	54	A
I_{FSM}	@ 50 Hz	380		475	A
	@ 60 Hz	400		500	A
I^2t	@ 50 Hz	730		1140	A^2s
	@ 60 Hz	665		1040	A^2s
$I^2\sqrt{t}$		10,325		16,130	$A^2\sqrt{s}$
V_{RWM}		20 - 45	35	20 - 45	V
C_t @ −5V		1400			pF
T_J		-55 to 175			°C

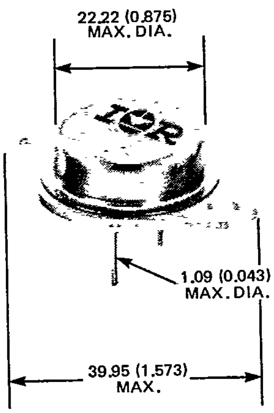
Description/Features

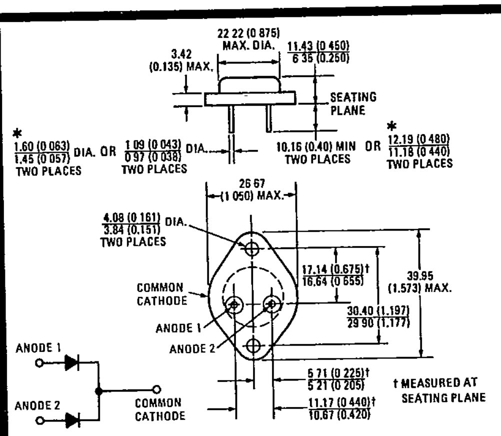
The 40CDQ and 60CDQ Dual Schottky Rectifier Series and SD241 employ the "830" process which results in a very low ratio of reverse leakage current to junction temperature. In addition to offering improvements in reliability and performance, they are rugged devices with a guaranteed repetitive peak reverse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

- 175°C T_J 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_{RWM} over temperature range
- A guaranteed repetitive peak reverse voltage capability for short pulses which is 20% above V_{RWM}
- 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.

C

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)

VOLTAGE RATINGS PER JUNCTION

Part Numbers			V_{RWM} – Max. Working Peak Reverse Voltage (V) ①	V_{RRM} – Max. Repetitive Peak Reverse Voltage (V) ③ (t_p = 200 ns Max.)	V_R – Max. Direct Reverse Voltage (V) ④
40CDQ020	–	60CDQ020	20	24	20
40CDQ030	–	60CDQ030	30	36	30
40CDQ035	SD241	60CDQ035	35 ⑤	42 ⑤	35
40CDQ040	–	60CDQ040	40	48	40
40CDQ045	–	60CDQ045	45	54	45

T-23-09

ELECTRICAL SPECIFICATIONS

		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		60 Hz half cycle sine wave or 5 ms rectangular pulse,
		455		570	A	50 Hz — With V_{RWM} = 0 following surge, initial T_J = 175°C.
		475		595		60 Hz
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°C.
		665		1040		t = 8.3 ms.
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°C.
		940		1470		t = 8.3 ms.
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ for individual ⑥ junction fusing, per junction	10,325		16,130	$A^2\sqrt{s}$	t = 0.1 to 10 ms, T_J = 175°C, V_{RWM} = 0 following surge.
V_{FM}	Max. peak forward voltage per junction	0.70	0.82		V	T_J = 25°C — I_{FM} = 20A peak for 40CDQ, I_{FM} = 30A peak for 60CDQ and SD241 180° rectangular wave.
		0.91	1.09			T_J = 25°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°C
I_{RM}	Max. peak reverse current, per junction	10			mA	T_J = 25°C — V_{RM} = rated V_{RWM}
		20				T_J = 125°C
I_{RRM}:	Max. repetitive peak reverse current	2.0			A	T_C = 25°C, t_p = 2 μs rectangular pulse, f = 1 kHz. ⑦ see fig. 11 for test circuit.
C_t	Max. capacitance, per junction	1400			pF	T_C = 25°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/μs	T_C = 25°C, V_{RM} = rated V_{RWM}

THERMAL-MECHANICAL SPECIFICATIONS

				Units	Conditions
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°C, 180° conduction
③ T_C = 0 to 172°C, 180° conduction
④ T_C = -55 to 162°C.
⑤ For SD241 rated V_{RWM} and V_{RRM} = 45V @ T_J = 25°C; = 35V @ T_J = 150°C
⑥ I^2t for time $t_x = I^2\sqrt{t} \cdot \sqrt{t_x}$.
⑦ For test circuit refer to Fig. 11.

T-23-09

IOR INTERNATIONAL RECTIFIER

40CDQ & 60CDQ Series and SD241

4855452 INTERNATIONAL RECTIFIER 55C 05099 D

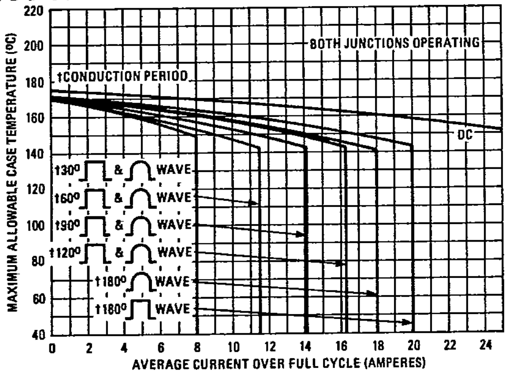


Fig. 1 – Maximum Allowable Case Temperature Vs. Average Forward Current, Per Junction (40CDQ Series)

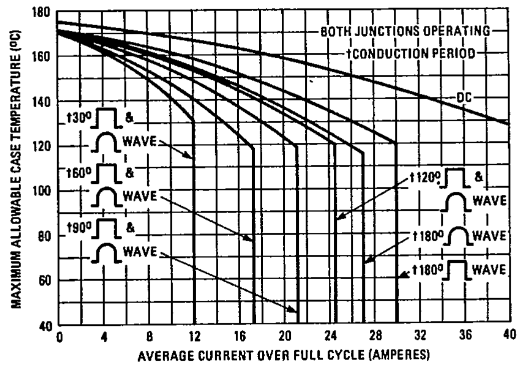


Fig. 2 – Maximum Allowable Case Temperature Vs. Average Forward Current, Per Junction (60CDQ Series and SD241)

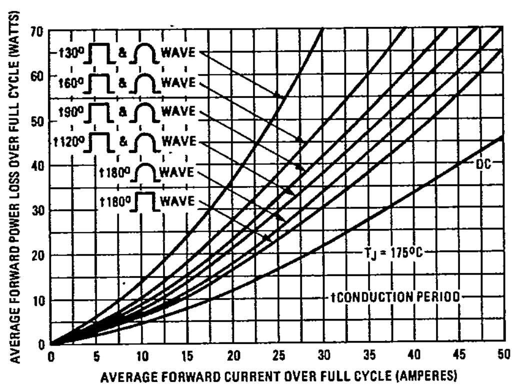


Fig. 3 – Maximum Forward Power Loss Vs. Average Forward Current, Per Junction (Both Series and SD241)

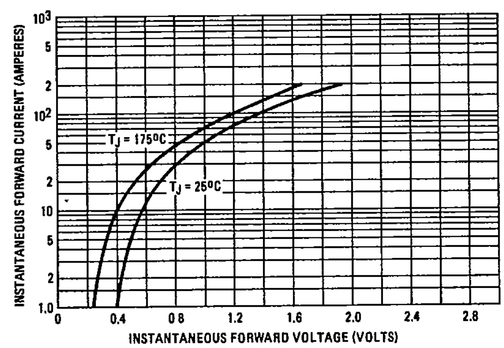


Fig. 4 – Maximum Instantaneous Forward Voltage Vs. Instantaneous Forward Current, Per Junction (Both Series and SD241)

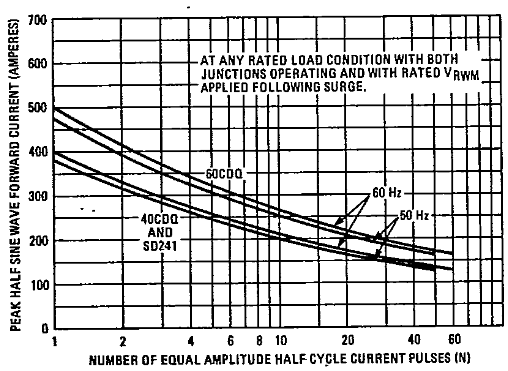


Fig. 5 – Maximum Non-Repetitive Surge Current Vs. Number of Cycles, Per Junction (Both Series and SD241)

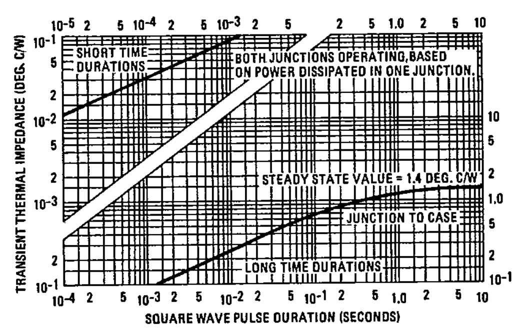


Fig. 6 – Maximum Transient Thermal Impedance, Junction-to-Case, Vs. Square Wave Pulse Duration, Per Junction (Both Series and SD241)

C

T-23-09

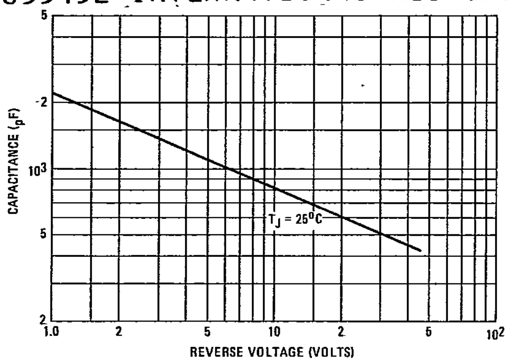


Fig. 7 — Typical Capacitance Vs. Reverse Voltage, Per Junction (Both Series and SD241)

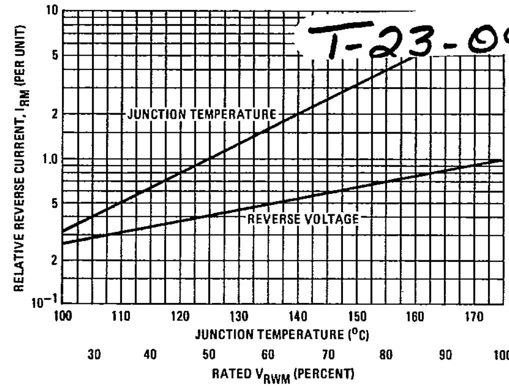
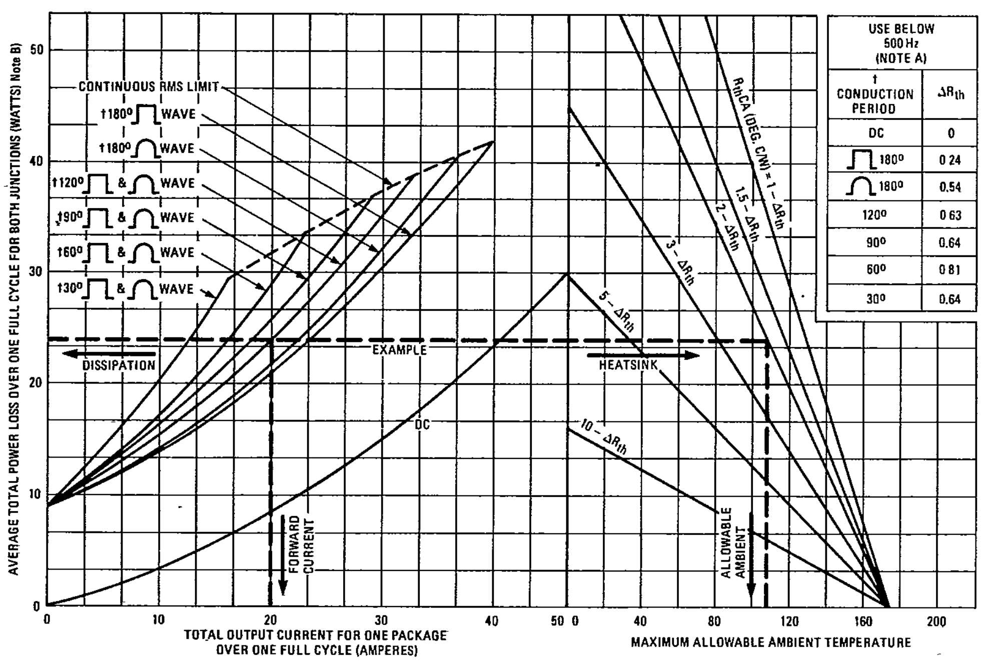


Fig. 8 — Typical Variation of Reverse Current Vs. Junction Temperature and Reverse Voltage, Per Junction (Both Series and SD241)



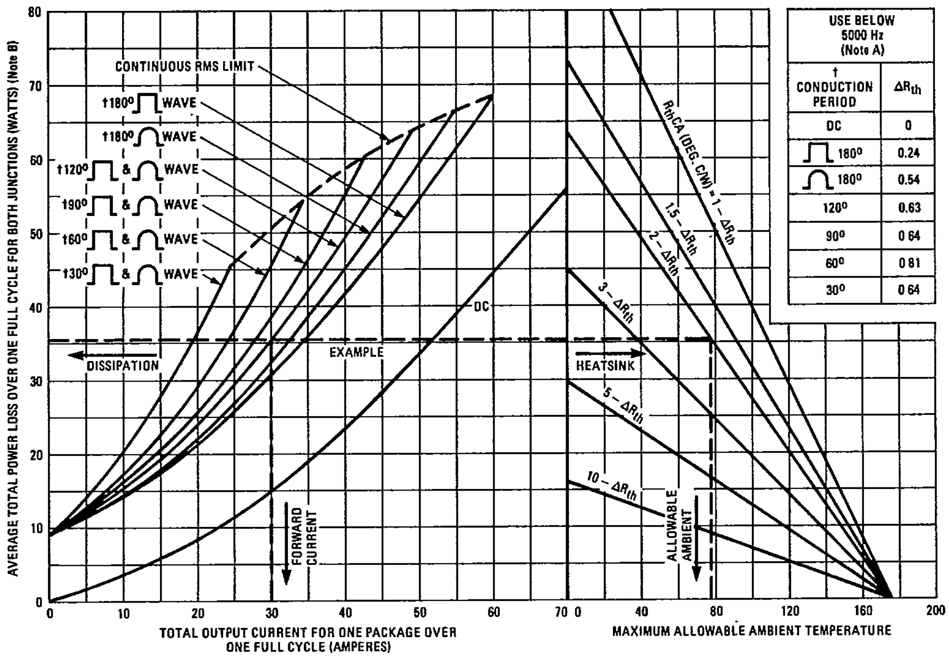
USE BELOW 500 Hz (NOTE A)	
† CONDUCTION PERIOD	ΔR_{th}
DC	0
180° (rectangular)	0.24
180° (sine)	0.54
120°	0.63
90°	0.64
60°	0.81
30°	0.64

Fig. 9 — Thermal Nomogram (40CDQ Series)

Note A: Maximum allowable heatsink thermal resistance, R_{thSA}, equals the graph value minus ΔR_{th} minus R_{thCS}. At frequencies above 5000 Hz, ΔR_{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°C. Lower reverse losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

T-23-09



USE BELOW 5000 Hz (Note A)	
† CONDUCTION PERIOD	ΔR_{th}
DC	0
⊓ 180°	0.24
∩ 180°	0.54
120°	0.63
90°	0.64
60°	0.81
30°	0.64

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

Note A: Maximum allowable heatsink thermal resistance, R_{thSA}, equals the graph value minus ΔR_{th} minus R_{thCS}. At frequencies above 5000 Hz, ΔR_{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°C. Lower reverse losses allow higher operating ambient, smaller heatsinks or larger operating safety margin.

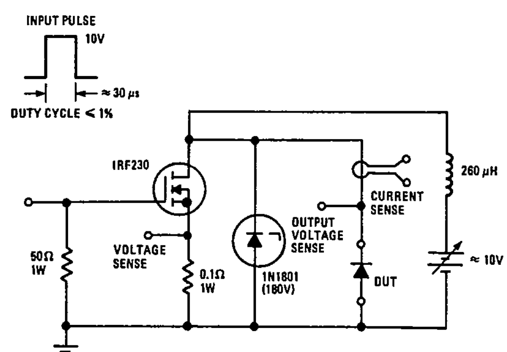


Fig. 11 — I_{RRM} Test Circuit