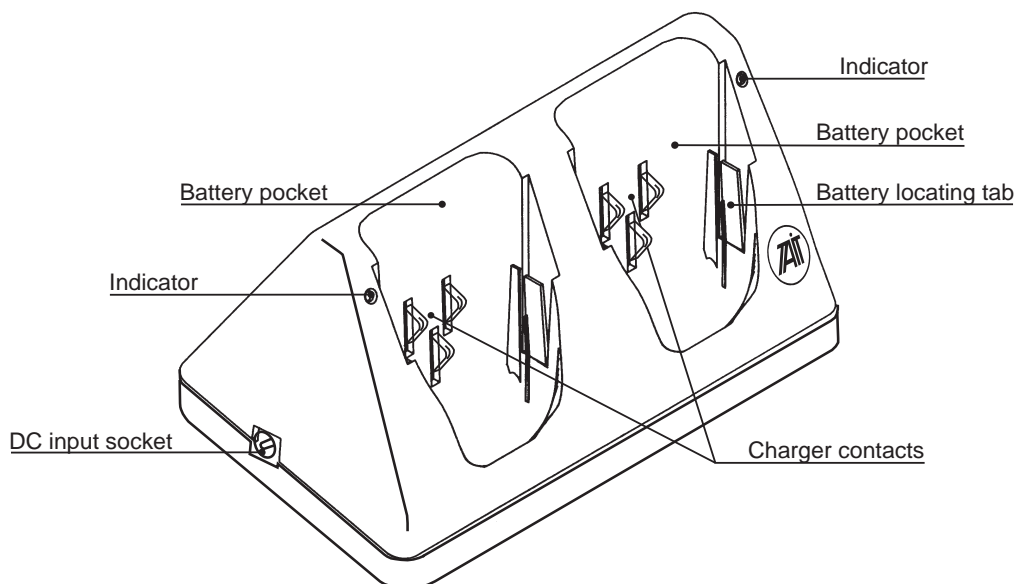# 7.12　T3004 Rapid Charger

7.12.1　Introduction

The T3004-0000 dual desktop rapid charger is designed to charge one or two T3000 rechargeable battery packs, with two slots for either the combined battery and radio or for the battery alone. The charger is powered by either a dedicated T952 AC/DC plug pack, complying with the local requirements of the country into which it is sold, or a suitable DC supply. Batteries are charged sequentially if two are placed in the charger.

Although the T3004 is primarily intended for use in desktop situations, it may be used in vehicles with a nominal 12V or 24V supply voltage, in conjunction with the T952-050 vehicle supply cable. The vehicle supply cable is 1.5m long and has a cigarette lighter adapter plug at one end and a DC jack (centre pin positive) at the other.

The T3004, T3004 plug packs and vehicle supply cable are available under the following IPNs:

T952-050	Vehicle Supply Cable
T952-014	T3004 Plug Pack Australia/New Zealand
T952-024	T3004 Plug Pack UK
T952-034	T3004 Plug Pack Europe
T952-044	T3004 Plug Pack USA
T3004-0000	T3004 Rapid Charger

7.12.2   Performance Specifications

Power Supply..	..	10.7 to 32V DC, 30W maximum
Battery Capacity	..	up to 2AH
Battery Types	..	NiCd and NiMH
Operating Temperature	..	+5°C to +40°C (best performance between +15°C to +25°C)
Rapid Charge Rate	..	C/1

Trickle Charge Rate:

NiCd	..	C/10 (average)
NiMH	..	C/40 (average)

Standby Charge Rate	..	C/360

Charge Duration:

Rapid (for an exhausted battery pack)	..	up to 1.5 hours (1 hour nominal)

Trickle:

NiCd	..	3 hours
NiMH	..	2 hours
Standby	..	indefinite

End Of Charge Detection	..	- high voltage - ΔT (rate of temperature rise) - negative ΔV - high temperature cut-off - safety timer

7.12.3   Warnings

⚠ • **Avoid extreme temperatures and direct sunlight when charging a T3000 battery pack. The required temperature range for the charger is 5°C to 40°C. Charging efficiency is maximised around normal room temperature i.e. 15°C to 25°C.**

• **To give maximum battery life, do not recharge the battery until the 'low battery warning' is activated. This will avoid reduced battery capacity.**

7.12.4 Operation

Place the charging unit on a stable horizontal surface and power the unit either from the T952 plug pack or the T952-050 vehicle supply cable.

Check that the connectors are properly pushed home to ensure reliable electrical contact.

Place the battery to be charged, with or without its radio, into the charging unit with the 4 silver contacts to the rear.

• To locate a battery pack correctly in the charger, lean the top of the battery as far forward as possible to seat the bottom of the battery. Pivot the battery back against the contacts and it should snap into place.

• After about 1 hour, the charge current terminates. The green LED then illuminates, indicating that trickle charge has commenced.

• The battery may be left in the charger until needed, where it will be trickle charged with no risk of damage.

• The indicator beside the pocket indicates the charge status, as shown in the following table.

LED	Condition	Function
off	charging suspended	• Battery awaiting charge. • Incorrectly seated battery. • Input supply voltage too low. • Charger powered but no battery present. • No power connected.
amber	test (3 seconds)	Battery presence has been detected and testing has begun.
red	rapid charge	Rapid charge in progress.
green	standby charge	Rapid charge complete - trickle or standby charge in progress.
red flashing	fault	Charge suspended - faulty battery, or faulty charger.

7.12.5   Circuit Description

The T3004 rapid charger can be divided into three functional areas:

* DC to DC switchmode converter.

* Two linear current regulators (one for each battery pocket).

* Microprocessor control and monitor functions.

1   DC To DC Switchmode Converter

Power Supply

The T3004 is powered by either a dedicated T952 AC/DC plug pack, consisting of a mains transformer, full wave rectifier, and smoothing capacitor, or by a 12V or 24V vehicle battery.

The DC supply is fed via a printed 5A fuse and reverse/over voltage protection diode (D1) to two DC linear voltage regulators, IC1 and IC2.

Regulator IC1 provides a 2% 5V reference to the microprocessor and is the reference voltage standard for the unit. Regulator IC2 feeds the switchmode IC, IC3, and limits its maximum voltage to nominally 13.75V and ensures that the maximum gate voltage rating of Q6 is not exceeded at high supply voltages.

Switchmode Supply

The switchmode supply operates at a frequency of 134kHz (determined by the time constant R11xC14), and generates a sawtooth waveform at the base of emitter follower Q1, that feeds an attenuated version of this waveform to pin 3 of IC3. This converts the current control mode of IC3 to voltage control mode.

A square wave is generated at pin 6 of IC3 to feed the gate of Q6, with a duty cycle that is determined by the feedback voltage on pin 2 of IC3. This voltage is compared with half the internal reference voltage, and stabilises at 2.5V.

For example, if Q7 is off, the output voltage (measured at the top of R35) has a maximum value of:

$$\left(\frac{2.5\,\text{V}}{1\text{k}\Omega}\right) \times (3.9\text{k}\Omega + 1\text{k}\Omega) \ = \ 12.25\,\text{V}$$

R16, C16, and C17 are the feedback components around IC3's internal inverting mode op-amp. These components, together with R27, R28, and C28, are chosen to provide both closed loop stability and a response time adequate to reduce 100Hz supply ripple to an acceptable level.

IC3 exhibits under voltage sensing with a start-up threshold of 8.4V and only switches on its internal 5V reference at pin 8 when this threshold is exceeded. Q6, an N channel power MOSFET is the main switching transistor. When Q6 is on, energy is stored in the primary winding of the 1:1 transformer T1, and is released via the secondary winding and diode D7, when it is off.

C23 and C31 are the main smoothing capacitors and minimise the switching frequency ripple voltage. The output voltage is approximated by:

$$Vo = \frac{VsK}{(1-K)}$$

where K is the fractional on-time of Q6 and Vs is the supply voltage.

Transistors Q4 and Q5 provide a 'soft start'. Q11 switches the switchmode on when Q11 switches off, resulting in Q4 switching on. C26 charges via R22 and the emitter of Q5 drops as a controlled voltage ramp. As this voltage drops, the output voltage ramps up, attempting to preserve the virtual earth at pin 2 of IC3 at 2.5V. This results in the required soft start.

2   Linear Current Regulators

Two identical circuits control the charge current to the appropriate battery pocket. If both batteries are present, the microprocessor arbitrates over which battery is charged first. These constant current regulators share a common 0.2Ω current sensing resistance, consisting of nine parallel 1.8Ω resistors (R68, R69, R70, R71, R72, R74, R75, R76, R77).

The battery under charge defines the charge current as a function of the battery's internal capacity resistor. If the battery in the left pocket is being charged, the battery capacity resistor is in series with R64 and is connected to the microprocessor via R80. With R80 pulled high by the microprocessor port, the current to the emitter of Q8 is zero.

With the microprocessor's port in the high impedance state, the resulting current in Q8 sets a voltage drop across R61 and R62 which is transferred by the negative feedback loop (consisting of the op-amp and Q9) to the current sensing resistors R68 to R76. This translates to a constant current available at the drain of Q9 to charge the battery. If the battery is open circuit, the gate of Q9 will be driven to ground and switch off Q10. The collector of Q10 signals the resulting open circuit condition to the microprocessor.

The differential drain source voltage drop across Q9 is monitored via diode D10 and the emitter of Q7. This results in a current in Q7 which reduces the switchmode output voltage so that it tracks the battery voltage over a limited window and therefore limits the power dissipation in Q9. At low battery voltages, Q7 is fully on and R36 limits the lower switchmode voltage tracking limit to around 9.2V.

To avoid the upper common mode input voltage limit of the op-amp, the op-amp's supply is boosted by the square wave from IC3 pin 6 and superimposed via C30 and D9 on to the switchmode output voltage. This is peak detected by the second half of D9, smoothed and provides the boosted op-amp supply voltage of approximately 25V.

3   Microprocessor Control And Monitor Functions

The microprocessor monitors the following battery parameters:
- battery temperature

- battery voltage

- expanded battery voltage

- battery cell type i.e. NiCad or NiMH

Each T3000 battery pack contains a battery temperature sensing thermistor which forms a potential divider with R125 (left pocket) or R130 (right pocket). The resulting voltage is a function of temperature. This is sensed via the analogue multiplexer, IC6, and is interpreted by the microprocessor.

If a battery in the left pocket is being charged, the potential divider consisting of R84, R95 and R96 translates the battery voltage through to the microprocessor via IC6.

The expanded battery voltage is available via the op-amp output pin 1. This approximately maps battery voltage ranges from 8.24V to 10.5V to 0V to 5V at the op-amp output, and is again sensed via IC6 and interpreted by the microprocessor.

The peak negative ripple of the power supply voltage is monitored and the charger is disabled if the supply voltage drops below 10.5V. The potential divider formed by R1 and R2 sample the supply voltage via the emitter follower Q26 and peak detector emitter follower Q21. This voltage is directly sampled by the microprocessor's AD. If the peak negative voltage is less than 10.5V, the battery charger is disabled until the supply is removed and then restored.

The low voltage reset IC, IC5, resets the microprocessor if its supply drops below approximately 4.75V.

Two dual red/green LEDS are utilised to display the charge status of each battery. A third colour amber is displayed when both the red and green colours of the LED are switched on.

T3004 Parts List (IPN 220-01270-03)

Ref	IPN	Description	Ref	IPN	Description
C1	018-14100-00	CAP 0603 CHIP 1N 50V X7R 1080	C78	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%
C2	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	C79	015-25470-08	CAP CER 0805 CHIP 47N 10% X7R 50V
C3	015-25470-08	CAP CER 0805 CHIP 47N 10% X7R 50V	C80	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%
C4	015-25470-08	CAP CER 0805 CHIP 47N 10% X7R 50V	C81	018-12180-00	CAP 0603 CHIP 18P 50V NPO +-5%
C5	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	C82	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V
C6	016-08100-01	CAP ELECT 6X4MM CHIP 10M 20% 16V	C83	018-12180-00	CAP 0603 CHIP 18P 50V NPO +-5%
C7	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	C84	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%
C8	020-08560-09	CAP ELECT RADL 56M 50V 6.3X15.5MM L/S			
C9	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	D1	001-00153-30	(S) DIODE 1.5KE33P ZENER 33V TRANSIENT
C10	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	D2	001-10000-99	(S) DIODE SMD BAV99 DUAL SWTCH SNGLE LI
C12	016-08100-01	CAP ELECT 6X4MM CHIP 10M 20% 16V	D3	001-10000-99	(S) DIODE SMD BAV99 DUAL SWTCH SNGLE LI
C13	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	D4	001-00012-91	(S) DIODE 16V TRANSIENT SUPPRESSOR
C14	015-24330-08	CAP CER 0805 CHIP 3N3 10% X7R 50V	D5	001-10036-00	(LS) SMD DIODE SCHOTTKY MBR360 3A 60V I
C15	018-15100-00	CAP 0603 CHIP 10N 50V X7R +-10%	D7	001-10036-00	(LS) SMD DIODE SCHOTTKY MBR360 3A 60V I
C16	015-24330-08	CAP CER 0805 CHIP 3N3 10% X7R 50V	D9	001-10000-99	(S) DIODE SMD BAV99 DUAL SWTCH SNGLE II
C17	015-24330-08	CAP CER 0805 CHIP 3N3 10% X7R 50V	D10	001-10000-99	(S) DIODE SMD BAV99 DUAL SWTCH SNGLE I
C20	020-08560-09	CAP ELECT RADL 56M 50V 6.3X15.5MM L/S	D11	001-10032-00	(S) DIODE MBRD320 SMD RECTIFIER
C21	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	D12	001-10032-00	(S) DIODE MBRD320 SMD RECTIFIER
C22	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V			
C23	020-19120-00	(L) CAP ELECT RADL 1200M 35V 16*25MM LXF	IC1	002-00078-05	(S) IC MC7805ACT 5V REG(LINEAR)1AMP TO-2
C25	018-15100-00	CAP 0603 CHIP 10N 50V X7R +-10%	IC2	002-00014-62	(S) IC 317L 100MA REG 3 TERMINAL TO-92
C26	016-07100-01	CAP ELECT 6X4MM CHIP 1M 20% 16V	IC3	002-00384-30	(S) IC UC3843/A CURRENT MODE CONTROLLE
C28	015-25150-08	CAP CER 0805 CHIP 15N 10% X7R 50V	IC4	002-06870-51	(LS) IC MC68HC705P6P OTP MICRO 28DIP
C29	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	IC5	002-10340-64	(S) IC SMD MC34064 LO VOLT SENSE
C30	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	IC6	002-11405-10	(S) IC SMD MC14051BDR2 CMOS 8INPUT ANA
C31	020-19120-00	(L) CAP ELECT RADL 1200M 35V 16*25MM LXF	IC8	002-10003-24	(S) IC SMD 324 QUAD OP AMP SO14
C32	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%			
C33	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	LEFT	008-02099-00	(S) LED RED/GREEN BI-COLOUR 3.1MM DIA 3
C34	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	L1	056-00010-15	IND FXD TAIT NO 15 5T ON 3B BEAD
C35	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	L2	056-00010-15	IND FXD TAIT NO 15 5T ON 3B BEAD
C36	020-09470-07	CAP 470M 16V 20% ELEC VERT 8*20 3.5MM L/	L3	056-00010-15	IND FXD TAIT NO 15 5T ON 3B BEAD
C37	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%			
C38	016-08100-01	CAP ELECT 6X4MM CHIP 10M 20% 16V	Q1	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C39	016-07100-01	CAP ELECT 6X4MM CHIP 1M 20% 16V	Q4	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C40	016-07100-01	CAP ELECT 6X4MM CHIP 1M 20% 16V	Q5	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C41	018-15100-00	CAP 0603 CHIP 10N 50V X7R +-10%	Q6	000-10200-60	(S) XSTR SMD MTD20N06HDLT4 N-CHANNEL P
C42	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	Q7	000-10085-71	(S) XSTR SMD BC857BW PNP SOT-323 SMALL
C43	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	Q8	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C44	018-12180-00	CAP 0603 CHIP 18P 50V NPO +-5%	Q9	000-10295-51	(S) XSTR SMD MTD2955ET4 P CHANNEL PWR
C45	018-12470-00	CAP 0603 CHIP 47P 50V NPO +-5%	Q10	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C46	018-12180-00	CAP 0603 CHIP 18P 50V NPO +-5%	Q11	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C47	018-12330-00	CAP 0603 CHIP 33P 50V NPO +-5%	Q12	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C48	018-12330-00	CAP 0603 CHIP 33P 50V NPO +-5%	Q13	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C49	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	Q14	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C50	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	Q15	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C51	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	Q16	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C52	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	Q17	000-10295-51	(S) XSTR SMD MTD2955ET4 P CHANNEL PWR
C56	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	Q18	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C57	015-25470-08	CAP CER 0805 CHIP 47N 10% X7R 50V	Q19	000-10085-71	(S) XSTR SMD BC857BW PNP SOT-323 SMALL
C58	016-08100-01	CAP ELECT 6X4MM CHIP 10M 20% 16V	Q20	000-10084-81	(S) XSTR SMD BC848BW NPN SOT-323 SMALL
C59	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	Q21	000-10085-71	(S) XSTR SMD BC857BW PNP SOT-323 SMALL
C60	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%			
C61	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	R1	036-15390-10	RES M/F 0805 CHIP 39K 1%
C63	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	R2	038-14680-00	RES 0603 CHIP 6K8 1/16W +-5%
C64	014-06470-00	CAP TANT CHIP 470N 25V +-20% 6X3.2X2.5MM	R3	038-15150-00	RES 0603 CHIP 15K 1/16W +-5%
C65	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	R4	036-16120-10	RES M/F 0805 CHIP 120K 1%
C66	018-12470-00	CAP 0603 CHIP 47P 50V NPO +-5%	R7	036-15100-10	RES M/F 0805 CHIP 10K 1%
C67	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	R8	038-14100-00	RES 0603 CHIP 1K0 1/16W +-5%
C70	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	R9	038-14100-00	RES 0603 CHIP 1K0 1/16W +-5%
C71	014-06470-00	CAP TANT CHIP 470N 25V +-20% 6X3.2X2.5MM	R10	038-14220-00	RES 0603 CHIP 2K2 1/16W +-5%
C72	018-12470-00	CAP 0603 CHIP 47P 50V NPO +-5%	R11	036-14390-00	RES M/F 0805 CHIP 3K9 5%
C73	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V	R14	038-15150-00	RES 0603 CHIP 15K 1/16W +-5%
C74	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	R15	036-15100-10	RES M/F 0805 CHIP 10K 1%
C75	018-14100-00	CAP 0603 CHIP 1N 50V X7R +-10%	R16	036-15220-00	RES M/F 0805 CHIP 22K 5%
C76	018-12470-00	CAP 0603 CHIP 47P 50V NPO +-5%	R20	038-13100-00	RES 0603 CHIP 100E 1/16W +-5%
C77	016-08100-01	CAP ELECT 6X4MM CHIP 10M 20% 16V	R21	036-15100-10	RES M/F 0805 CHIP 10K 1%

Ref	IPN	Description	Ref	IPN	Description
R22	036-15470-10	RES M/F 0805 CHIP 47K 1%	R111	036-15100-10	RES M/F 0805 CHIP 10K 1%
R24	038-12100-00	RES 0603 CHIP 10E 1/16W +-5%	R114	036-15470-10	RES M/F 0805 CHIP 47K 1%
R25	038-12100-00	RES 0603 CHIP 10E 1/16W +-5%	R115	036-15470-10	RES M/F 0805 CHIP 47K 1%
R26	036-14390-00	RES M/F 0805 CHIP 3K9 5%	R116	038-14100-00	RES 0603 CHIP 1K0 1/16W +-5%
R27	038-13100-00	RES 0603 CHIP 100E 1/16W +-5%	R117	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%
R28	036-15100-10	RES M/F 0805 CHIP 10K 1%	R118	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%
R32	038-13100-00	RES 0603 CHIP 100E 1/16W +-5%	R125	036-15100-10	RES M/F 0805 CHIP 10K 1%
R33	036-15100-10	RES M/F 0805 CHIP 10K 1%	R130	036-15100-10	RES M/F 0805 CHIP 10K 1%
R34	038-14100-00	RES 0603 CHIP 1K0 1/16W +-5%	RIGHT	008-02099-00	(S) LED RED/GREEN BI-COLOUR 3.1MM DIA
R35	036-14390-00	RES M/F 0805 CHIP 3K9 5%			
R36	036-14820-00	RES M/F 0805 CHIP 8K2 5%	SK1	240-02020-07	SKT DC JACK 5.5MM HOLE 2.5MM PIN PCB MN
R37	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R38	036-14820-00	RES M/F 0805 CHIP 8K2 5%	T1	053-01068-00	XFMR T3004 SWITCHMODE
R39	038-14680-00	RES 0603 CHIP 6K8 1/16W +-5%			
R40	038-15150-00	RES 0603 CHIP 15K 1/16W +-5%	XL1	274-00010-33	XTAL 4MHZ TE-35 HC49U C/W TEFLON INS
R41	038-12220-00	RES 0603 CHIP 22E 1/16W +-5%			
R42	038-12470-00	RES 0603 CHIP 47E 1/16W +-5%		065-00010-20	BEAD FERRITE BALUN 4B1 PHILIPS
R43	038-14680-00	RES 0603 CHIP 6K8 1/16W +-5%			L1, L2, L3
R46	036-15470-10	RES M/F 0805 CHIP 47K 1%		220-01270-03	PCB T3004 DUAL DESKTOP RAPID BATTERY C
R47	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%			
R48	036-15470-10	RES M/F 0805 CHIP 47K 1%		240-04020-64	SKT JACK AN 0.98MM PCB MTG 64 WAY SIL S
R49	038-14100-00	RES 0603 CHIP 1K0 1/16W +-5%			
R50	036-15470-10	RES M/F 0805 CHIP 47K 1%		265-00010-61	FUSE 5A 5X20MM NORMAL BLOW C/W HOLDC
R51	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R52	038-17100-00	RES 0603 CHIP 1M 1/16W +-5%		303-03032-00	COVER A1M2849 TOP T3000 RAPID CHARGER
R53	036-15470-10	RES M/F 0805 CHIP 47K 1%			
R56	036-13820-00	RES M/F 0805 CHIP 820E 5%		303-03033-00	COVER A1M2847 BTM T3000 RAPID CHARGER
R57	036-13560-00	RES M/F 0805 CHIP 560E 5%			
R58	036-13820-00	RES M/F 0805 CHIP 820E 5%		303-50027-00	CONTACT A3M2818 T3000 BAT CHARGER
R59	036-13560-00	RES M/F 0805 CHIP 560E 5%			+7V2 CAP GND TEMP
R60	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%		349-00010-22	SCREW NO 4X3/8 PAN POZI PLASTITE
R61	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R62	036-15100-10	RES M/F 0805 CHIP 10K 1%		353-00010-10	WASHER M3 FLAT 7MM*0.6MM ST BZ
R63	038-14220-00	RES 0603 CHIP 2K2 1/16W +-5%			
R64	036-15390-10	RES M/F 0805 CHIP 39K 1%		365-01430-01	(L) LABEL MODEL ID T3004-0000
R67	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%			
R68	036-11180-10	RES M/F 0805 CHIP 1E8 1%		365-01450-00	LABEL BLNK 38*9MM TAMPERMARK VOID (TR
R69	036-11180-10	RES M/F 0805 CHIP 1E8 1%			
R70	036-11180-10	RES M/F 0805 CHIP 1E8 1%		369-00010-11	FOOT RUBBER BUMP-ON S/A
R71	036-11180-10	RES M/F 0805 CHIP 1E8 1%			
R72	036-11180-10	RES M/F 0805 CHIP 1E8 1%		369-00020-40	TAPE POLY FILM S/A UHMW 5421
R73	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%			2 PIECES 25MM EACH
R74	036-11180-10	RES M/F 0805 CHIP 1E8 1%		410-01108-00	BOX T3004 RAPID CHARGER
R75	036-11180-10	RES M/F 0805 CHIP 1E8 1%			
R76	036-11180-10	RES M/F 0805 CHIP 1E8 1%			
R77	036-11180-10	RES M/F 0805 CHIP 1E8 1%			
R80	036-13560-00	RES M/F 0805 CHIP 560E 5%			
R84	038-14100-00	RES 0603 CHIP 1K0 1/16W +-5%			
R85	036-15470-10	RES M/F 0805 CHIP 47K 1%			
R86	036-15470-10	RES M/F 0805 CHIP 47K 1%			
R87	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R90	036-15390-10	RES M/F 0805 CHIP 39K 1%			
R91	036-16120-10	RES M/F 0805 CHIP 120K 1%			
R93	036-15330-00	RES M/F 0805 CHIP 33K 5%			
R95	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R96	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R98	038-14220-00	RES 0603 CHIP 2K2 1/16W +-5%			
R100	036-15390-10	RES M/F 0805 CHIP 39K 1%			
R101	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%			
R102	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R103	036-15100-10	RES M/F 0805 CHIP 10K 1%			
R104	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%			
R105	038-14470-00	RES 0603 CHIP 4K7 1/16W +-5%			
R106	036-13560-00	RES M/F 0805 CHIP 560E 5%			
R107	036-15390-10	RES M/F 0805 CHIP 39K 1%			
R108	036-16120-10	RES M/F 0805 CHIP 120K 1%			
R109	036-15330-00	RES M/F 0805 CHIP 33K 5%			
R110	036-15100-10	RES M/F 0805 CHIP 10K 1%			

T3004 Grid Reference Index (IPN 220-01270-03)

Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit
C1	1:P3	1-A9	C65	1:D8	1-N4			1-M1
C2	1:P6	1-C8	C66	1:D7	1-M4			1-R9
C3	1:P6	1-B8	C67	1:D7	1-M4	*IC500	1:F10	2-C0
C4	1:Q6	1-D8	C70	1:E8	1-K0			2-E4
C5	1:P6	1-B7	C71	1:D8	1-L0			2-G4
C6	1:P7	1-D7	C72	1:D6	1-M0	*IC501	1:E10	2-D0
C7	1:P6	1-D7	C73	1:D6	1-N0			2-F4
C8	1:P5	1-E9	C74	1:D6	1-M0	*IC502	1:E10	2-D0
C9	1:Q6	1-C8	C75	1:B6	1-L2			2-F4
C10	1:N5	1-D9	C76	1:D6	1-M2	*IC504	2:H10	2-E0
C12	1:K8	1-E8	C77	1:D4	1-P2	LEFT	2:Q8	1-G3
C13	1:L7	1-F8	C78	1:C4	1-P2			1-G3
C14	1:L8	1-E7	C79	1:B5	1-K1	L1	1:M7	1-H9
C15	1:L7	1-G8	C80	1:E3	1-R2	L2	1:N6	1-L9
C16	1:L8	1-G7	C81	1:D6	1-M3	L3	1:P7	1-E9
C17	1:L8	1-G7	C82	1:E4	1-R1	*LK500	1:D10	2-C4
C20	1:P7	1-G9	C83	1:C6	1-N2	*L500	2:M10	2-F0
C21	1:P7	1-G9	C84	1:D6	1-N2	*LK501	1:D10	2-D4
C22	1:L6	1-H9	*C500	1:E10	2-E3	*L501	1:M11	2-A2
C23	1:K5	1-J9	*C501	1:M10	2-B2	*LK502	1:D10	2-D4
C25	1:J6	1-J9	*C502	1:M10	2-C2	*L502	1:M11	2-B2
C26	1:N8	1-H8	*C503	1:N10	2-C2	*LK503	1:D10	2-D4
C28	1:N8	1-K7	*C504	2:K10	2-G1	*P500	1:C9	2-A1
C29	1:K5	1-K9	*C505	2:K10	2-G1	*P501	1:F9	2-A1
C30	1:J5	1-L9	*C506	2:J10	2-G1	Q1	1:K8	1-E8
C31	1:K4	1-L9	*C507	2:K10	2-G0	Q4	1:L7	1-H8
C32	1:M7	1-M9	*C508	2:M10	2-G0	Q5	1:N8	1-J8
C33	1:N8	1-M8	D1	1:Q6	1-B9	Q6	1:J3	1-J7
C34	1:P8	1-N8	D2	1:E6	1-N2	Q7	1:P8	1-L8
C35	1:P4	1-P9	D3	1:M8	1-H8	Q8	1:B7	1-L6
C36	1:N4	1-P9	D4	1:J6	1-J9	Q9	1:C4	1-N7
C37	1:B7	1-M7	D5	1:J6	1-J8	Q10	1:C8	1-M6
C38	1:B7	1-Q9	D7	1:J5	1-K9	Q11	1:H6	1-B6
C39	1:C7	1-Q9	D9	1:B7	1-Q9	Q12	1:Q7	1-G5
C40	1:D7	1-R9			1-Q9	Q13	1:Q7	1-G4
C41	1:G6	1-A6	D10	1:D6	1-N6	Q14	1:B8	1-G4
C42	1:F6	1-B6	D11	1:D5	1-Q7	Q15	1:C8	1-H4
C43	1:D7	1-R9	D12	1:D3	1-Q3	Q16	1:B6	1-L2
C44	1:D7	1-M7	*D500	1:D10	2-D4	Q17	1:B4	1-N3
C45	1:D7	1-M6	*D501	1:D10	2-D4	Q18	1:A5	1-K1
C46	1:C7	1-N7			2-D4	Q19	1:N7	1-L9
C47	1:J7	1-C1	*D502	1:D10	2-C4	Q20	1:P6	1-C7
C48	1:J7	1-D1	*D503	1:K10	2-D2	Q21	1:P6	1-C7
C49	1:H6	1-E6	*D504	1:L10	2-D2	*Q501	1:J10	2-E2
C50	1:J8	1-F6	*FUSE	1:P3	1-B9	*Q502	1:G10	2-F2
C51	1:J8	1-G6	IC1	1:Q6	1-C8	*Q503	1:H10	2-G2
C52	1:D6	1-N6	IC2	1:K7	1-D8	*Q504	2:J10	2-G2
C56	1:C7	1-L6	IC3	1:M8	1-F7	*Q505	2:K10	2-G2
C57	1:C8	1-N5	IC4	1:H8	1-E2	RIGHT	2:B8	1-H3
C58	1:D4	1-P6	IC4A	1:G7	1-D2			1-G3
C59	1:C4	1-P6	IC5	1:J8	1-G6	R1	1:P6	1-B7
C60	1:A3	1-Q7	IC6	1:E7	1-J0	R2	1:P6	1-C7
C61	1:L3	1-R6	IC8	1:D7	1-M5	R3	1:P6	1-C7
C63	1:M4	1-R5			1-M7	R4	1:P6	1-D7
C64	1:D7	1-L4			1-M3	R7	1:K8	1-E8

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Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit
R8	1:K8	1-E8	R85	1:C7	1-N6			
R9	1:K7	1-E7	R86	1:C8	1-M6			
R10	1:K8	1-E7	R87	1:D6	1-M5			
R11	1:L8	1-F8	R90	1:D7	1-L4			
R14	1:L7	1-F8	R91	1:D7	1-M5			
R15	1:L7	1-G8	R93	1:D7	1-M5			
R16	1:M8	1-F7	R95	1:C7	1-N4			
R20	1:M8	1-H8	R96	1:C8	1-N4			
R21	1:M8	1-H8	R98	1:B6	1-L3			
R22	1:M8	1-H8	R100	1:B6	1-L2			
R24	1:K3	1-H7	R101	1:E7	1-J1			
R25	1:K3	1-H7	R102	1:B6	1-L3			
R26	1:N8	1-J7	R103	1:B6	1-M3			
R27	1:M8	1-J7	R104	1:B6	1-M2			
R28	1:M8	1-K7	R105	1:E6	1-K0			
R32	1:J5	1-K9	R106	1:B6	1-L1			
R33	1:N7	1-M9	R107	1:D6	1-L0			
R34	1:M7	1-L8	R108	1:D6	1-M1			
R35	1:M7	1-L8	R109	1:D6	1-M1			
R36	1:N8	1-L8	R110	1:E6	1-N0			
R37	1:N8	1-M8	R111	1:E6	1-N0			
R38	1:N7	1-M8	R114	1:B6	1-K2			
R39	1:N7	1-M8	R115	1:B5	1-L1			
R40	1:N8	1-M8	R116	1:E5	1-Q3			
R41	1:K3	1-Q9	R117	1:C6	1-N3			
R42	1:C7	1-Q9	R118	1:C6	1-N3			
R43	1:P8	1-N8	R125	1:M4	1-Q5			
R46	1:G6	1-A6	R130	1:F6	1-Q1			
R47	1:F6	1-B5	*R500	1:E11	2-E5			
R48	1:G6	1-A6	*R501	1:E11	2-E4			
R49	1:F6	1-C6	*R502	1:E10	2-G3			
R50	1:J8	1-F6	*R510	1:H11	2-E1			
R51	1:F8	1-E3	*R511	1:G11	2-E1			
R52	1:J7	1-C2	*R512	1:H11	2-E1			
R53	1:F8	1-E2	*R513	1:H11	2-F1			
R56	1:Q8	1-G4	*R514	1:G11	2-F1			
R57	1:Q8	1-G4	*R515	1:H11	2-G1			
R58	1:B8	1-G4	*R516	1:H11	2-G1			
R59	1:B8	1-H4	*R517	2:K10	2-E1			
R60	1:C7	1-M6	*R518	2:K10	2-E1			
R61	1:B7	1-L7	*R519	2:J10	2-E1			
R62	1:B7	1-M7	*R520	2:K10	2-F1			
R63	1:C7	1-L7	*R521	2:J10	2-F1			
R64	1:B7	1-L6	*R523	2:J10	2-F1			
R67	1:C7	1-M7	*RV524	2:L10	2-E0			
R68	1:A3	1-N7	SK1	1:R4	1-A9			
R69	1:B3	1-P7	*SK500	2:J11	2-E0			
R70	1:B3	1-P7	T1	1:G4	1-K9			
R71	1:B3	1-P7	XL1	1:J7	1-C1			
R72	1:B3	1-P7						
R73	1:C7	1-N7						
R74	1:C3	1-N7						
R75	1:C3	1-N7						
R76	1:C3	1-N7						
R77	1:C3	1-N7						
R80	1:F6	1-L5						
R84	1:C7	1-Q7						