

## 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.)	$I_D$
<b>DMX4022E</b>	<b>400V</b>	<b>25Ω</b>	<b>0.20A</b>
<b>DMS4022E</b>	<b>400V</b>	<b>25Ω</b>	<b>0.24A</b>

### 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 <sup>[1]</sup>	400		V
$V_{DGX}$	Drain-to-Gate Voltage <sup>[1]</sup>	400		V
$I_D$	Continuous Drain Current	0.20	0.24	A
$I_{DM}$	Pulsed Drain Current <sup>[2]</sup>	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 <sup>[3]</sup>	3000		V
	Source to Gate ESD <sup>[3]</sup>	3000		V
$T_L$	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300		°C
$T_J$ 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	$\mu A$	$V_{DS}=400V, V_{GS}=-5V$
		--	--	1	mA	$V_{DS}=400V, V_{GS}=-5V$ $T_J=125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Leakage Current	--	--	5	$\mu A$	$V_{GS}=+20V, V_{DS}=0V$
		--	--	-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	$\Omega$	$V_{GS}=0V, I_D=200mA^{[4]}$
		--	11	23	$\Omega$	$V_{GS}=10V, I_D=200mA^{[4]}$
$V_{GS(OFF)}$	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

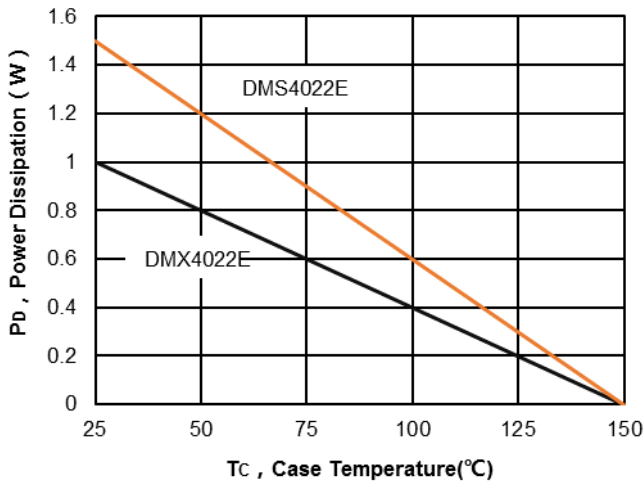


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

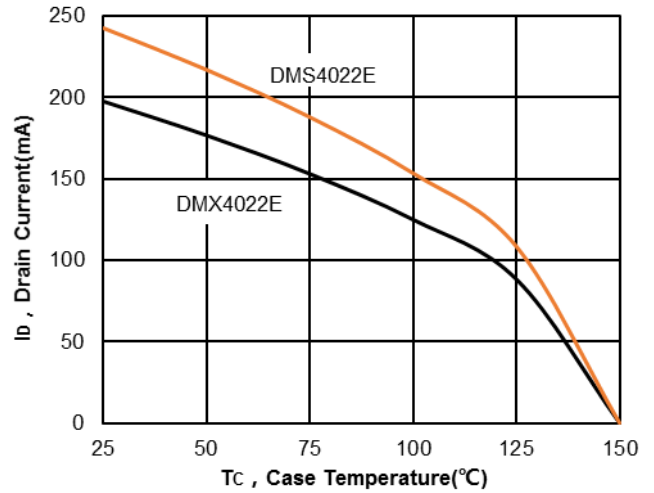


Figure 3. Typical Output Characteristics

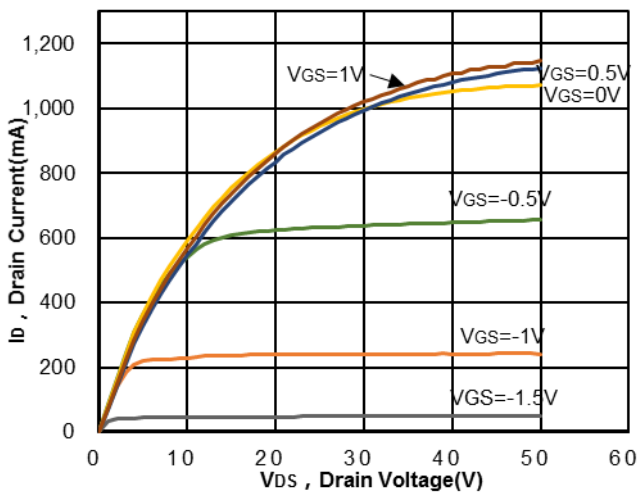


Figure 4. Typical Transfer Characteristics

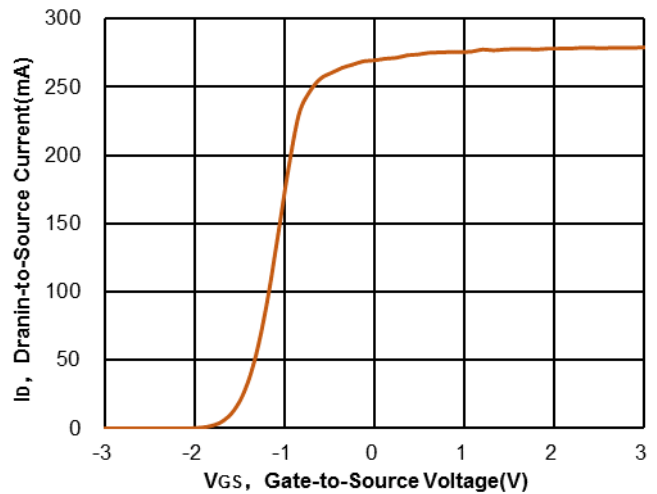


Figure 5. Typical Capacitance vs. Drain-to-Source Voltage

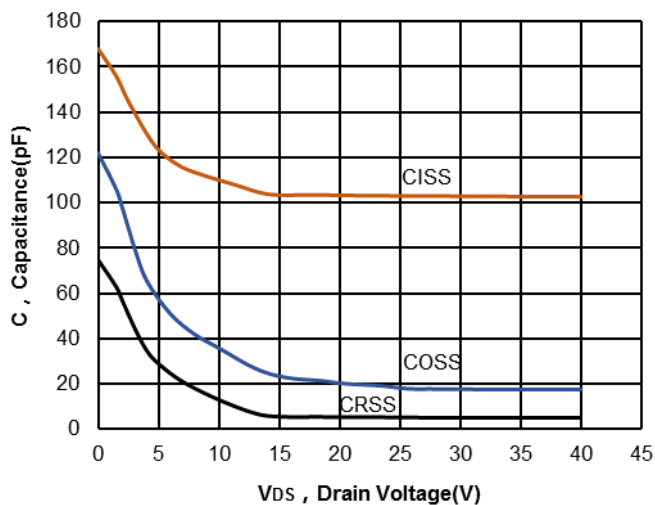


Figure 6. Typical Gate Charge vs. Gate-to-Source Voltage

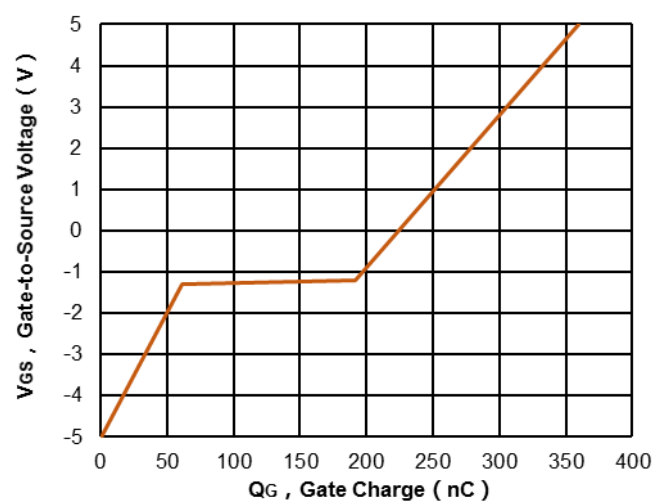


Figure 7. Maximum Rated Safe Operating Area

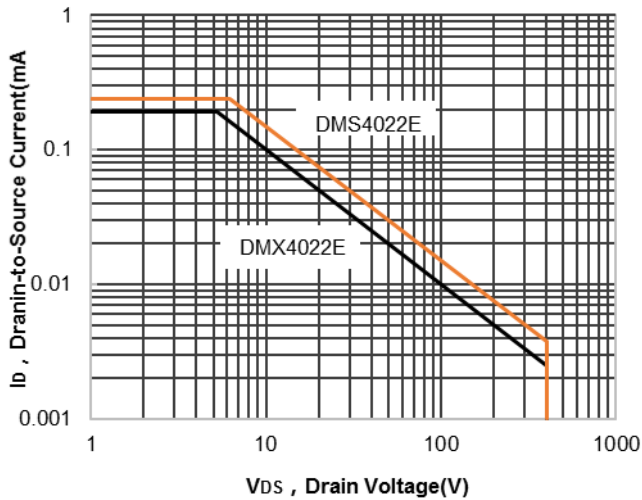


Figure 8. Drain-to-Source On-Resistance vs. Drain Current

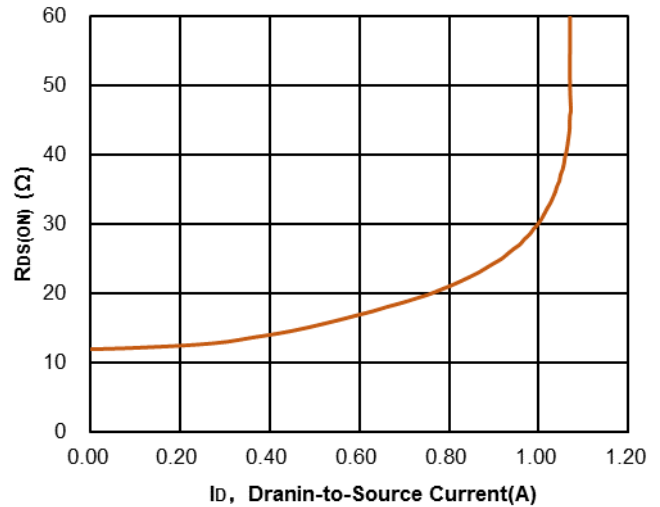


Figure 9. Drain-to-Source On-Resistance vs. Junction Temperature

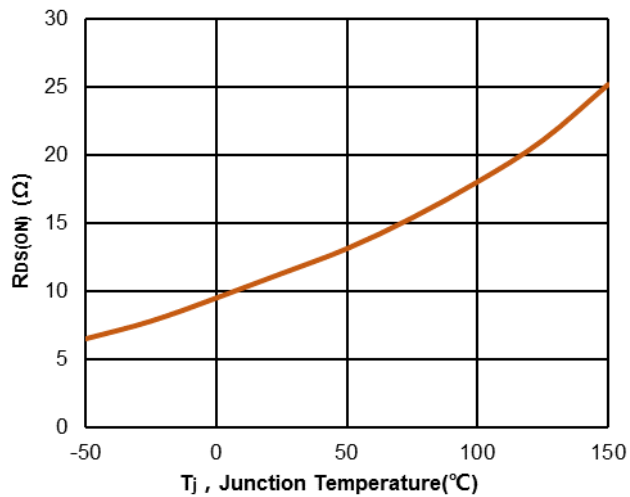
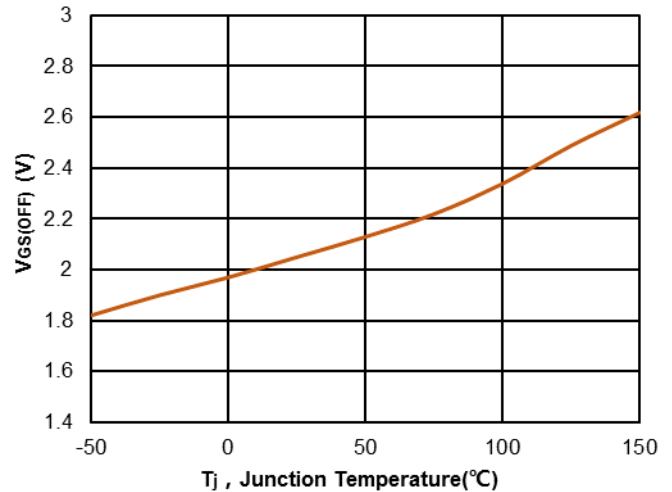
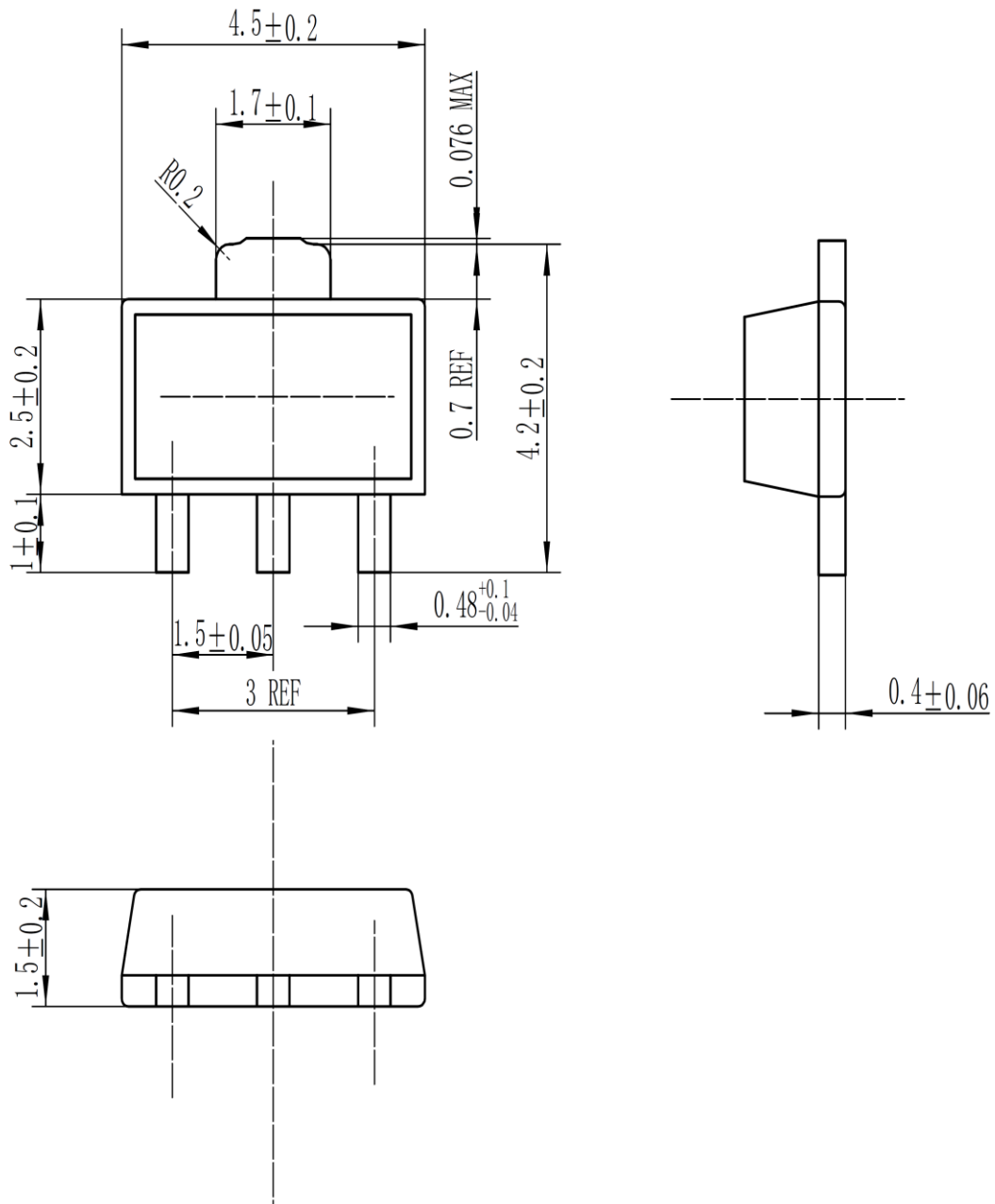


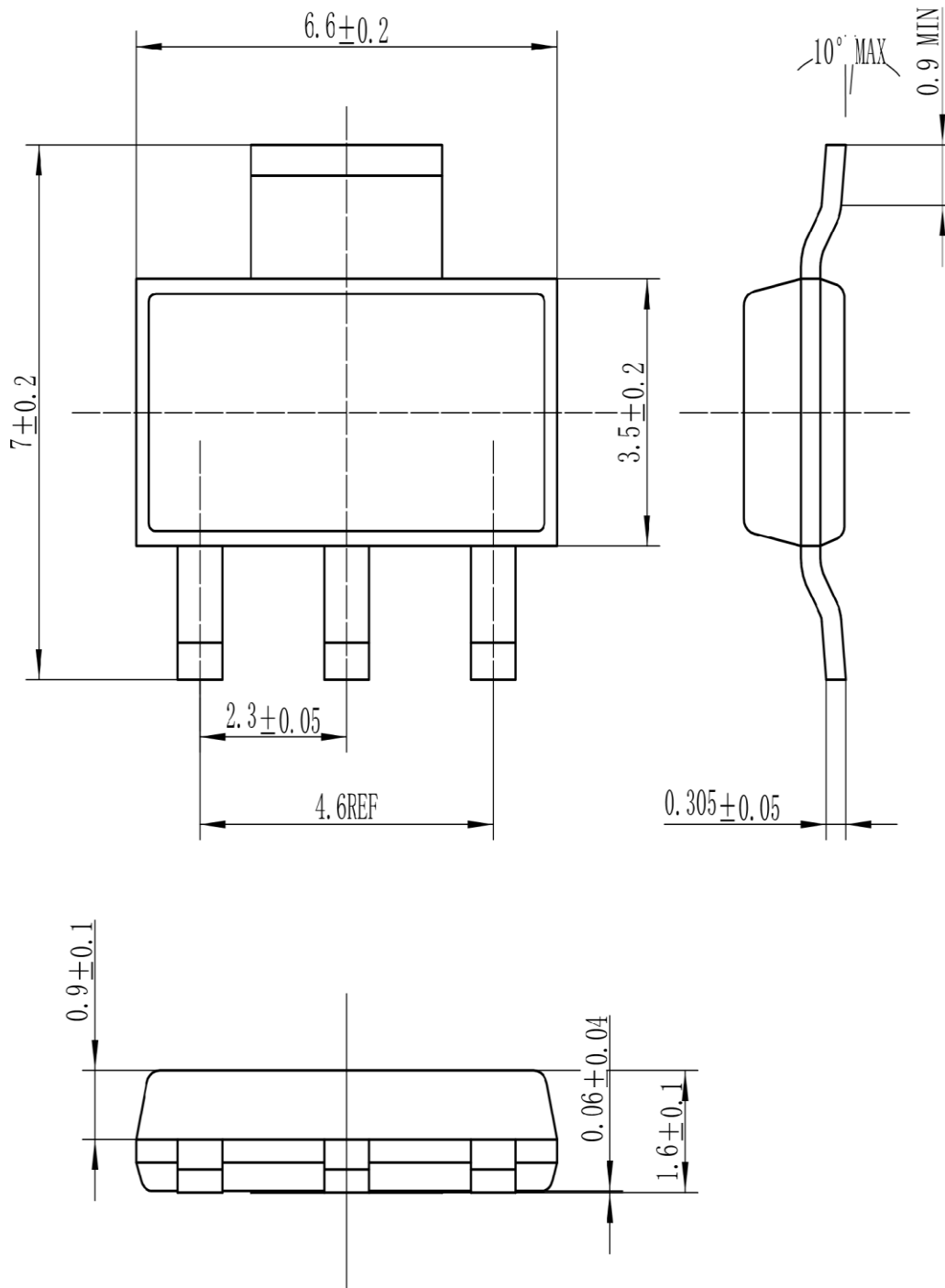
Figure 10. Gate-to-Source Cut-off Voltage vs. Junction Temperature



Package Dimensions

SOT-89



**SOT-223**


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