400V Depletion-Mode Power MOSFET

General Features

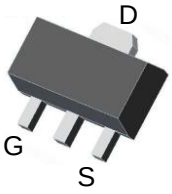
- Depletion Mode (Normally On)
- Proprietary Advanced Planar Technology
- Small Package
- Low Leakage Current
- RoHS Compliant
- Halogen-free Available

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

SOT-89



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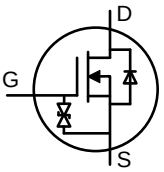


Ordering Information

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

Absolute Maximum Ratings

T_A=25℃ 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℃	0.008	0.012	W/℃
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 Distance of 1.6mm from case for 10 seconds	300		℃
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	℃/W

Electrical Characteristics

OFF Characteristics

T_A =25℃ 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=250μA
$I_{D(OFF)}$	Drain-to-Source Leakage Current	--	--	1	μA	V_{DS}=400V, V_{GS}=-5V
		--	--	1	mA	V_{DS}=400V, V_{GS}=-5V T_J=125℃
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℃ 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=8μA
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~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~5V, V_{DD}=100V, I_D=200mA, R_G=10 Ω
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℃ unless otherwise specified

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

NOTE：

[1] T_J=+25℃ to +150℃.
[2] Repetitive rating, pulse width limited by maximum junction temperature.
[3] The test is based on JEDEC EIA/JESD22-A114(HBM).
[4] Pulse width≤380μs; duty cycle≤2%.

Typical Characteristics

Figure 1. Maximum Power Dissipation vs. Case Temperature

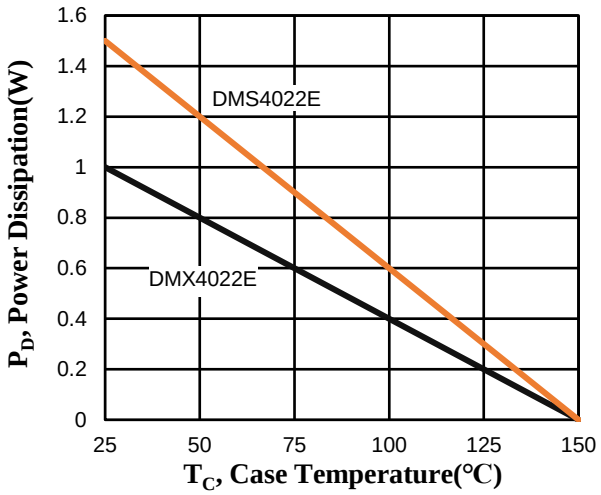


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

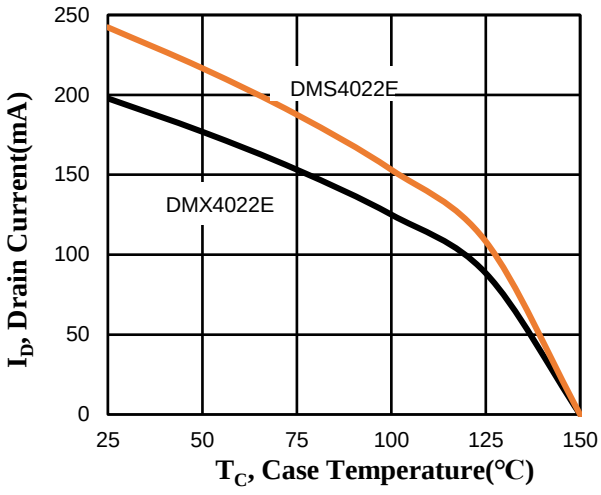


Figure 3.Typical Output Characteristics

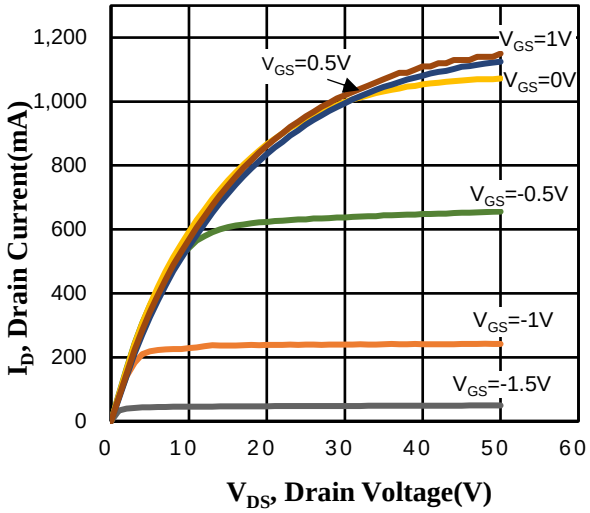


Figure 4. Typical Transfer Characteristics

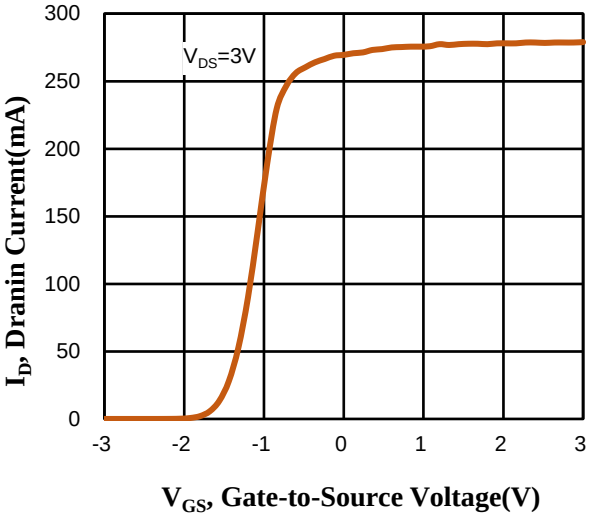


Figure 5. Typical Capacitance vs. Drain-to-Source Voltage

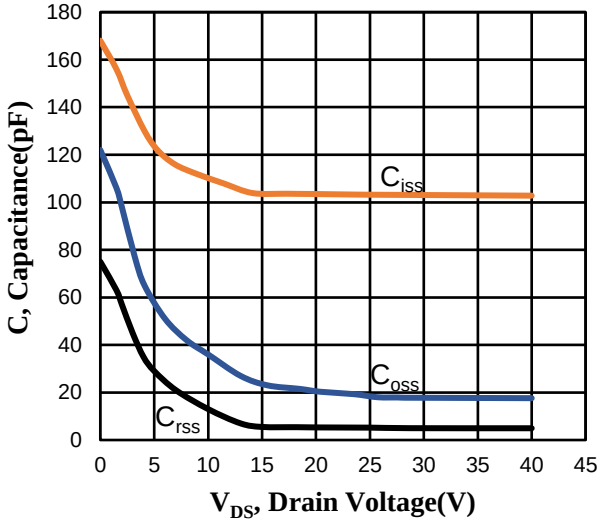


Figure 6. Typical Gate Charge vs. Gate-to-Source Voltage

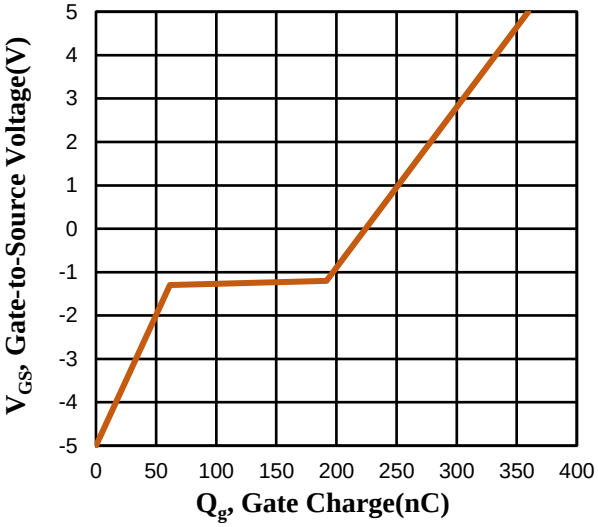


Figure 7. Maximum Rated Safe Operating Area

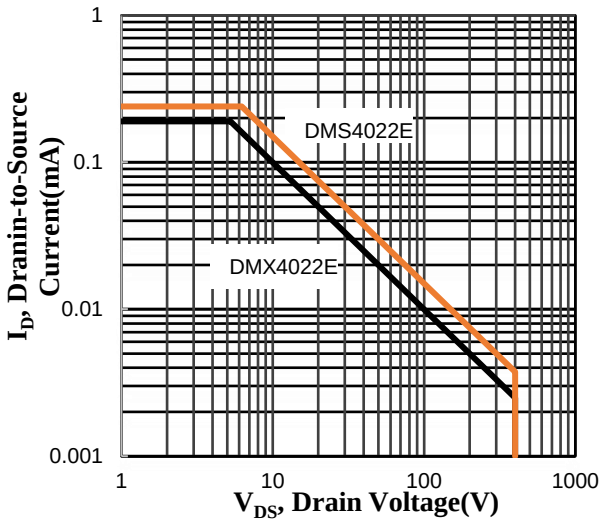


Figure 8. Drain-to-Source On-Resistance vs. Drain Current

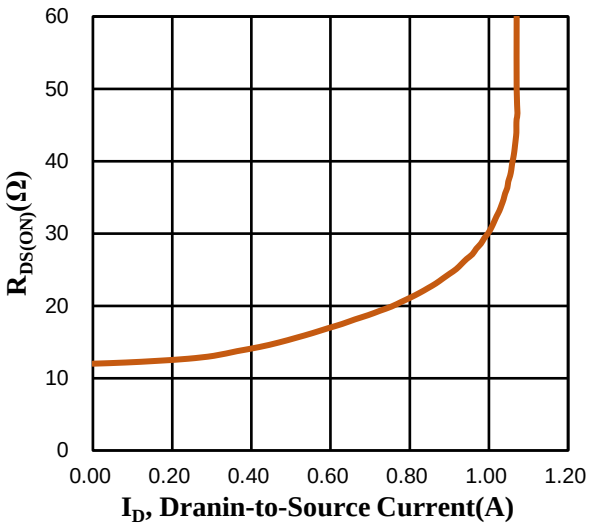


Figure 9. Drain-to-Source On-Resistance vs. Junction Temperature

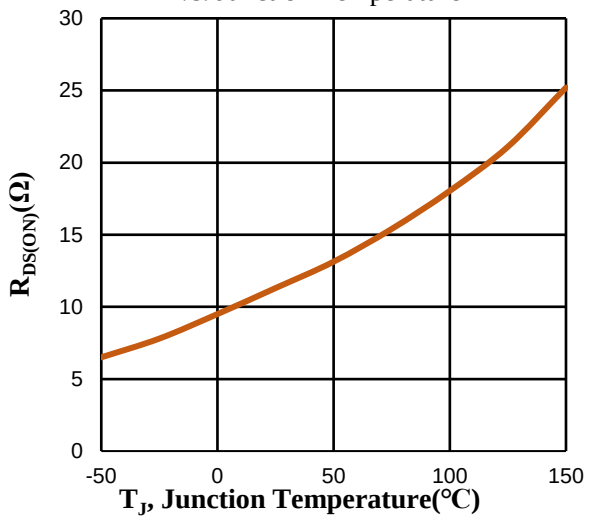
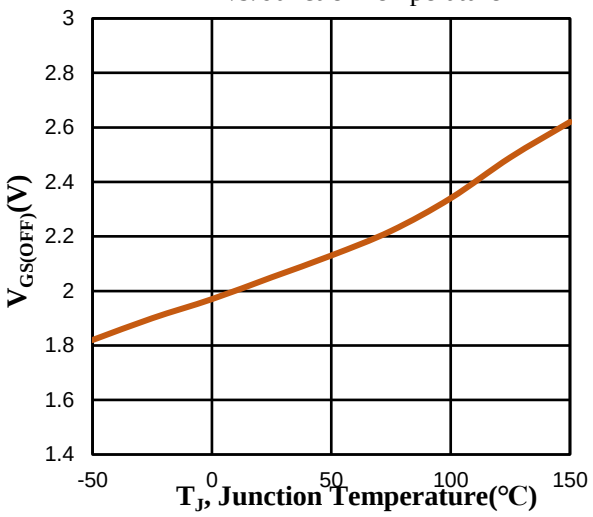


Figure 10. Gate-to-Source Cut-off Voltage vs. JunctionTemperature



Package Dimensions

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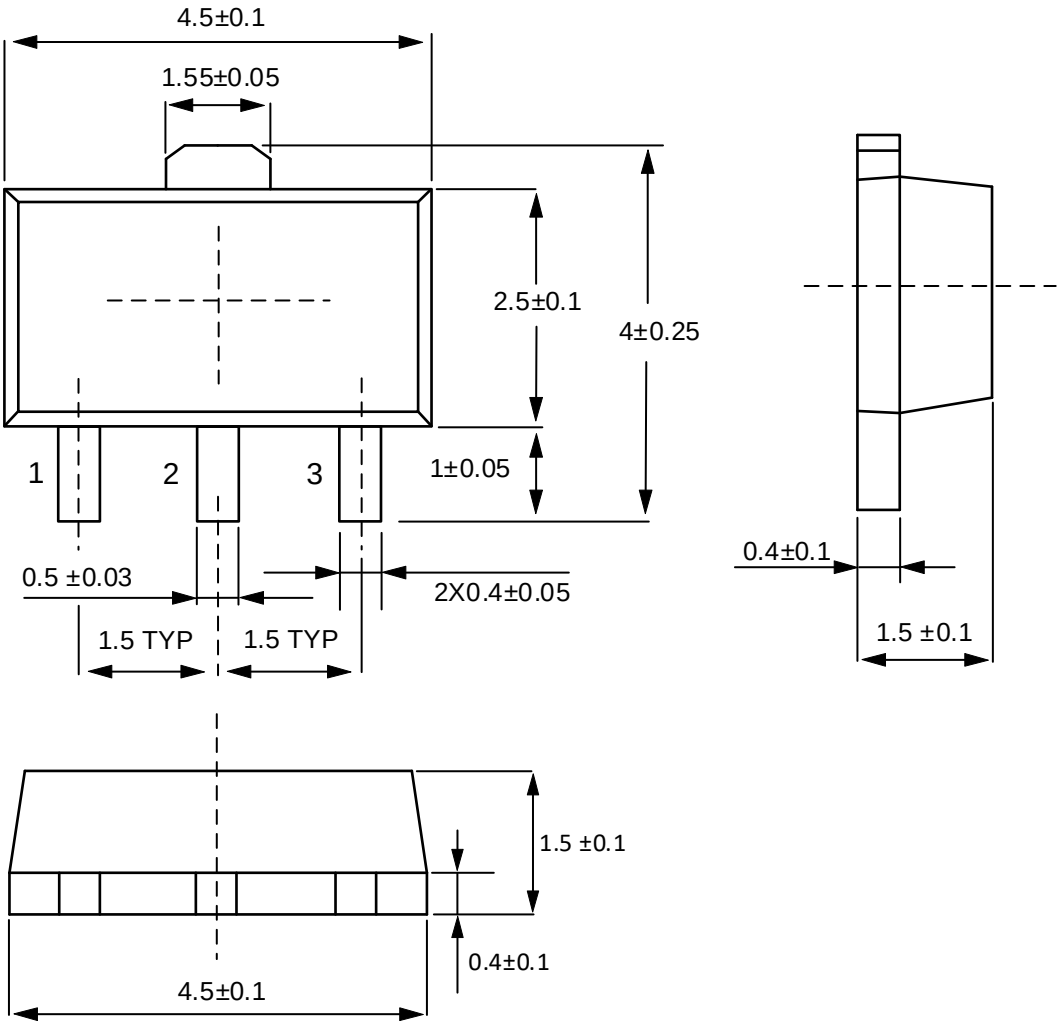

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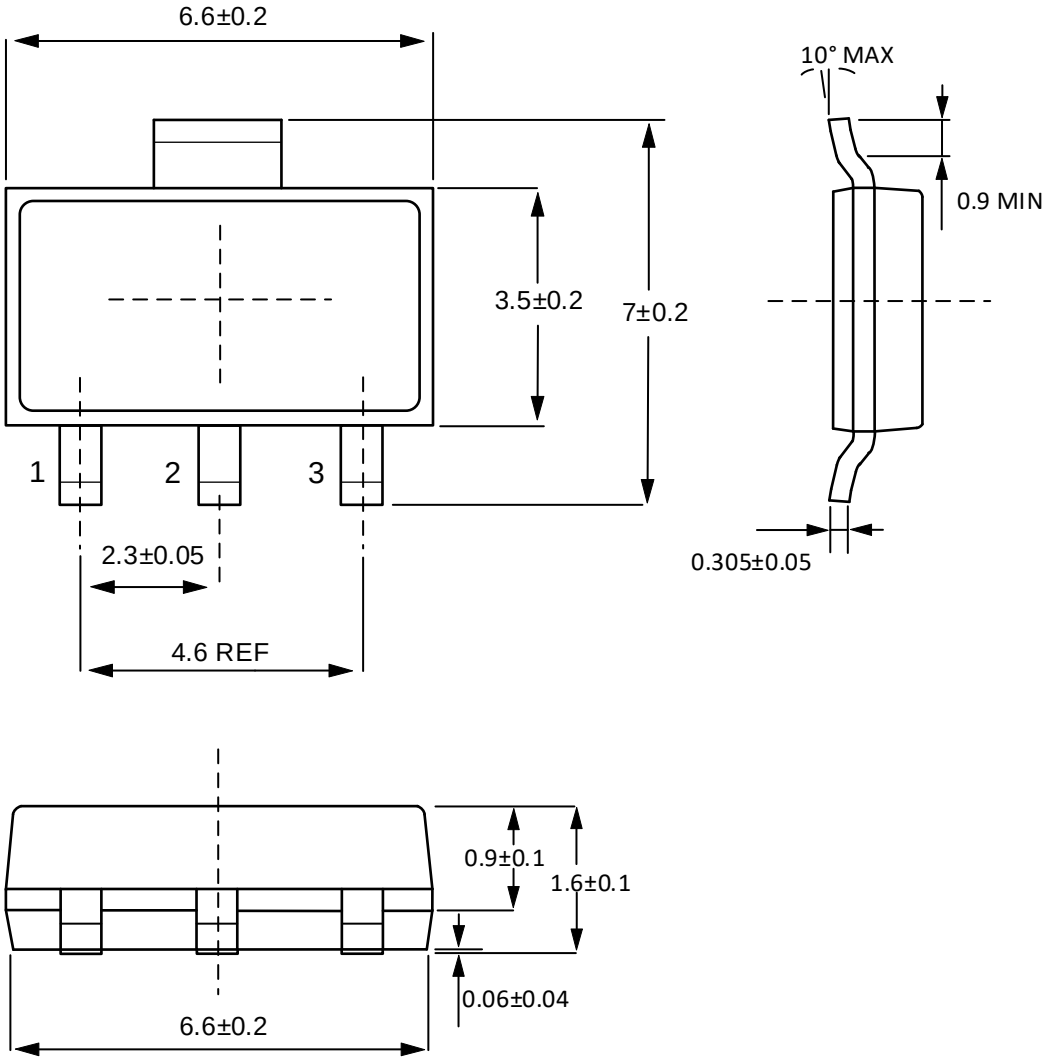
6.6±0.2
10° MAX
0.9 MIN
3.5±0.2
7±0.2
1
2
3
2.3±0.05
4.6 REF
0.305±0.05
0.9±0.1
1.6±0.1
0.06±0.04
6.6±0.2

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