

60V N-Channel Depletion-Mode Power MOSFET

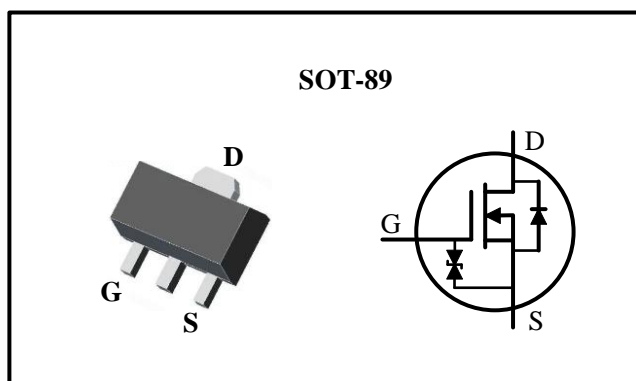
General Features

- Depletion Mode (Normally On)
- Fast Switching Speed
- Low $R_{DS(ON)}$
- Small Package Size: SOT-89
- Proprietary Advanced Planar Technology
- Rugged Polysilicon Gate Cell Structure
- RoHS Compliant
- Halogen-free Available

BV_{DSX}	$R_{DS(ON)(Typ.)}$	$I_{DSS(Min.)}$
60V	0.5Ω	500mA

Applications

- Ignition Modules
- Normally-On Switches
- Solid State Relays
- Converters
- Security
- Power Supplies



Ordering Information

Part Number	Package	Marking	Remark
DMX0652E	SOT-89	0652	Halogen Free

Absolute Maximum Ratings

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

Symbol	Parameter	DMX0652E	Unit
V_{DSX}	Drain-to-Source Voltage ^[1]	60	V
I_D	Continuous Drain Current	1	A
I_{DM}	Pulsed Drain Current ^[2]	4	
P_D	Power Dissipation	1	W
V_{GS}	Gate-to-Source Voltage	±20	V
T_L	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300	°C
T_J & 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	DMX0652E	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	125	°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	60	--	--	V	$V_{GS}=-10\text{V}$, $I_D=250\mu\text{A}$
$I_{D(OFF)}$	Drain-to-Source Leakage Current	--	--	10	μA	$V_{DS}=60\text{V}$, $V_{GS}=-10\text{V}$
I_{GSS}	Gate-to-Source Leakage Current	--	--	20	μA	$V_{GS}=20\text{V}$, $V_{DS}=0\text{V}$
		--	--	-20		$V_{GS}=-20\text{V}$, $V_{DS}=0\text{V}$

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	500	--	--	mA	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	0.5	1.5	Ω	$V_{GS}=0\text{V}$, $I_D=200\text{mA}$ [3]
$V_{GS(OFF)}$	Gate-to-Source Cut-off Voltage	-3.5	--	-1.5	V	$V_{DS}=3\text{V}$, $I_D=8\mu\text{A}$
gfs	Forward Transconductance	--	1.28	--	S	$V_{DS}=20\text{V}$, $I_D=200\text{mA}$

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	543.3	--	pF	$V_{GS}=-10\text{V}$ $V_{DS}=25\text{V}$ $f=1.0\text{MHz}$
C_{oss}	Output Capacitance	--	96.5	--		
C_{rss}	Reverse Transfer Capacitance	--	3.2	--		
Q_g	Total Gate Charge	--	11.3	--	nC	$V_{GS}=-10\text{V}\sim 10\text{V}$ $V_{DS}=30\text{V}$ $I_D=200\text{mA}$
Q_{gs}	Gate-to-Source Charge	--	4.3	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	1.0	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(on)}$	Turn-on Delay Time	--	18.5	--	ns	$V_{GS}=-10\text{V}\sim 0\text{V}$ $V_{DD}=30\text{V}$ $I_D=200\text{mA}$ $R_G=10\Omega$
t_{rise}	Rise Time	--	4.2	--		
$t_{d(off)}$	Turn-off Delay Time	--	21.5	--		
t_{fall}	Fall Time	--	50.6	--		

Source-Drain Diode Characteristics

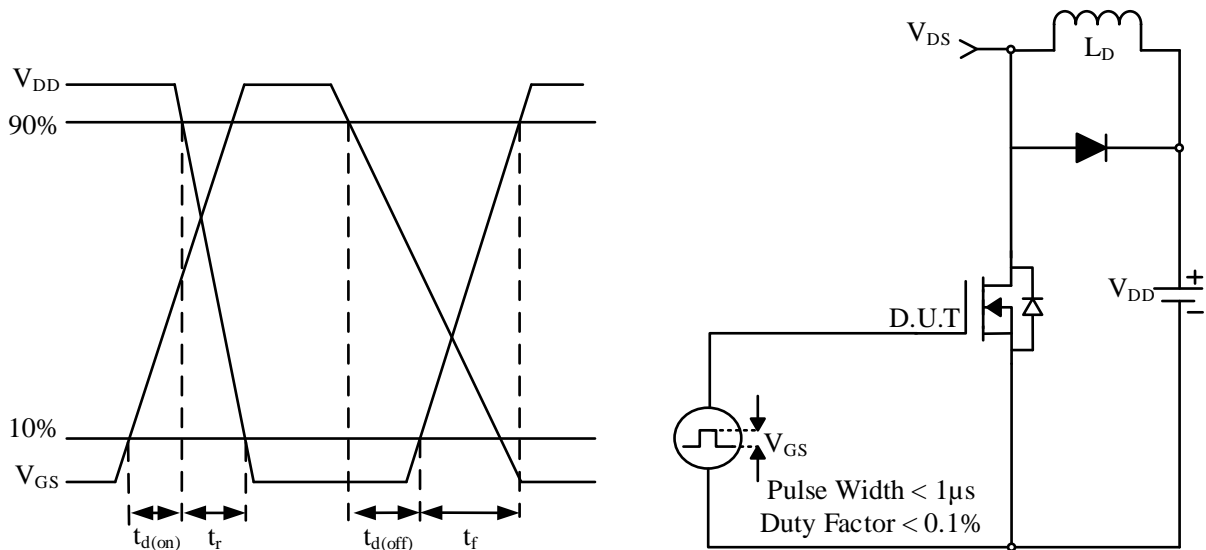
$T_A=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	--	--	1.2	V	$I_{SD}=200\text{mA}$, $V_{GS}=-10\text{V}$

NOTE:

- [1] $T_J=+25^\circ\text{C}$ to $+150^\circ\text{C}$.
- [2] Repetitive rating, pulse width limited by maximum junction temperature.
- [3] Pulse width $\leq 380\mu\text{s}$, duty cycle $\leq 2\%$.

Switching Waveform & Test Circuit



Typical Characteristics

Figure 1. Maximum Power Dissipation vs. Case Temperature

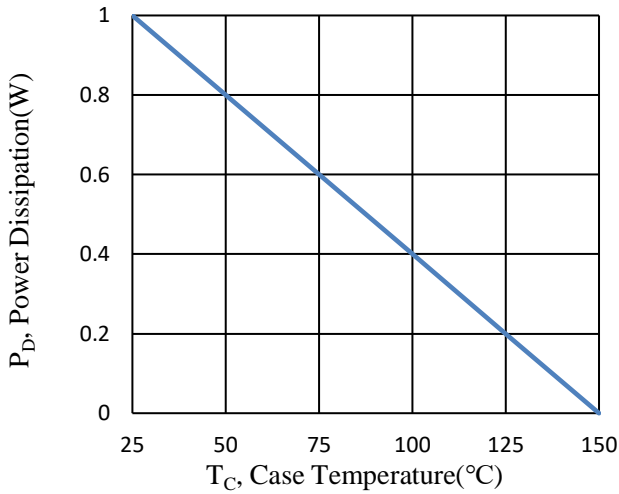


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

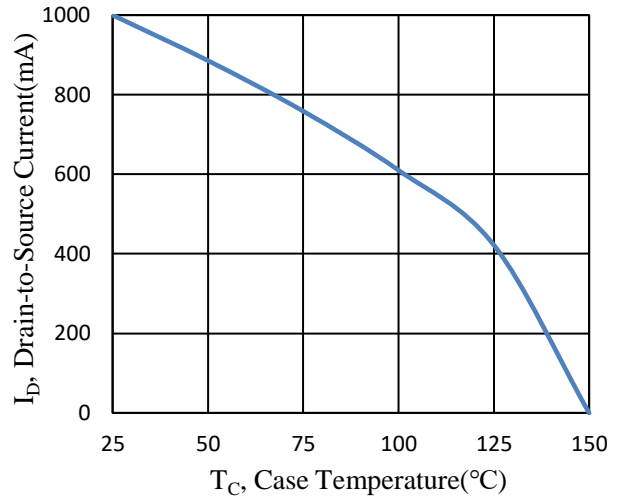


Figure 3. Typical Output Characteristics

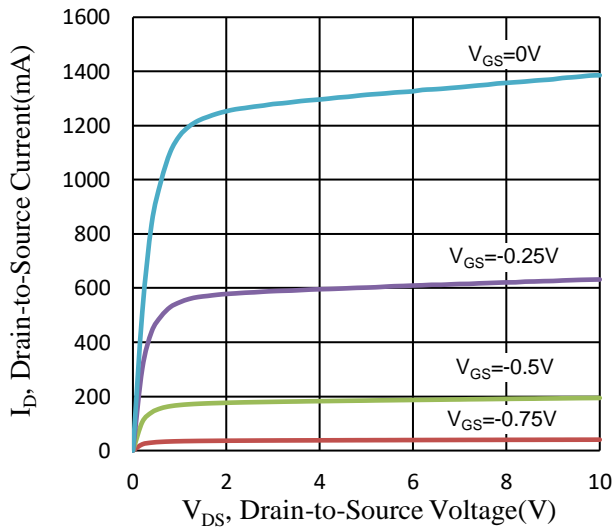


Figure 4. Typical Transfer Characteristics

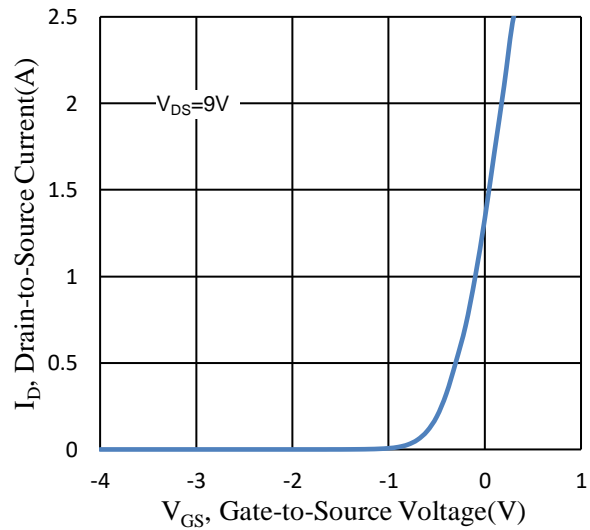


Figure 5. Typical Transfer Characteristics

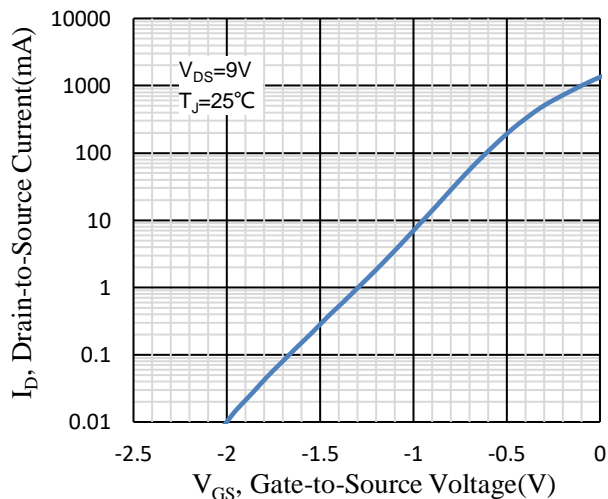


Figure 6. Typical Capacitance vs. Drain-to-Source Voltage

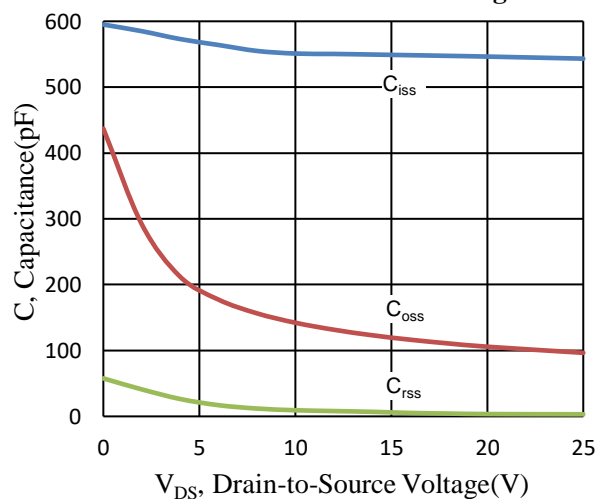


Figure 7. Typical Gate Charge vs. Gate-to-Source Voltage

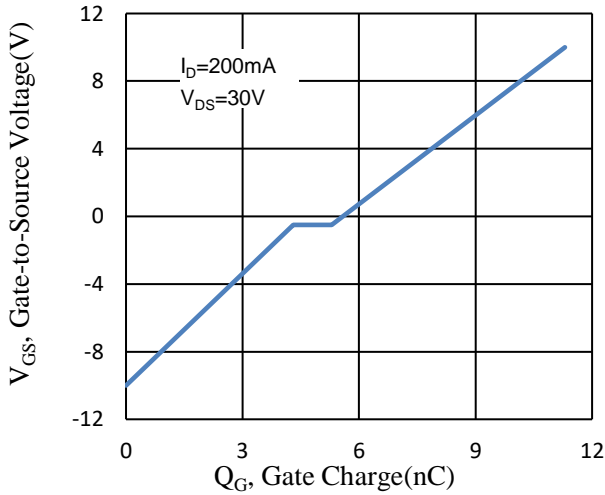


Figure 8. Normalized On-Resistance vs. Junction Temperature

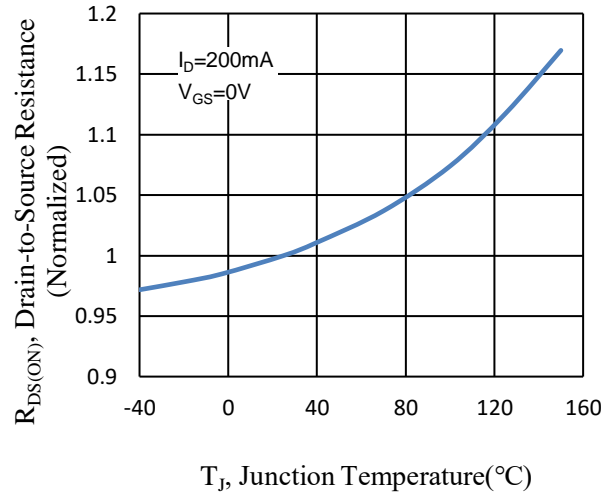


Figure 9. Gate-to-Source Cut-off Voltage vs. Junction Temperature

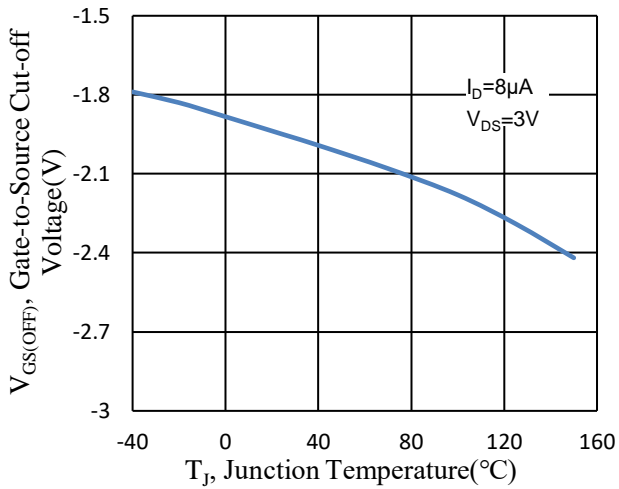


Figure 10. Drain-to-Source Breakdown Voltage vs. Junction Temperature

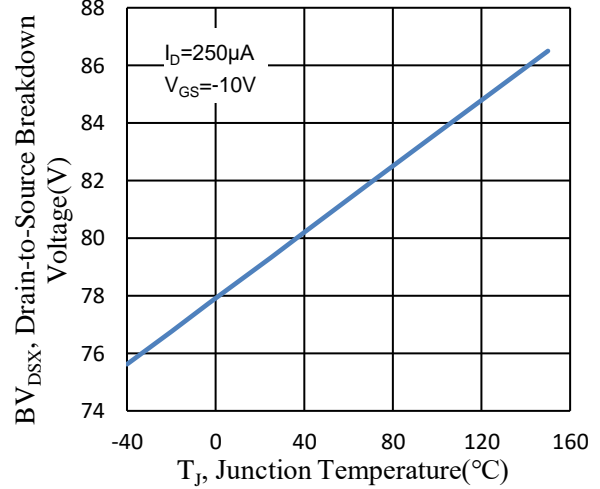
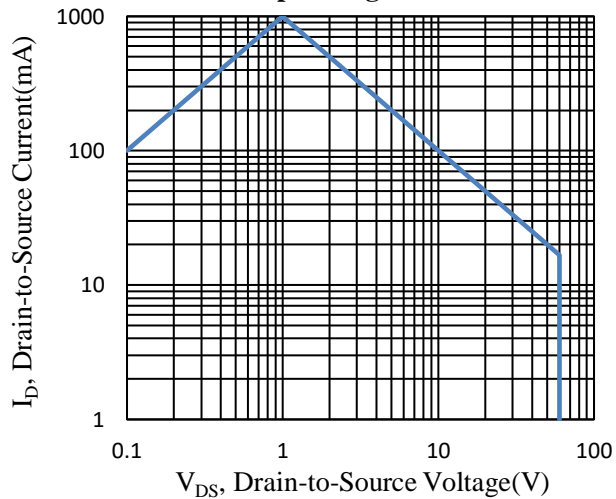
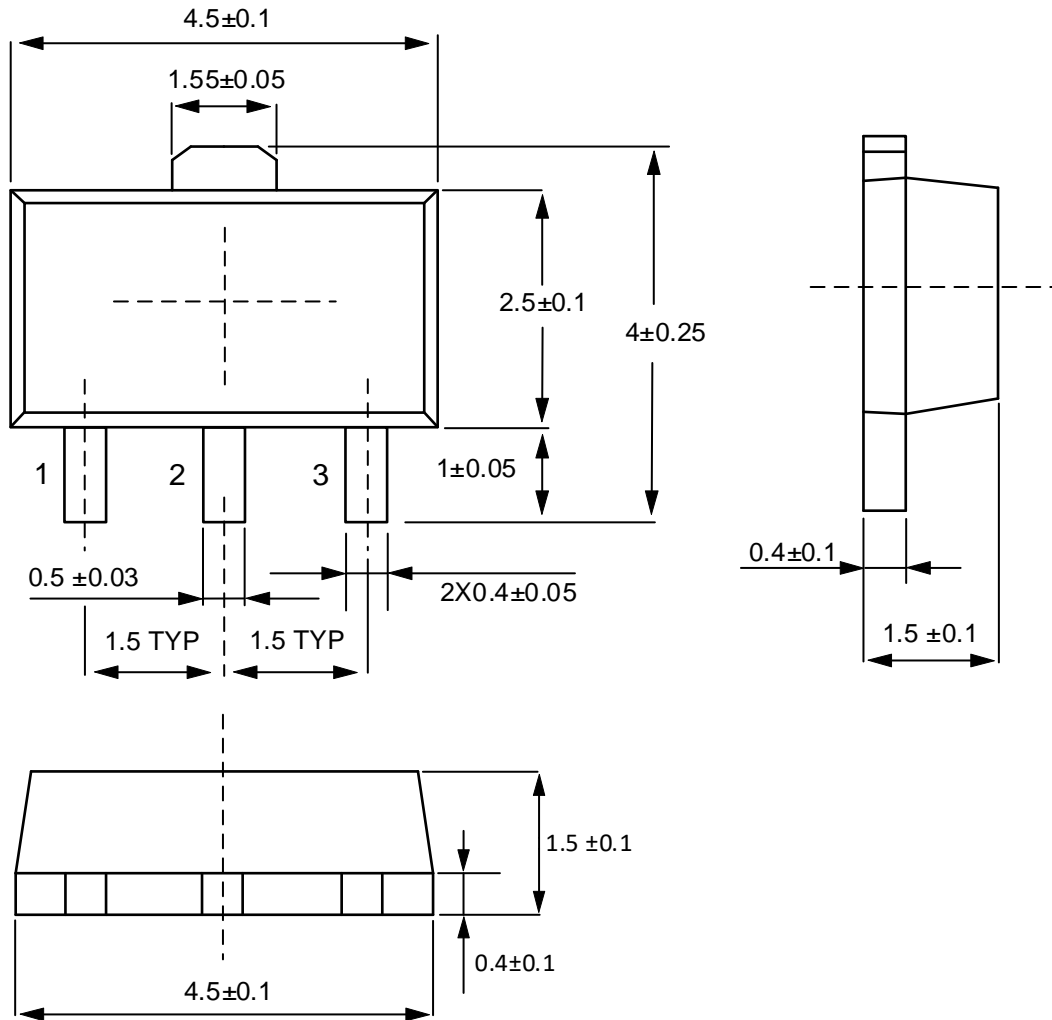


Figure 11. Maximum Forward Safe Operating Area



Package Dimensions

SOT-89





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