

HV\_PCHRG HV\_ACCU

HV\_PCHRG HV\_VEHI

TS\_P\_ACCU

+24V\_TS\_P

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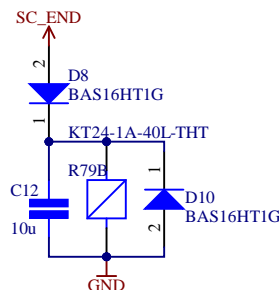
Two diodes in series to keep galvanic isolation between vehicle and TSAC (3xTS voltage, EV1.2.1)

$V_f = 1000V \rightarrow 2 * V_f = 2000V > 3 * 556V$

Relay carry-current: 2.5A  
Max switching capacity: 100W  $\rightarrow$  Max switching current =  $100W/600V = .167A$

Switch on:  
 $\rightarrow$  Relay opens  
 $\rightarrow$  Constant current source (depletion nfet) limits to 0.05A  
 $\rightarrow$  Full current ( $600V/10000\Omega = .6A$ ) switched on after  $t_{\text{bounce}} (=1.1ms \rightarrow 2ms)$  determined by RC

Switch off:  
 $\rightarrow$  Relay stays on because of diode-decoupled C  
 $\rightarrow$  MOSFET turns off because opto is off  
 $\rightarrow$  Relay opens after MOSFET turns off



Peak current at 556V (Limited by PTCs' R25):  $556V/(2*5000\Omega) = 0.55A$   
Tolerance of PTCs = 30%  $\rightarrow$  Peakcurrent at least resistance:  $0.55/0.7 = 0.79A$

MOSFET cont. current: 1.8A at 100°C die-temp  
MOSFET pulsed current: 5A

This is the same calculation as for the discharge as both have to absorb the same energy:

$1/2 * (550V)^2 * 2 * 200\mu F = 62J$   
(DTI Inverter has 200uF DC bus, two are installed; other capacitances in the vehicle are negligible)

Two PCTEL are going to be used in series, so each absorb's half the bus energy (31J)  
According to datasheet table "CONSECUTIVE ENERGY / LOAD-DUMPS AT DIFFERENT TAMB FOR PCTEL17":  
3.5 consecutive dumps at 85°C, 31J

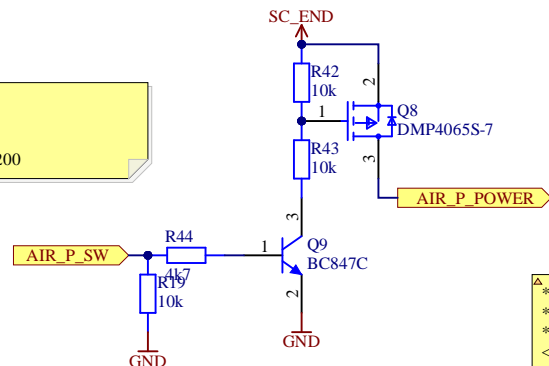
This ensures three consecutive dumps in the 5 minutes required for scrutineering.  
PCTEL13 could also be used, but the required space for PCTEL17 isn't much greater and the cost is negligible.

Alternative to PCTEL: TDK EPCOS B59219J0130A020  
(Other footprint)

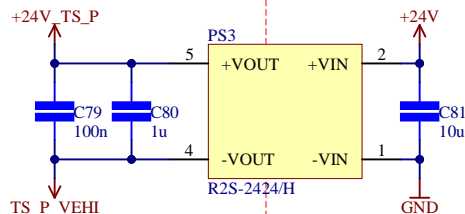
$I_{LED} = 10mA$   
 $V_f = 1.5V$   
 $V_{SC\_END} = 24V$   
 $R = (24V - 1.5V)/10mA = 2250\Omega \rightarrow 2200\Omega$

$I_{LED} = 10mA$   
 $V_f = 1.5V$   
 $V_{iso} = 24V$   
 $R = (24V - 2 * 1.1V - 1.5V)/10mA = 2030 \rightarrow 2200$

Precharge detection logic states:  
PC open: PCHRG\_ACT = GND  
PC closed: PCHRG\_ACT = 3.3V



\*Monitor SC  
\*Precharge if SC closed  
\*Turn on AIR if SC closed AND voltage difference over AIR is  $\leq 10\%$  of max TS voltage



HV\_PCHRG HV\_VEHI

Title: precharge

Projekt: tsac-distribution.PrjPcb

Author: Leon Loeser

Checked by: UNCHECKED

Rules: EV5.7

Sheet 6 of 9

Size: A4

Revision: xx.xx

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