

Depletion-Mode Power MOSFET

General Features

- Depletion Mode (Normally On)
- Proprietary Advanced Planar Technology
- Small Package
- Low Leakage Current
- RoHS Compliant
- Halogen-free Available

Part Number	BV_{DSX}	$R_{DS(ON)}$ (Max.)	I_D
DMX4022E	400V	25Ω	0.20A
DMS4022E	400V	25Ω	0.24A

Applications

- Transient Protect
- Start-up
- Converters
- Normally On Switches
- LED Drive Circuits
- Power Supplies
- Current Source
- Voltage Source



Ordering Information

Part Number	Package	Marking	Remark
DMX4022E	SOT-89	4022	Halogen Free
DMS4022E	SOT-223	4022	Halogen Free

Absolute Maximum Ratings

 $T_A=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	DMX4022E	DMS4022E	Unit
V_{DSX}	Drain-to-Source Voltage ^[1]	400		V
V_{DGX}	Drain-to-Gate Voltage ^[1]	400		V
I_D	Continuous Drain Current	0.20	0.24	A
I_{DM}	Pulsed Drain Current ^[2]	0.80	0.96	
P_D	Power Dissipation	1	1.5	W
	Derating Factor above 25°C	0.008	0.012	
V_{GS}	Gate-to-Source Voltage	±20		V
V_{ESD}	Gate Source ESD ^[3]	3000		V
	Source to Gate ESD ^[3]	3000		V
T_L	Soldering Temperature	300		°C
	Distance of 1.6mm from case for 10 seconds			
T_J and T_{STG}	Operating and Storage Temperature Range	-55 to 150		

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	DMX4022E	DMS4022E	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to- Case	125	83	°C/W

Electrical Characteristics

OFF Characteristics

 $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSX}	Drain-to-Source Breakdown Voltage	400	--	--	V	$V_{GS}=-5V, I_D=250\mu A$
$I_{D(OFF)}$	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=400V, V_{GS}=-5V$
		--	--	1	mA	$V_{DS}=400V, V_{GS}=-5V$ $T_J=125^\circ\text{C}$
I_{GSS}	Gate-to-Source Leakage Current	--	--	5	μA	$V_{GS}=+20V, V_{DS}=0V$
		--	--	-5		$V_{GS}=-20V, V_{DS}=0V$

ON Characteristics

 $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
I_{DSS}	Saturated Drain-to-Source Current	0.2	--	--	A	$V_{GS}=0V, V_{DS}=25V^{[4]}$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	12	25	Ω	$V_{GS}=0V, I_D=200mA^{[4]}$
		--	11	23	Ω	$V_{GS}=10V, I_D=200mA^{[4]}$
$V_{GS(OFF)}$	Gate-to-Source Cut-off Voltage	-3.3	--	-1.5	V	$V_{DS}=3V, I_D=8\mu A$
gfs	Forward Transconductance	--	193	--	mS	$V_{DS}=10V, I_D=200mA^{[4]}$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{ISS}	Input Capacitance	--	103.2	--	pF	$V_{GS}=-5V$ $V_{DS}=25V$ $f=1.0MHz$
C_{OSS}	Output Capacitance	--	17.7	--		
C_{RSS}	Reverse Transfer Capacitance	--	5.2	--		
Q_G	Total Gate Charge	--	359.6	--	nC	$V_{GS}=-5V\sim 5V$ $V_{DD}=100V, I_D=200mA$
Q_{GS}	Gate-to-Source Charge	--	61.6	--		
Q_{GD}	Gate-to-Drain (Miller) Charge	--	130	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	6.6	--	ns	$V_{GS}=-5V\sim 5V$ $V_{DD}=100V, I_D=200mA$ $R_G=10\Omega$
t_{rise}	Rise Time	--	9.2	--		
$t_{d(OFF)}$	Turn-off Delay Time	--	18.8	--		
t_{fall}	Fall Time	--	356	--		

Source-Drain Diode Characteristics

 $T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{SD}	Diode Forward Voltage	--	0.8	1.5	V	$I_{SD}=200mA^{[4]}, V_{GS}=-10V$

NOTE:

[1] $T_J=+25^\circ\text{C}$ to $+150^\circ\text{C}$

[2] Repetitive rating, pulse width limited by maximum junction temperature.

[3] The test is based on JEDEC EIA/JESD22-A114(HBM).

[4] Pulse width $\leq 380\mu s$; duty cycle $\leq 2\%$.

Typical Characteristics

Figure 1. Maximum Power Dissipation vs. Case Temperature

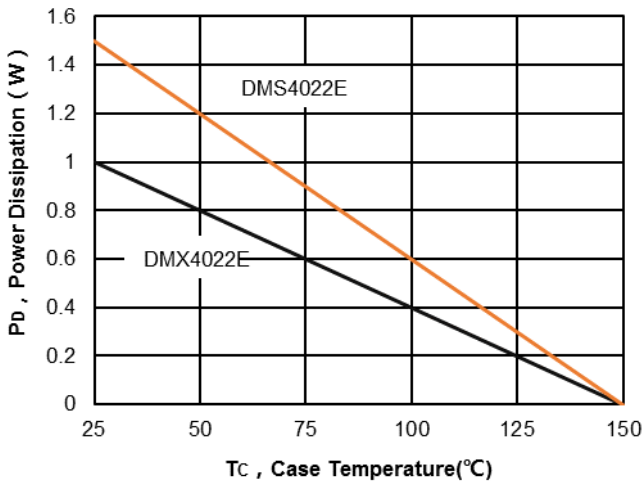


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

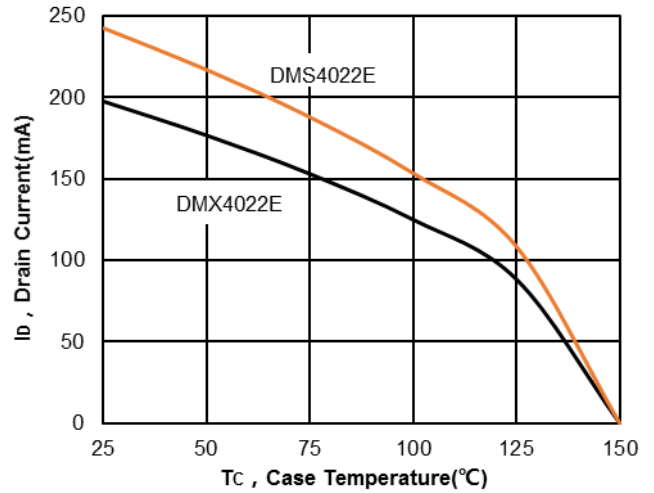


Figure 3. Typical Output Characteristics

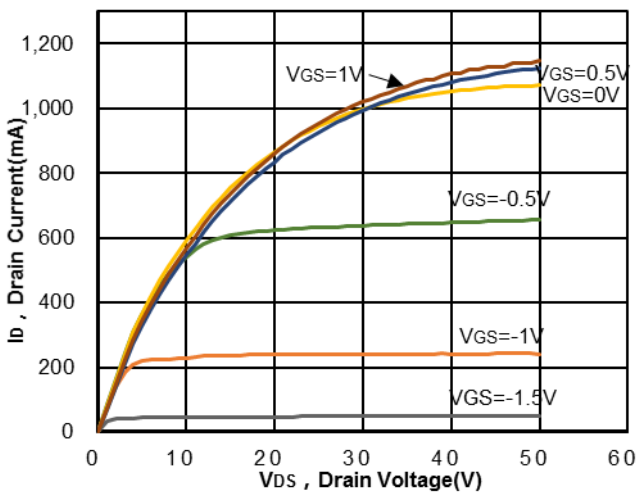


Figure 4. Typical Transfer Characteristics

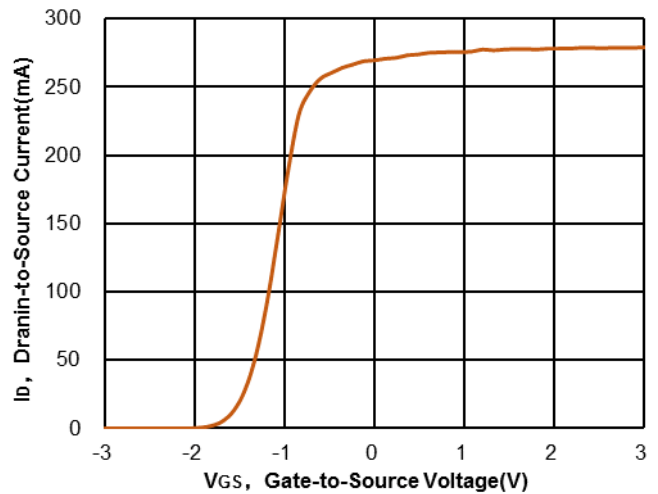


Figure 5. Typical Capacitance vs. Drain-to-Source Voltage

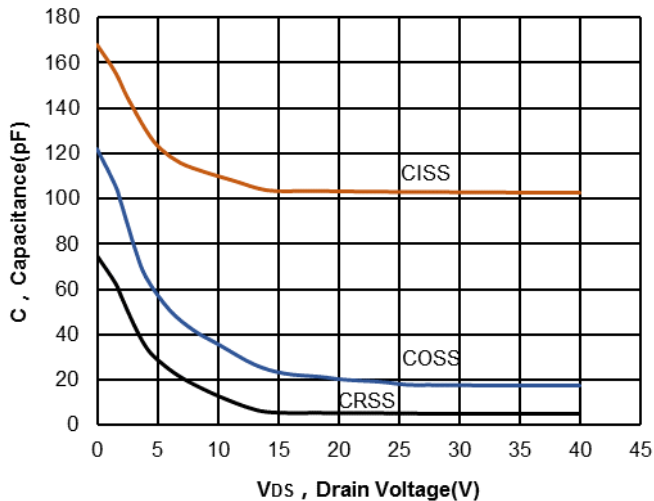


Figure 6. Typical Gate Charge vs. Gate-to-Source Voltage

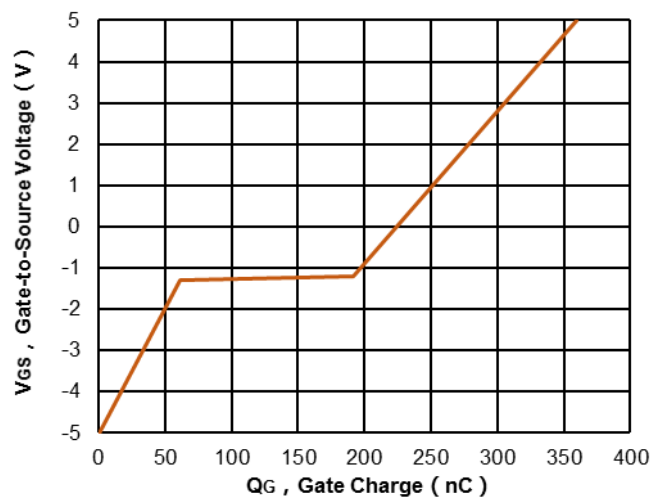


Figure 7. Maximum Rated Safe Operating Area

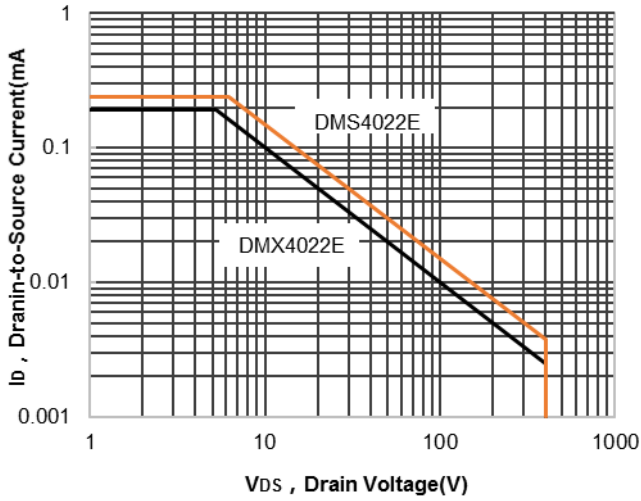


Figure 8. Drain-to-Source On-Resistance vs. Drain Current

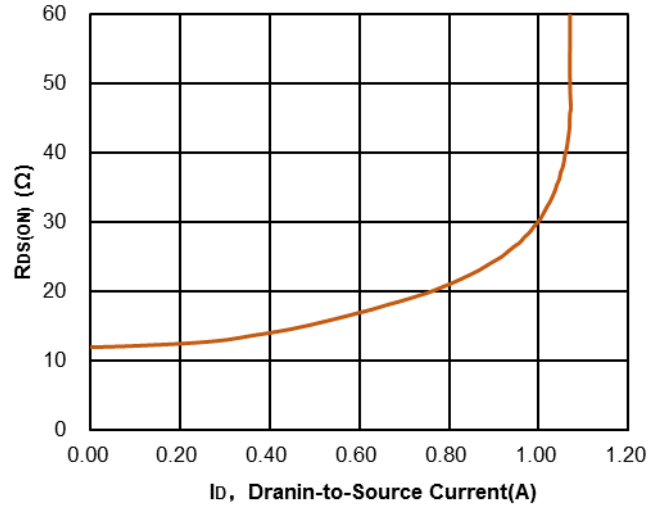


Figure 9. Drain-to-Source On-Resistance vs. Junction Temperature

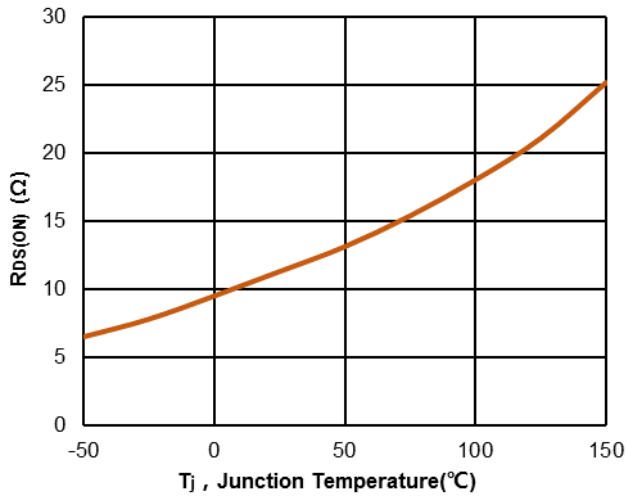
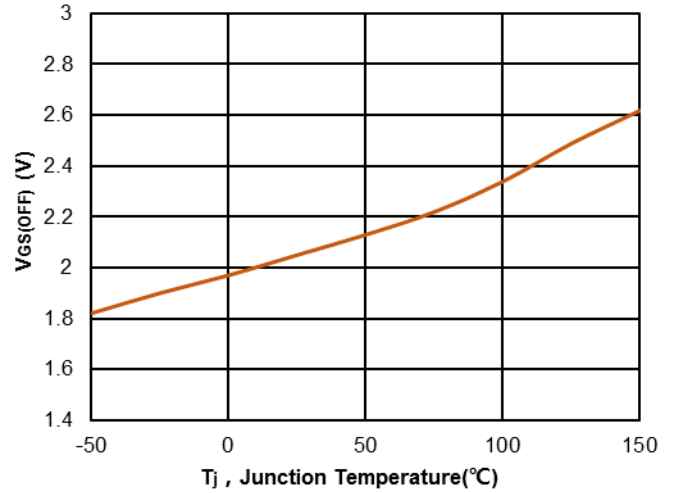
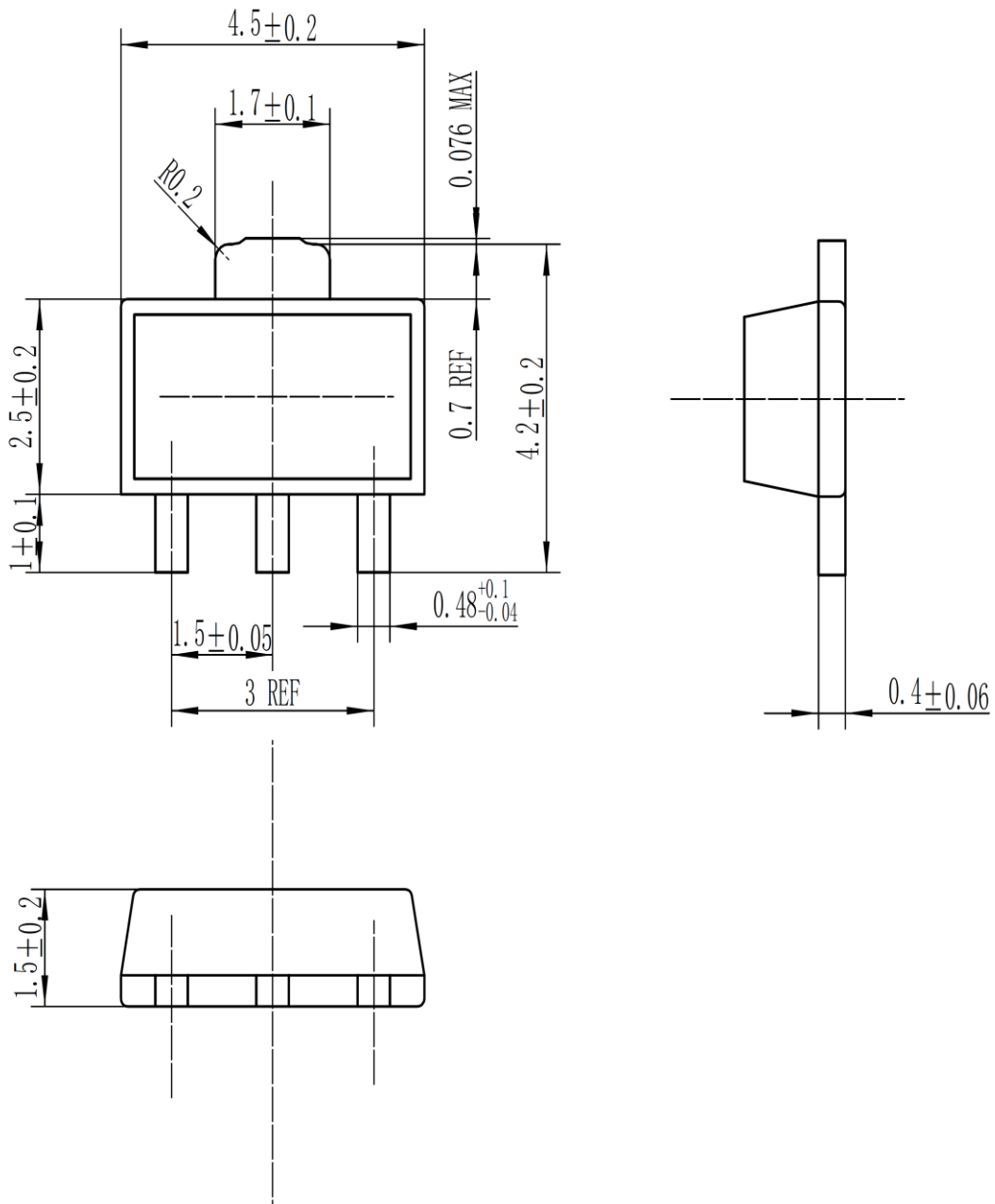


Figure 10. Gate-to-Source Cut-off Voltage vs. Junction Temperature

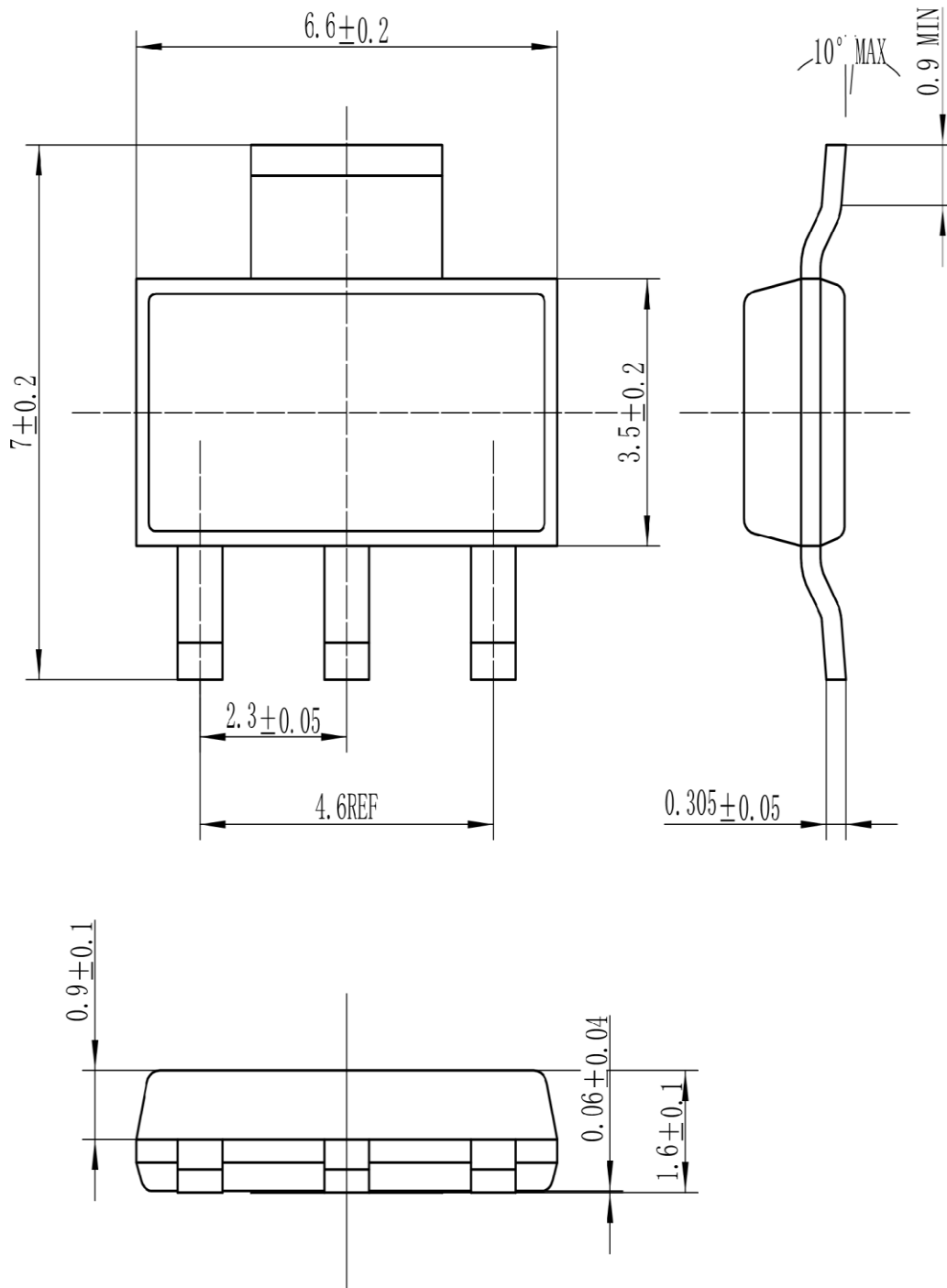


Package Dimensions

SOT-89



SOT-223



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