M52313SP

STANDARD PLL VIF/SIF

DESCRIPTION

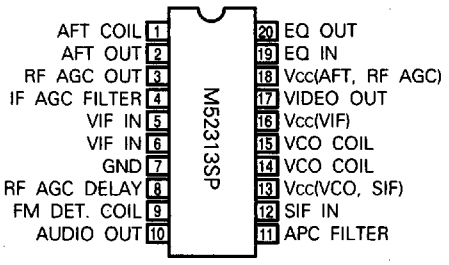
The M52313SP is a semiconductor integrated circuit consisting of IF signal processing for VCR or CTV tuner. The circuit realizes PLL detection system with same application as conventional quasi-synchronous VIF/SIF ICs. The circuit includes VIF amplifier, video detector, VCO, APC detector, AFT, SIF detector, IF/RF AGC, SIF limiter and FM detector functions.

The package is of the 20-pin shrink type. Flat package is also available.

FEATURES

- Low power dissipation is realized by 5V PLL detector. (Vcc = 5.0V, Icc = 35mA)
- A full synchronous detector circuit using PLL as video detector provides excellent DG, DP, 920kHz beat and cross color characteristics.
- Dynamic AGC realizes high speed response with only single filter.
- 12V power supply can be used for RF AGC and AFT outputs.
- Optimum for VCR and CTV with video output terminals due to the built-in equalizer amplifier.

PIN CONFIGURATION (TOP VIEW)



Outline 20P4B

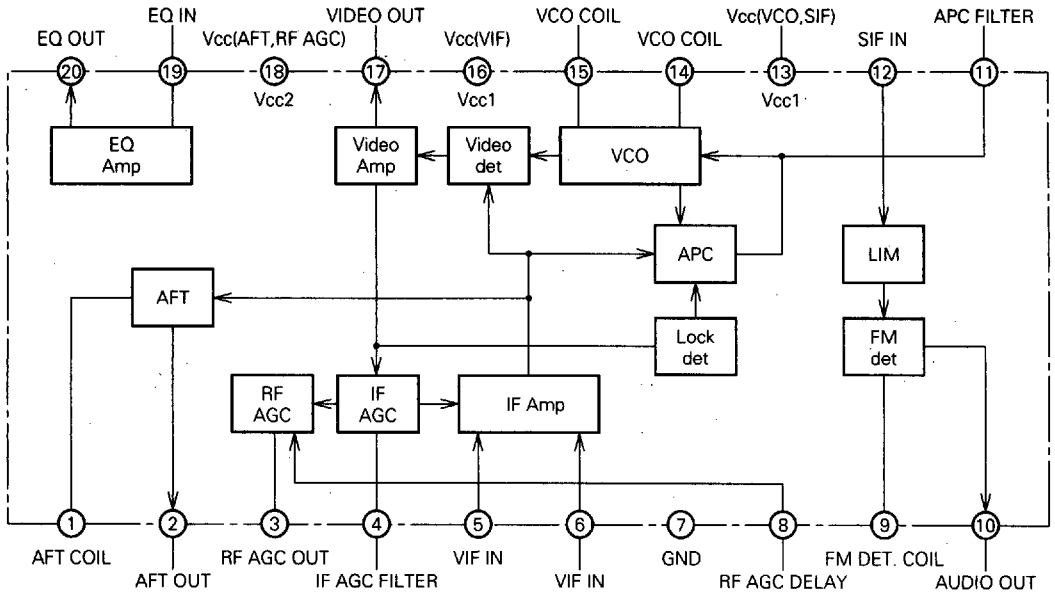
APPLICATION

CTV, VCR

RECOMMENDED OPERATING CONDITION

Supply voltage range ..... 4.5~5.5V
Rated supply voltage 5.0V

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V_{CC1}	Supply voltage 1	7	V
V_{CC2}	Supply voltage 2	14	V
P_d	Power dissipation	1000	mW
T_{opr}	Operating temperature	−20~75	°C
T_{stg}	Storage temperature	−40~125	°C
Surge	Electrostatic discharge	±200	V

ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc1=5V, Vcc2=12V, unless otherwise noted)

VIF SECTION

Symbol	Parameter	Test point	Input		Test conditions								Test circuit	Limits			Unit
			VIF	SIF	1	2	3	4	5	6	V4	V8		Min.	Typ.	Max.	
Icc	Circuit current	A	–	–	2	1	1	1	1	1	–	–	1	25.0	36.0	47.0	mA
V_{17}	Video detector output DC voltage 1	TP7	–	–	1	1	1	2	1	1	1	–	1	2.61	3.35	4.09	V
V_{20}	Video detector output DC voltage 2	TP9	–	–	1	1	1	2	1	1	1	–	1	2.74	3.5	4.27	V
V_{Odet1}	Video detector output 1	TP7	SG 1	–	1	1	1	1	1	1	–	–	1	0.74	1.00	1.26	Vp-p
V_{Odet2}	Video detector output 2	TP9	SG 1	–	1	1	1	1	1	1	–	–	1	1.55	2.00	2.50	Vp-p
P/N	Video S/N	TP8	SG 2	–	1	1	1	1	1	1	–	–	1	50.0	57.0	–	dB
BW	Video frequency characteristics	TP7	SG 3	–	1	1	1	1	1	1	–	–	1	5.5	6.2	–	MHz
Vin (min)	Input sensitivity	TP7	SG 4	–	1	1	1	1	1	1	–	–	1	–	45	52	dBμ
Vin (max)	Maximum allowable input	TP7	SG 5	–	1	1	1	1	1	1	–	–	1	102	108	–	dBμ
GR	AGC control range	–	–	–	–	–	–	–	–	–	–	–	1	50	63	–	dB
V_{4H}	IF AGC maximum voltage	TP3	–	–	1	1	1	1	1	1	–	–	1	3.23	4.25	–	V
V_4	IF AGC voltage (80 dBμ)	TP3	SG 6	–	1	1	1	1	1	1	–	–	1	2.3	2.9	3.5	V
V_{4L}	IF AGC minimum voltage (120 dBμ)	TP3	SG 7	–	1	1	1	1	1	1	–	–	1	–	0.0	0.2	V
V_2	AFT output voltage	TP1	–	–	1	1	1	2	1	1	0	–	1	3.0	5.0	6.9	V
μ	AFT detector sensitivity	TP1	SG10	–	1	1	1	1	1	1	–	–	1	40	56	78	mV/kHz
V_{2H}	AFT maximum voltage	TP1	SG10	–	1	1	1	1	1	1	–	–	1	11.4	11.8	–	V
V_{2L}	AFT minimum voltage	TP1	SG10	–	1	1	1	1	1	1	–	–	1	–	0.1	0.5	V
V_{3H}	RF AGC maximum voltage	TP2	SG 2	–	1	1	1	1	1	1	–	2	1		11.6	–	V
V_{3L}	RF AGC minimum voltage	TP2	SG 2	–	1	1	1	1	1	1	–	6	1	–	0.1	1.0	V
DG	DG	TP7	SG16	–	1	1	1	1	1	1	–	–	1	–	3	5	%
DP	DP	TP7	SG16	–	1	1	1	1	1	1	–	–	1	–	2	5	deg
CL-U	Capture range (U)	TP7	SG11	–	1	1	1	1	1	1	–	–	1	0.96	1.80	–	MHz
CL-L	Capture range (L)	TP7	SG11	–	1	1	1	1	1	1	–	–	1	1.00	2.00	–	MHz
CL-T	Capture range (T)	TP7	–	–	1	1	1	1	1	1	–	–	1	1.96	3.80	–	MHz
FC1	EQ frequency characteristics 1	TP7 TP9	SG12	–	1	1	1	1	1	1	–	–	1	3.5	6.0	8.5	dB
FC2	EQ frequency characteristics 2	TP7 TP9	SG13	–	1	1	1	1	1	1	–	–	1	6.6	9.0	11.5	dB
FC3	EQ frequency characteristics 3	TP7 TP9	SG14	–	1	1	1	1	1	1	–	–	1	8.7	11.0	13.3	dB
IM	Intermodulation	TP7	SG15	–	1	1	1	1	1	1	–	–	1	29	35	–	dB
V_{SYNC}	Pin 20 sync level	TP9	SG 2	–	1	1	1	1	1	1	–	–	1	1.0	1.3	1.6	V
Rin (V)	VIF input resistance		90dBμ	–	–	–	–	–	–	–	–	–	2	–	1.3	–	KΩ
Cin (V)	VIF input capacitance		90dBμ	–	–	–	–	–	–	–	–	–	2	–	7.4	–	PF

SIF SECTION

Symbol	Parameter	Test point	Input		Test conditions								Test circuit	Limits			Unit
			VIF	SIF	1	2	3	4	5	6	V4	V8		Min.	Typ.	Max.	
V_{10}	AF output voltage	TP4	–	–	1	1	1	2	1	1	0	–	1	1.20	2.00	2.40	V
$V_{OAF\ (Max)}$	Maximum AF output	TP4	–	SG17	1	1	1	2	1	1	0	–	1	160	230	299	mVrms
THD AF	AF output distortion	TP4	–	SG21	1	1	1	2	1	1	0	–	1	–	0.5	1.2	%
$V_{in\ (Lim)}$	Input limiting sensitivity	TP4	–	SG18	1	1	1	2	1	1	0	–	1	–	46	57	dBμ
AMR	AMR	TP4	–	SG19	1	1	1	2	1	1	0	–	1	50	60	–	dB
S/N	AF S/N	TP4	–	SG20	1	1	1	2	1	1	0	–	1	45	57	–	dB

ELECTRICAL CHARACTERISTICS TEST METHOD

P/N Video S/N

a. Input SG2 in VIF IN.

b. The noise appearing at pin 17 is determined by measuring the r.m.s. voltage at TP8 through low pass filter (-3dB at 5MHz).

c. $P/N = 20 \log \left\{ \frac{\text{Vodet 1 (Vp-p)} \times 0.7}{\text{Noise (Vr.m.s)}} \right\}$

BW Video frequency characteristics

a. Set SG3 as follows:

f_1= 58.75MHz Vi=90dBμ
f_2= 57.75MHz Vi=70dBμ
} Mixed Signal

b. Measure the amplitude of 1 MHz at TP7 and let it be V_1.

c. Decrease frequency f_2 until the amplitude of (f_1 - f_2) at TP7 reaches 3dB smaller than V_1. Then, read frequency f_2.

$$BW = 58.75 - f_2\ (MHz) + 1MHz$$

Vin (min) Input sensitivity

a. Input SG4 in VIF IN.

b. Decrease the SG4 level until the detector output of pin 17 reaches 3 dB smaller than Vodet1 and let the level be input sensitivity.

Vin (max) Maximum allowable input

a. Set SG5 to 90dBμ, and input it in VIF IN.

b. Let the detector output level at pin 17 be V_2.

c. Increase the SG5 voltage until the detector output level reaches 3dB smaller than V_2 and let the voltage be maximum allowable input.

GR AGC control range

a. AGC control range is defined as follows:

GR = (Maximum allowable input) – (Input sensitivity)

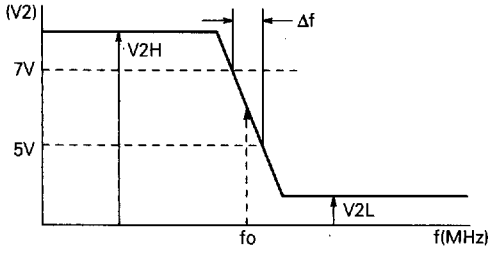
μ AFT detector sensitivity

a. Input SG10 in VIF IN.

b. Measure difference of frequency between 5v and 7v of DC voltage at TP1 and let it be Δf.

c. AFT detector sensitivity "μ" is defined as follows:

$$\mu = \frac{2000\ (mV)}{\Delta f(kHz)}\ (mv/kHz)$$



V2H AFT maximum voltage

a. In the above figure, let maximum DC voltage be V_{2H}.

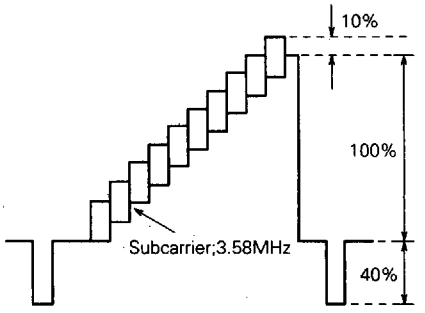
V2L AFT minimum voltage

a. In the above figure, let minimum DC voltage be V_{2L}.

DG, DP DG, DP

a. Modulated waves of SG16 is generated by 87.5% video modulation of the 10-step waves shown in the figure below.

b. At TP7, measure DG and DP with vectorscope.



CL-u Capture range (u)

a. Input SG11 in VIF IN and increase the frequency until VCO lock is released.
b. Decrease the frequency of SG11 and let the frequency at which VCO locks again be fu (MHz).
c. Capture range (u) = fu − 58.75 (MHz)

CL-L Capture range (L)

a. Input SG11 in VIF IN and decrease the frequency until VCO lock is released.
b. Increase the frequency of SG11 and let the frequency at which VCO locks again be f_L (MHz).
c. Capture range (L) = 58.75 − f_L (MHz)

CL-T Capture range (T)

a. "CL-T" = "CL-u" + "CL-L" (MHz)

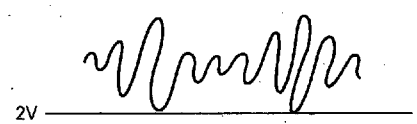
FC1, FC2, FC3 EQ frequency characteristics

a. Input SG12 in VIF IN.
b. Measure the level of (f_1 - f_2) at TP7 and let it be $V_{EQ\ IN}$ (dBμ).
c. Measure the level of (f_1 - f_2) at TP9 and let it be $V_{EQ\ OUT}$ (dBμ).
d. EQ frequency characteristics are defined as follows:

$$FC1\sim3 = V_{EQ\ OUT} - V_{EQ\ IN}\ (dB)$$

IM Intermodulation

a. Input SG15 in VIF IN.
b. Observe TP7 with oscilloscope and adjust the voltage of V_4 so that minimum level of detector output waveform will come to 2V.
c. Observe TP7 with spectrum analyzer and let the ratio of the 0.92MHz level to the 3.58MHz level be intermodulation.



Vin (lim) Input limiting sensitivity

a. Set SG18 to 80dBμ and input it in SIF IN.
b. Decrease the output level of SG18 until the detector output of TP4 reaches 3dB smaller than $V_{O\ AF\ MAX}$ and let the level be input limiting sensitivity.

AMR

a. Input SG19 in SIF IN.
b. Measure output voltage at TP4 and let it be V_{AM}.
c. AMR is defined as follows:

$$AMR = 20 \log \left\{ \frac{V_{O\ AF\ MAX}(mVr.m.s)}{V_{AM}\ (mVr.m.s)} \right\} (dB)$$

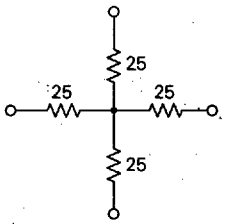
S/N AF S/N

a. Input SG20 in SIF IN.
b. Measure output voltage at TP4 and let it be V_N.
c. AF S/N is defined as follows:

$$S/N = 20 \log \left\{ \frac{V_{O\ AF\ MAX}(mVr.m.s)}{V_N\ (mVr.m.s)} \right\} (dB)$$

Notes:

- Amplitude level of all AM modulated waves shall be the peak level of modulated waves.
- The following is used for the mixer.

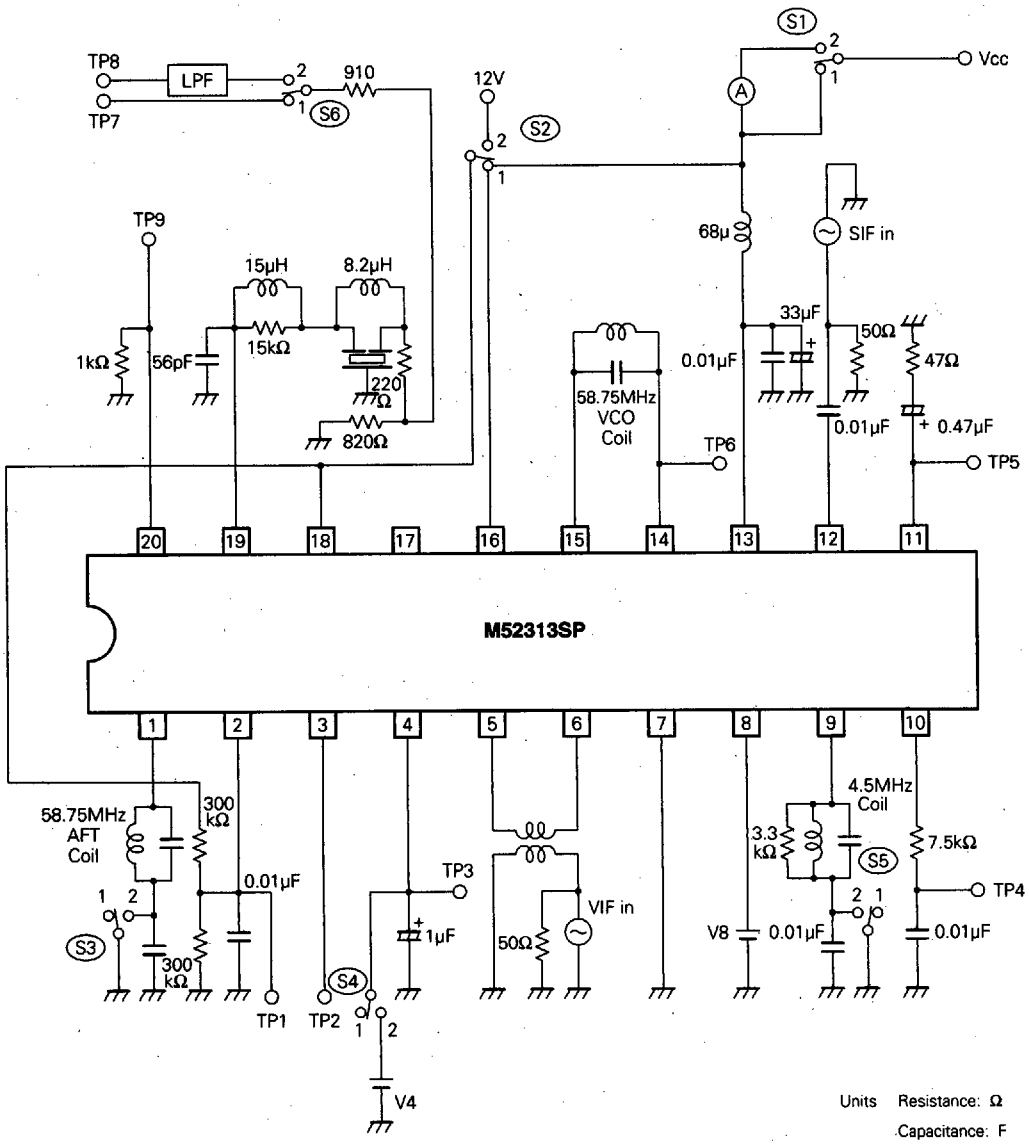


- With VCO coil, IF AGC 0V and non-input condition, adjust free run frequency to 58.75MHz.

INPUT SIGNAL

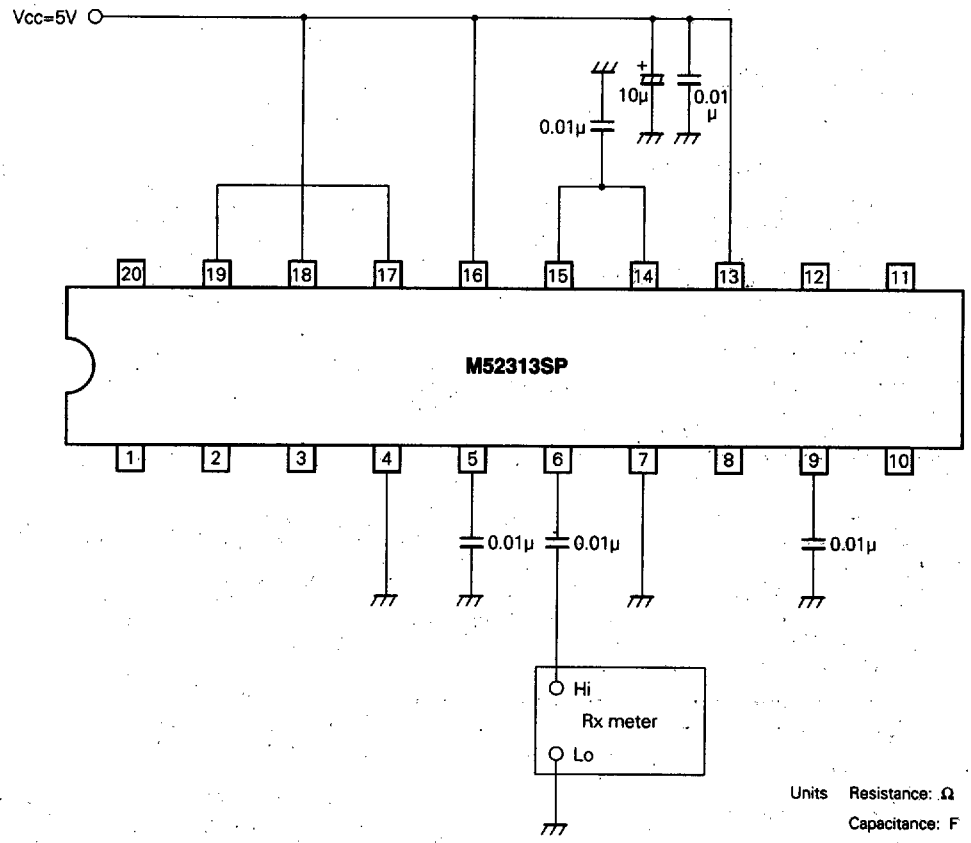
SG. No.	Signals (50Ω termination)
SG 1	f_0=58.75MHz V_i=90dBμ 77.8% AM (87.5% Video modulation equivalent fm=20kHz)
SG 2	f_0=58.75MHz V_i=90dBμ
SG 3	f_1=58.75MHz V_i=90dBμ, f_2=53±5MHz V_i=70dBμ } mixed signal
SG 4	f_0=58.75MHz V_i=Variable fm=20kHz 77.8% AM
SG 5	f_0=58.75MHz V_i=Variable fm=20kHz 16% AM
SG 6	f_0=58.75MHz V_i=80dBμ
SG 7	f_0=58.75MHz V_i=120dBμ
SG 8	f_0=54.25MHz V_i=100dBμ
SG 9	f_0=54.25MHz V_i=80dBμ
SG10	f_0=58.75MHz±5MHz V_i=90dBμ
SG11	f_0=58.75MHz±5MHz V_i=90dBμ fm=20kHz 77.8% AM
SG12	f_1=58.75MHz V_i=90dBμ, f_2=58.25MHz V_i=60dBμ } mixed signal
SG13	f_1=58.75MHz V_i=90dBμ, f_2=55.75MHz V_i=60dBμ } mixed signal
SG14	f_1=58.75MHz V_i=90dBμ, f_2=53.75MHz V_i=60dBμ } mixed signal
SG15	f_1=58.75MHz V_i=90dBμ, f_2=55.17MHz V_i=80dBμ, f_3=54.25MHz V_i=80dBμ } mixed signal
SG16	f_0=58.75MHz Standard 10-step wave modulation m=87.5% Video modulation Sync tip level V_i=90dBμ
SG17	f_0=4.5MHz±25kHz dev V_i=90dBμ fm=400Hz
SG18	f_0=4.5MHz±25kHz dev V_i=Variable fm=400Hz
SG19	f_0=4.5MHz V_i=90dBμ 30% AM fm=400Hz
SG20	f_0=4.5MHz V_i=90dBμ
SG21	f_0=4.5MHz V_i=90dBμ fm=400Hz±7.5kHz dev

TEST CIRCUIT 1



Units Resistance: Ω
Capacitance: F

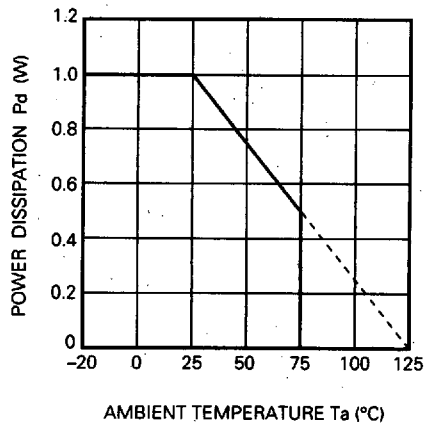
TEST CIRCUIT 2



Units Resistance: Ω
Capacitance: F

TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)



APPLICATION EXAMPLE