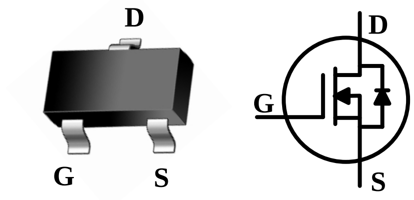
100V N-Channel Depletion-Mode Power MOSFET

General Features

- Depletion Mode (Normally-on)
- Excellent Temperature Characteristics
- Extremely low Leakage Current
- Fast Switching Speed
- High Reliability
- Small Package Size: SOT-23
- RoHS Compliant
- Halogen-free Available

BV_{DSX}	$R_{DS(ON)(Max.)}$	$I_{DSS(Min.)}$
100V	6Ω	90mA

SOT-23



Applications

- Ignition Modules
- Normally-on Switches
- Solid State Relays
- Converters
- Security
- Power Supplies
- Smart Transmitter
- Constant Current Source

Ordering Information

Part Number	Package	Marking	Remark
DMZ42C10S	SOT-23	42C10	Halogen Free

Absolute Maximum Ratings

T_A=25℃ unless otherwise specified

Symbol	Parameter	DMZ42C10S	Unit
V_{DSX}	Drain-to-Source Voltage [1]	100	V
I_D	Continuous Drain Current	0.2	A
I_{DM}	Pulsed Drain Current [2]	0.8	
P_D	Power Dissipation	0.5	W
V_{GS}	Gate-to-Source Voltage	±20	V
T_L	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300	℃
T_J & T_{STG}	Operating and Storage Temperature Range	-55 to 150	

Warning: Stresses exceeding the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	DMZ42C10S	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	250	℃/W

Electrical Characteristics

OFF Characteristics

T_A=25°C unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSX}	Drain-to-Source Breakdown Voltage	100	--	--	V	V_{GS}=-10V, I_D=250μA
$I_{D(OFF)}$	Drain-to-Source Leakage Current	--	--	0.1	μA	V_{DS}=100V, V_{GS}=-10V T_j=25°C
		--	--	10		V_{DS}=100V, V_{GS}=-10V T_j=125°C
I_{GSS}	Gate-to-Source Leakage Current	--	--	10	nA	V_{GS}=20V, V_{DS}=0V
		--	--	-10		V_{GS}=-20V, V_{DS}=0V

ON Characteristics

T_A=25°C unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
I_{DSS}	Saturated Drain-to-Source Current	90	--	--	mA	V_{GS}=0V, V_{DS}=10V
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	--	6	Ω	V_{GS}=0V, I_D=50mA [3]
		--	1.2	5	Ω	V_{GS}=10V, I_D=190mA [3]
$V_{GS(OFF)}$	Gate-to-Source Cut-off Voltage	-2.9	--	-1.8	V	V_{DS}=3V, I_D=50μA
gfs	Forward Transconductance	--	400	--	mS	V_{DS}=10V, I_D=150mA

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	90.0	--	pF	V_{GS}=-10V V_{DS}=25V f=1.0MHz
C_{oss}	Output Capacitance	--	25.6	--		
C_{rss}	Reverse Transfer Capacitance	--	4.9	--		
Q_g	Total Gate Charge	--	2.43	--	nC	V_{GS}=-3V~7V V_{DS}=80V I_D=120mA
Q_{gs}	Gate-to-Source Charge	--	0.35	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	0.68	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(on)}$	Turn-on Delay Time	--	3.0	--	ns	V_{GS}=-3V~7V V_{DD}=50V I_D=120mA R_G=6Ω
t_{rise}	Rise Time	--	2.8	--		
$t_{d(off)}$	Turn-off Delay Time	--	13.5	--		
t_{fall}	Fall Time	--	100	--		

Source-Drain Diode Characteristics

T_A=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	--	--	1.2	V	I_{SD}=190mA, V_{GS}=-10V

NOTE:

[1] T_J=+25℃ to +150℃.
[2] Repetitive rating, pulse width limited by maximum junction temperature.
[3] Pulse width≤380μs, duty cycle≤2%.

Typical Characteristics

Figure 1. Maximum Power Dissipation vs. Case Temperature

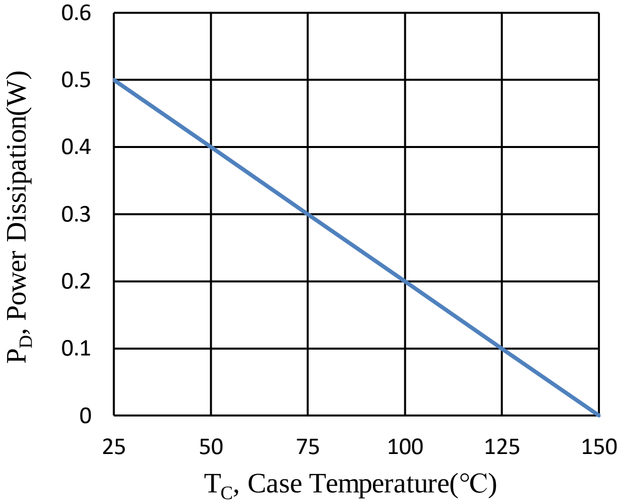


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

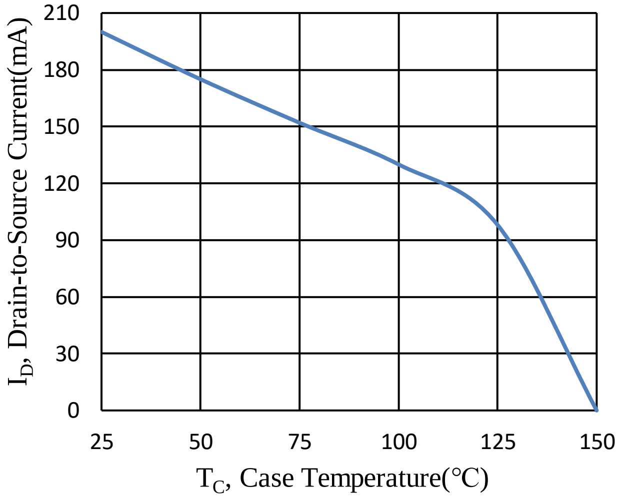


Figure 3. Typical Output Characteristics

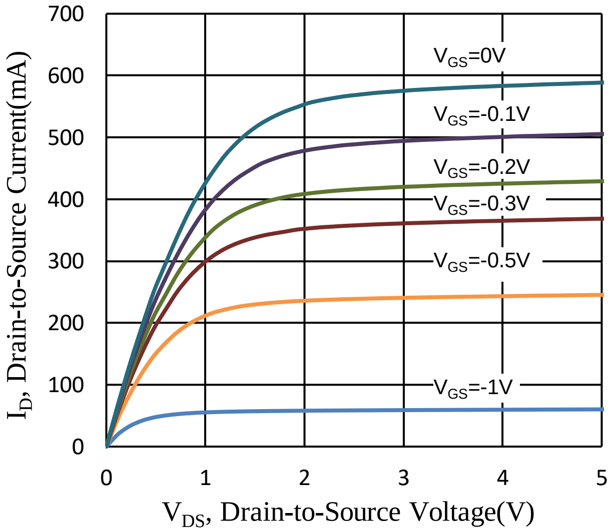


Figure 4. Typical Transfer Characteristics

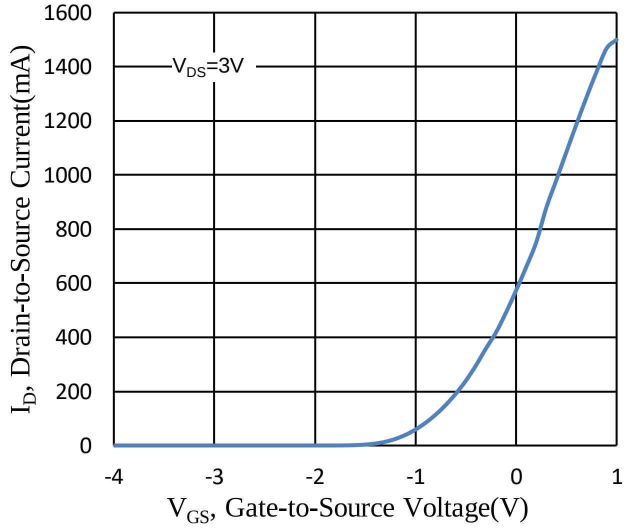


Figure 5. Typical Transfer Characteristics

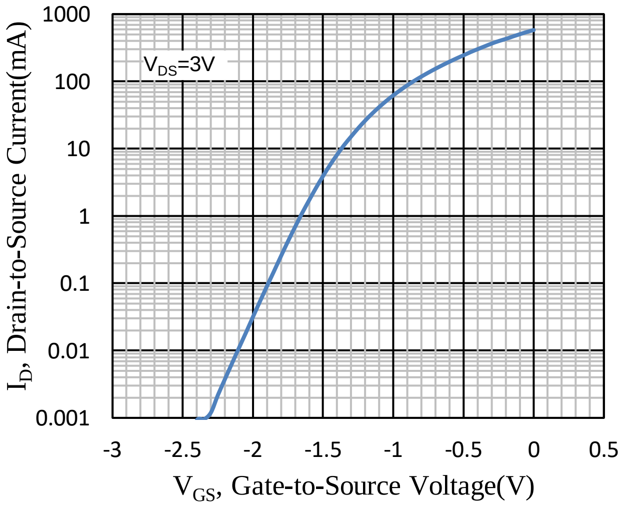


Figure 6. Typical Capacitance vs. Drain-to-Source Voltage

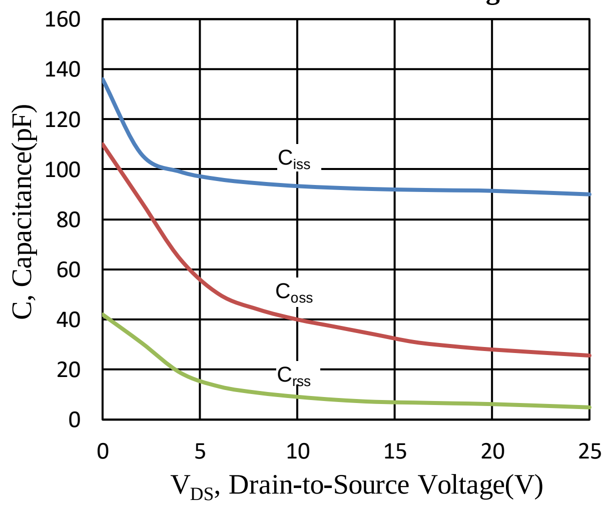


Figure 7. Typical Gate Charge vs. Gate-to-Source Voltage

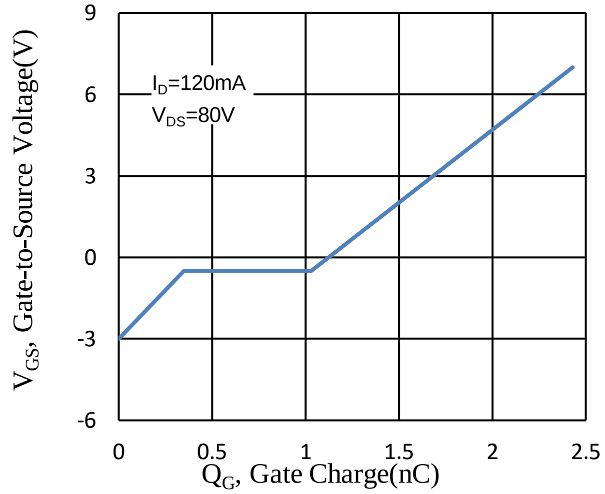


Figure 8. Normalized On-Resistance vs. Junction Temperature

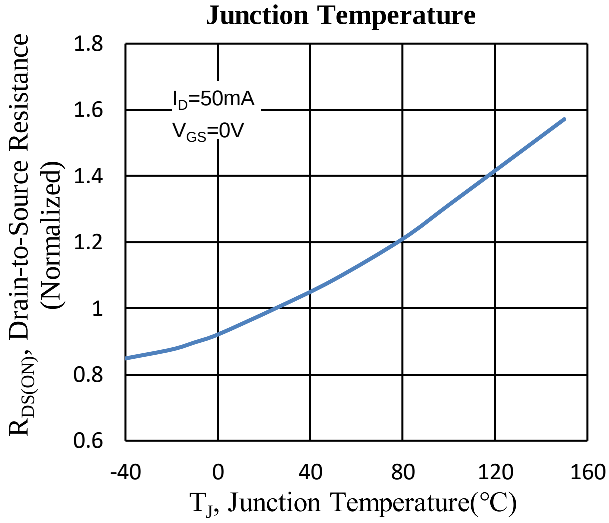


Figure 9. Gate-to-Source Cut-off Voltage vs. Junction Temperature

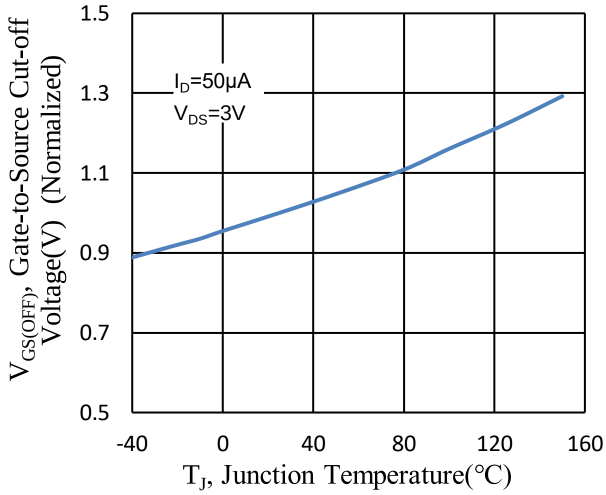


Figure 10. Drain-to-Source Breakdown Voltage vs. Junction Temperature

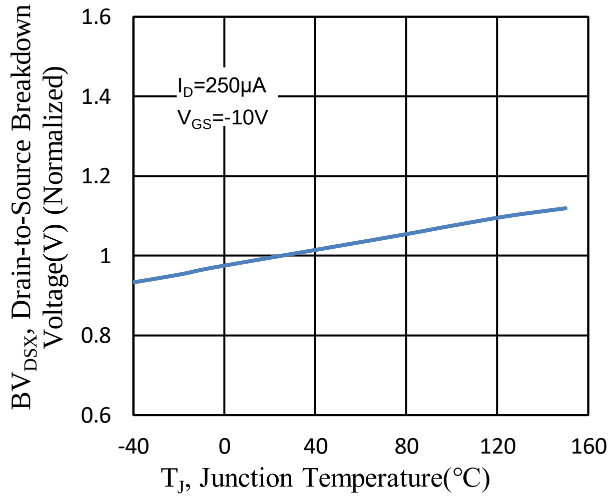
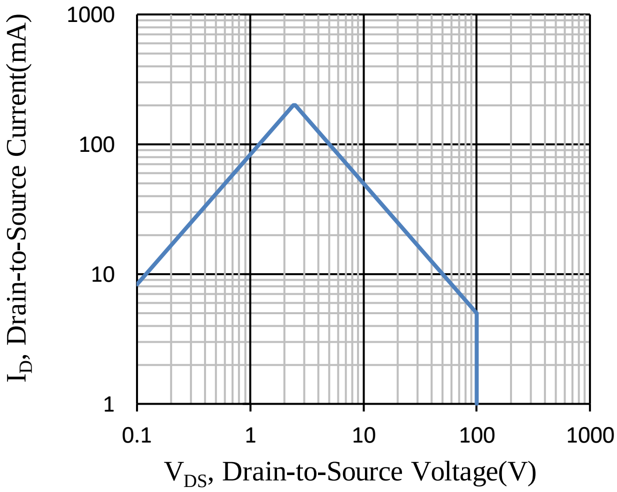


Figure 11. Maximum Forward Safe Operating Area



Typical Application Circuits

DMZ42C10S series products have excellent high temperature stability characteristics. Therefore, they are suitable for the applications such as over-voltage protection, over-current protection, and building simple constant current sources.

The typical over-current protection/simple constant current source circuit scheme is shown in Figure 12. The subthreshold characteristic of DMZ42C10S is used to limit the current through the resistor R1 within a set range to meet the requirements of the load circuit to achieve current limiting/constant current. The maximum current/constant current that the circuit can pass through is: $I = V_{GS(OFF)}/R_1$ ($V_{GS(OFF)}$ is related to the actual current flowing through).

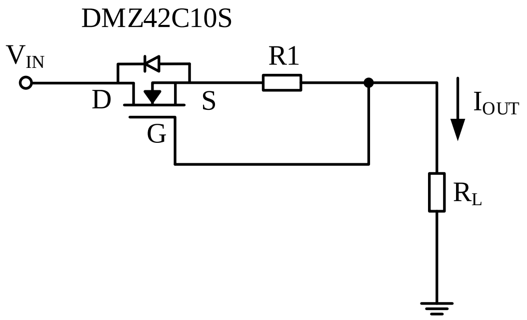


Figure 12. Overcurrent protection

The typical circuit of DMZ42C10S for over-voltage protection/regulated power supply is shown in Figure 13. When the input voltage is lower than the set output clamp threshold, V_{OUT} is approximately equal to V_{IN}; when the input voltage is higher than the set output clamping threshold, the output voltage is clamped, i.e. $V_{OUT} = |V_{GS(OFF)}| + V_Z$.

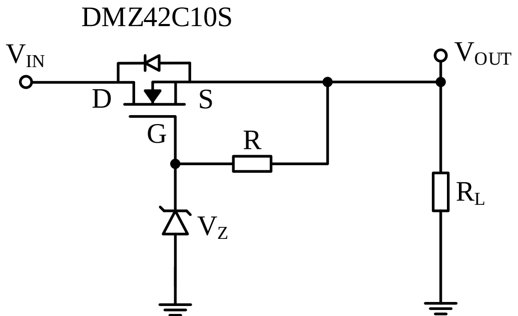


Figure 13: Voltage regulator/Overvoltage protection

The typical circuit of DMZ42C10S combined with LDO is shown in Figure 14. In this circuit, DMZ42C10S can effectively suppress circuit surge, provide overvoltage protection for LDO, effectively broaden the allowable input voltage range of LDO, and balance the LDO's power consumption, and use low-voltage LDOs for high-voltage circuits directly.

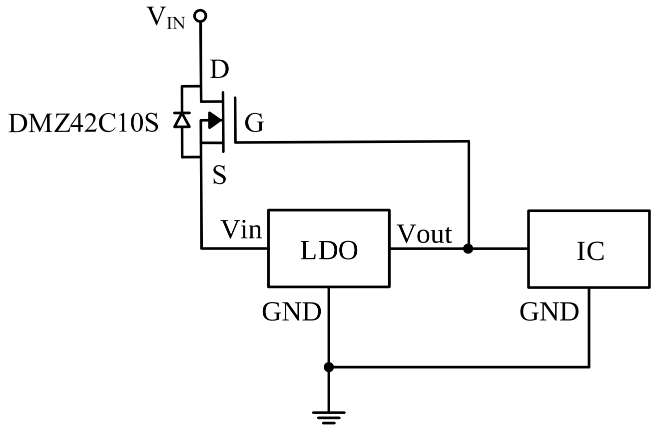


Figure 14. Collocation with LDO

DMZ42C10S series products have extremely low leakage current and excellent high-temperature stability, which are very suitable for power supply protection of DAC chips. Typical application circuits are shown in Figure 15 below, they can effectively suppress current surges and provide reliable over-voltage and over-current protection for sensors and transmitters in complex electromagnetic environments.

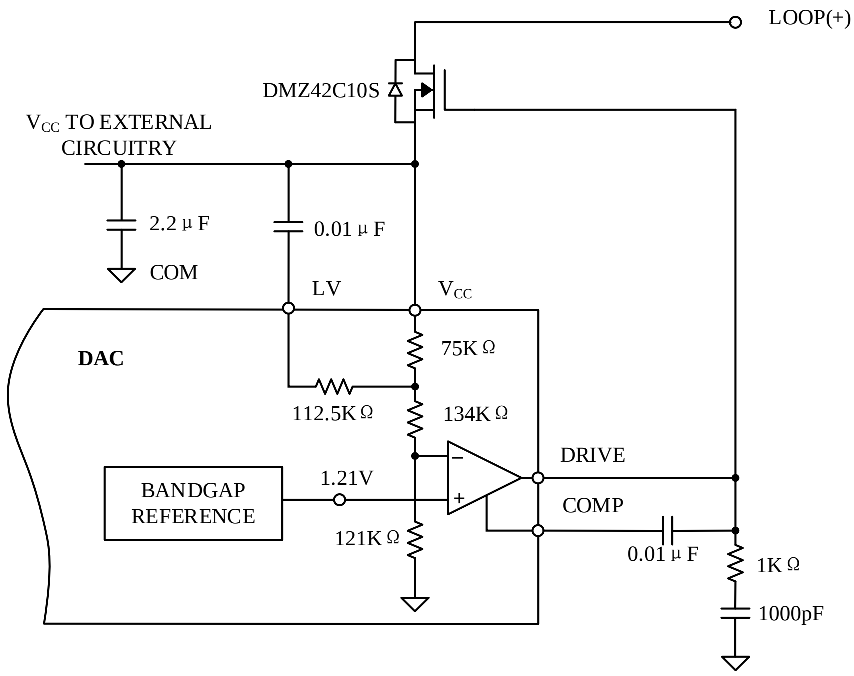
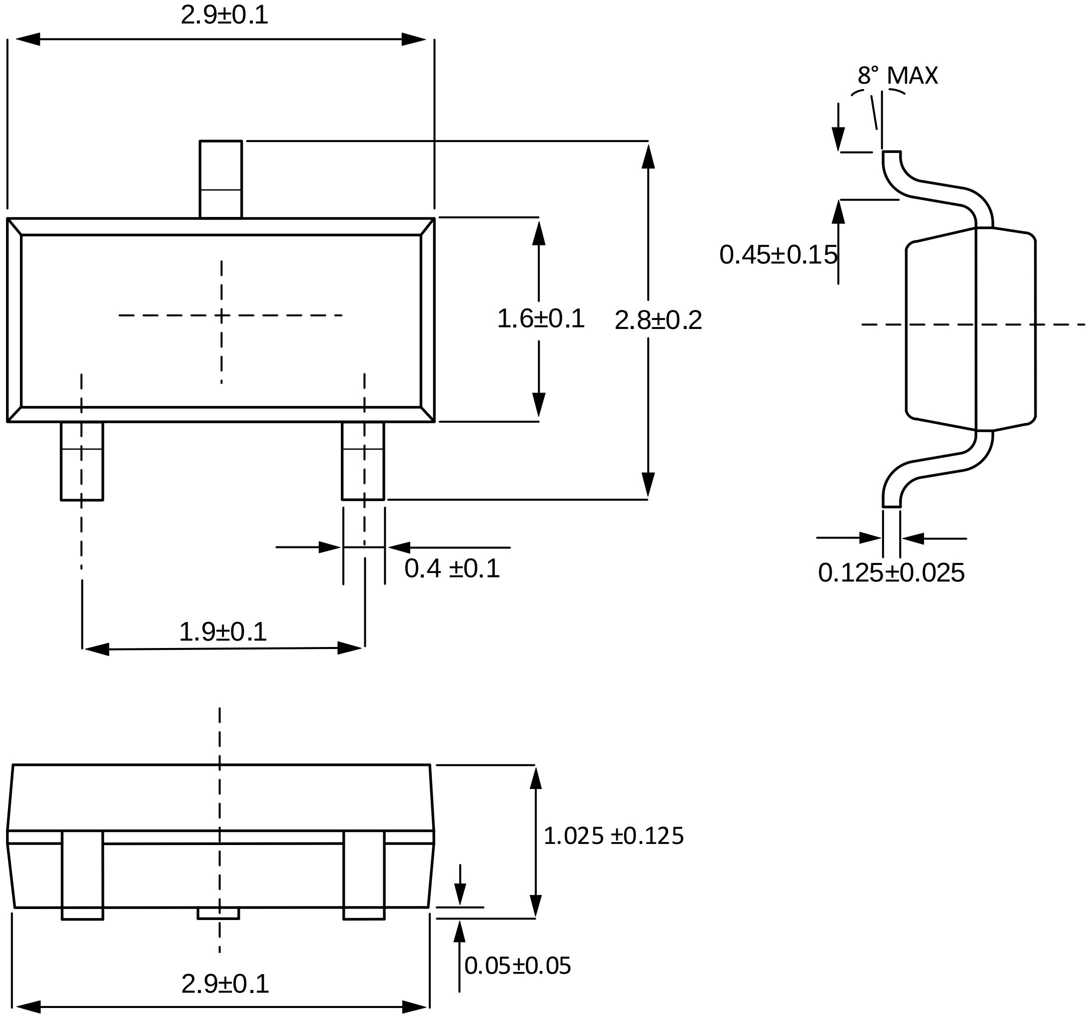


Figure 15. Collocation with operational amplifier

Package Dimensions

SOT-23



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