52458 Dual Current-to-Current Opto-Isolator, High Temperature (200°C)

Mii
MICROPAC
MICROCIRCUITS PRODUCTS
DIVISION

Features:

- Hermetically Sealed Package
- Optically Coupled
- Input/Output Isolation Tested to 1000 VDC
- 200°C Operation

Applications:

- Signal Isolation

DESCRIPTION

The 52458 is a Current-to-Current Opto-Isolator designed for high temperature applications to 200ºC.

Functionally, the device operates as a Current-to-Current Transformer with an output current proportional to the input current. The current transfer ratio is tightly controlled for temperatures from 25ºC through 200ºC.

ABSOLUTE MAXIMUM RATINGS

Continuous Input Current 20mA
Storage Temperature Range ..... -65ºC to +200ºC
Operating Temperature ..... -55ºC to +200ºC
Lead Solder Temperature for 10 seconds 300ºC
Reverse Input Voltage ..... 6 VDC

RECOMMENDED OPERATING CONDITIONS:

Parameter	Symbol	Min.	Max.	Units
Output Voltage	V_O		1.0	VDC
Input Current	$I_{F\ (ON)}$	5	15	mA
Input Voltage	V_F	1.1	1.6	VDC
Operating Case Temperature	T_C	-55	200	°C

ELECTRICAL SPECIFICATIONS

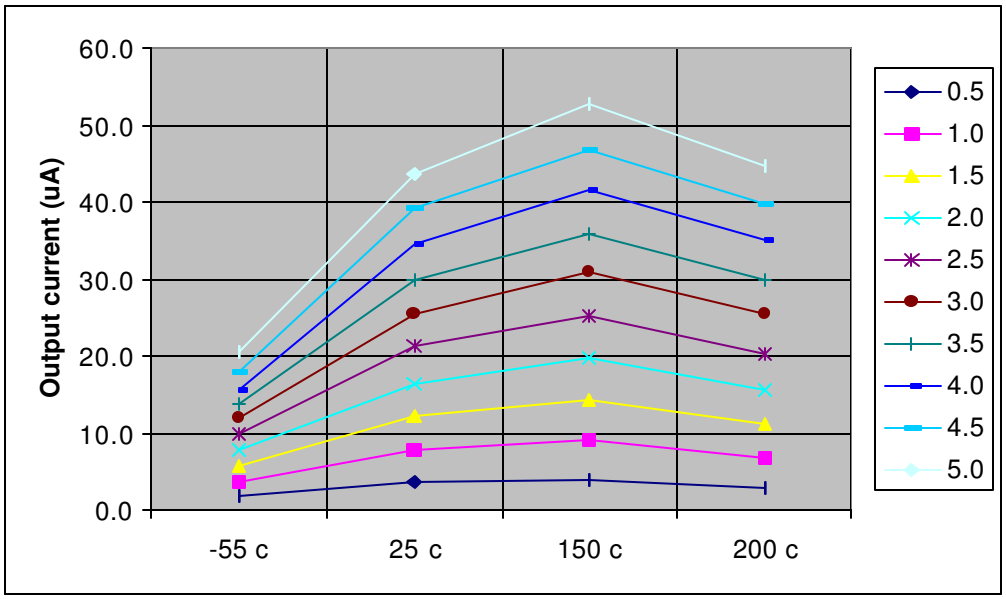
T_C= 25°C to +200°C unless otherwise specified

Parameter	Sym.	Min.	Typ.*	Max.	Units	Test Conditions	Notes
Input / Output Forward Voltage	V_F	—	1.6	2.2	VDC	I_F = 10 mA	
Input / Output Reverse Breakdown Voltage	V_R	6	40	—	VDC	I_R = 10 µA	
Input-Output Leakage	I_{I-O}	—	—	1	µA	RH ≤ 45%, t = 5 s V_{I-O} = 1000 VDC T_C = 25°C	1,2
Turn-On Time	t_{ON}	—	150		ns	I_F = 2.5 mA E_O = OV, shorted NOTE 4	
Turn-Off time	t_{OFF}	—	100		ns		
Rise Time	t_R	—	130		ns		3
Fall Time	t_F	—	90		ns		
Output Current			80		µA	I_F = 10 mA	

Notes:

1. Input pins are shorted together and output pins are shorted together.
2. Input-output potential applied momentarily, not an operating condition.
3. Rise time is measured from 10% to 90% of output current. Fall time is measured from 90% to 10% of output.
4. Measured values limited by the test Transimpedance circuit.

Figure 1. Output Current vs. Temperature



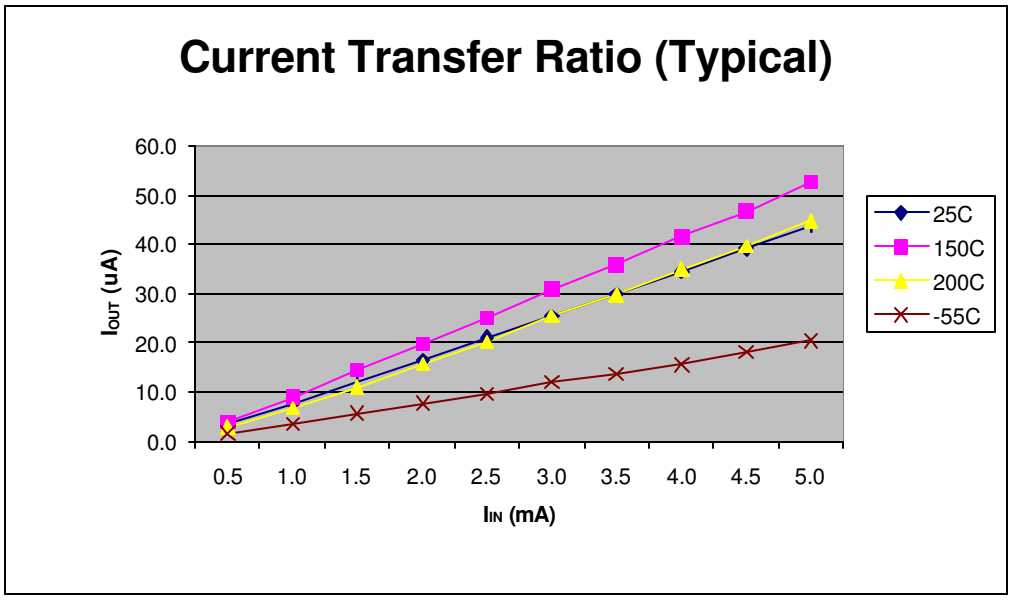


Figure 2. Output Current vs. Input Current (0.5mA – 5mA)

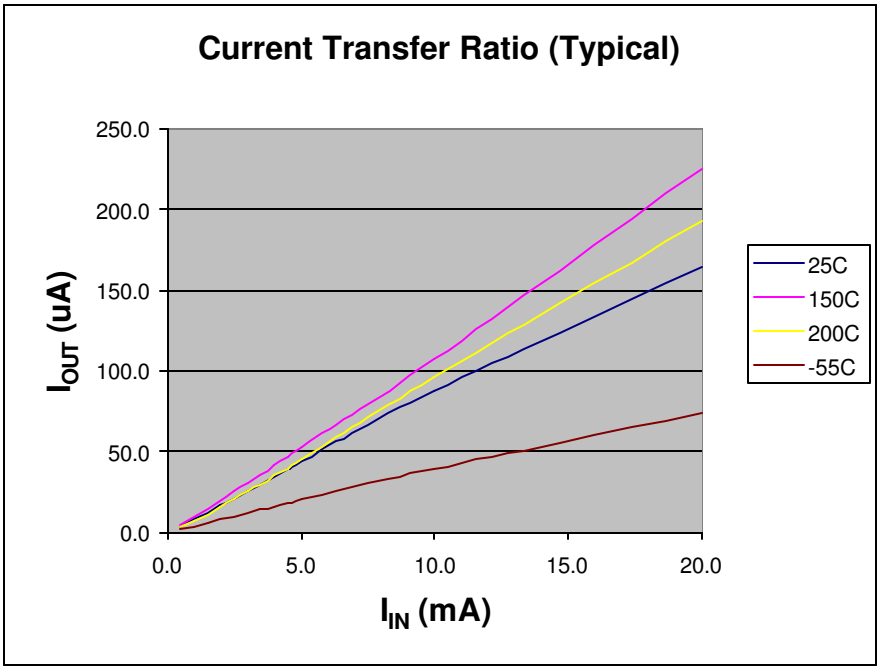
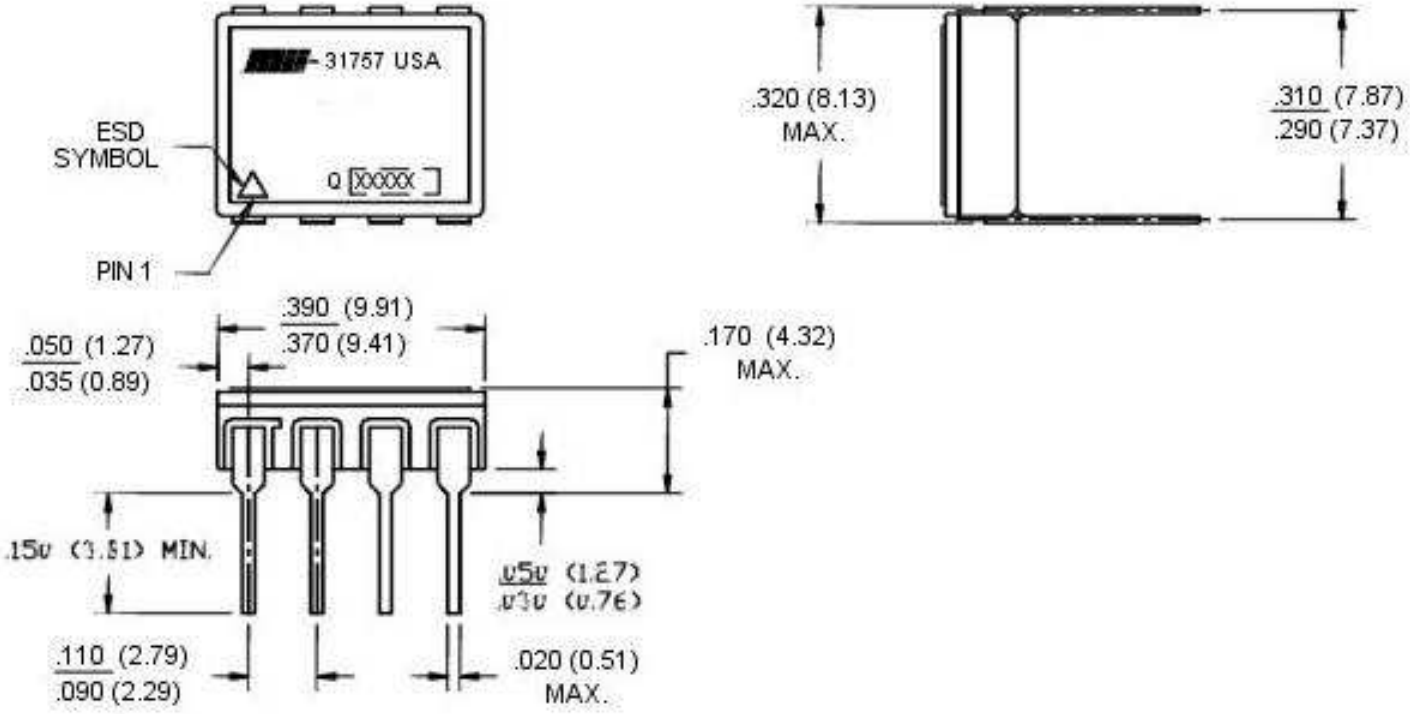


Figure 3. Output Current vs. Input Current (0.5mA – 20mA)

Pin	Function
1	+ in (section 1)
2	- in (section 1)
3	- out (section 2)
4	+ out (section 2)
5	+ in (section 2)
6	- in (section 2)
7	- out (section 1)
8	+ out (section 1)

1. ESD symbol (Δ) indicates pin 1.

Table 1. Pin Outs



Note: Package is a Ceramic 8 Pin DIP

Figure 4. Case Outline

Application Notes:

52458.01 Isolated Current Monitor.

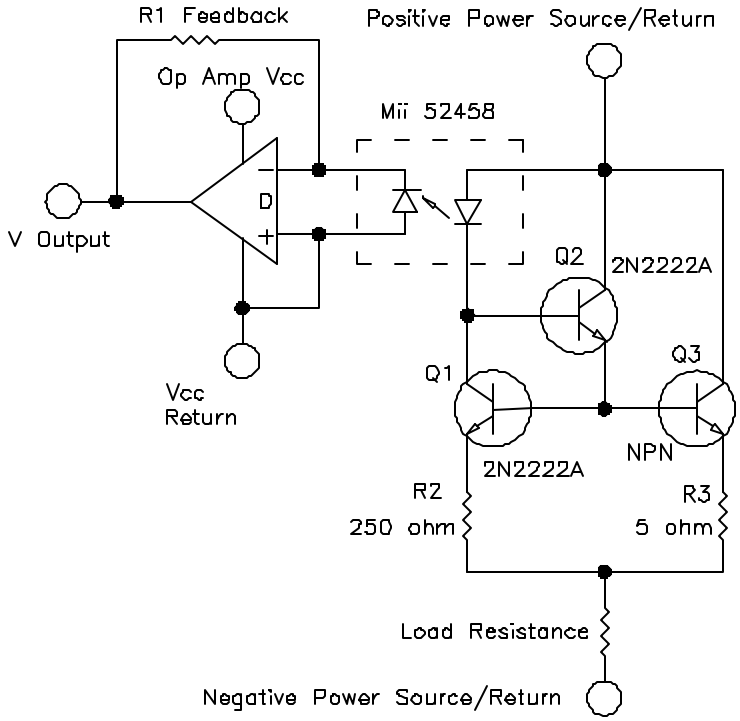
Figure 1 is a simple, moderately accurate circuit for monitoring an isolated load current. The heart of the circuit is the 52458 Opto Coupler.

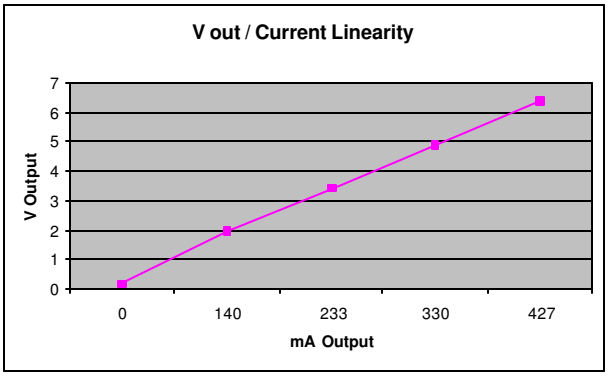
The LED current of the coupler is the sum of 1; the bias current of Q2, Q1 / H_{FE} (Q1) and Q3 / H_{FE} (Q3) and 2; the collector current of Q1. Q1 and Q3 form a current mirror with an Emitter current ration if R3 / R2.

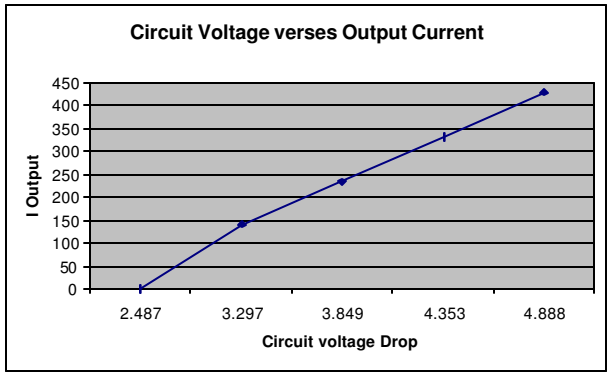
A Q3 emitter current of 0.5A represents a 0.010A current at the emitter of Q1 and a total load current of 0.510A.

The OP Amp output voltage is the output current of the 52458 Opto Coupler times the R FEEDBACK value. In this circuit case, 1µA of Detector current produces a 0.1V output.

The total circuit then has a transfer value of (10mA of LED current = 510mA load current) producing 80µA of Detector current x 100k Ohm = 8V output. This gives 8V output for a load current of 510mA or a sensitivity of 1 Volt per 63.75mA.







The following chart illustrates the Optocoupler output as a function of Load current for the circuit of Figure 1.

Vin	I Load	Voltage across	V Out
Volts	mA	Power Circuit	
10	0	2.487	.12
10	140	3.297	1.95
10	233	3.849	3.43
10	330	4.353	4.87
10	427	4.888	6.37
30	0	2.517	.19
30	140	3	1.96
30	233	3.837	3.42
30	330	4.376	4.89
30	427	4.876	6.36

The following chart illustrates the effects of temperature on the Coupler output.

Vin Volts	I Load mA	Temp. Deg, C	I Out uA
20	0.33	25	48.8
20	0.33	125	48.7
20	0.33	150	47