

**ADVANCED
POWER
TECHNOLOGY®**
2N7228 500 Volt 0.415Ω
JX2N7228*
JV2N7228*

POWER MOS IV™

*QUALIFIED TO MIL-S-19500/592 31/7/92

JEDEC REGISTERED N - CHANNEL HIGH VOLTAGE POWER MOSFETS

MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	2N7228	UNIT
V_{DSS}	Drain-Source Voltage	500	Volts
V_{GS}	Gate-Source Voltage	± 20	
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	12	Amps
	Continuous Drain Current @ $T_C = 100^\circ\text{C}$	8	
I_{DM}	Pulsed Drain Current ^①	48	
I_{AR}	Avalanche Current ^①	12	
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	150	Watts
	Total Power Dissipation @ $T_C = 100^\circ\text{C}$	60	
	Linear Derating Factor	1.2	W/K
E_{AS}	Single Pulse Avalanche Energy	750	mJ
E_{AR}	Repetitive Avalanche Energy	15	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$
T_L	Max. Lead Temp. for Soldering Conditions; 0.063" from Case for 10 Sec.	300	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu\text{A}$)	500			Volts
$V_{GS(TH)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 250\mu\text{A}$)	2		4	
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V$)			25	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			250	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 20V, V_{DS} = 0V$)			± 100	nA
$I_{D(ON)}$	On State Drain Current ^② ($V_{DS} > I_{D(ON)} \times R_{DS(ON)}$ Max, $V_{GS} = 10V$)	12			Amps
$R_{DS(ON)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, I_D = 8.0A$)			0.415	Ohms
	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, I_D = 8.0A, T_C = 125^\circ\text{C}$)			0.900	
	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, I_D = 12.0A$)			0.515	

CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

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Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{DC}	Drain-to-Case Capacitance	$f = 1 \text{ MHz}$		12	24	pF
C_{ISS}	Input Capacitance	$V_{GS} = 0V$		2410	2900	
C_{OSS}	Output Capacitance	$V_{DS} = 25V$		356	530	
C_{RSS}	Reverse Transfer Capacitance	$f = 1 \text{ MHz}$		125	235	
Q_g	Total Gate Charge	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ C$		103	150	nC
Q_{gs}	Gate-Source Charge			14	21	
Q_{gd}	Gate-Drain ("Miller") Charge			42	70	
$t_{d(on)}$	Turn-on Delay Time	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}] @ 25^\circ C$ $R_G = 2.35\Omega$		14	35	ns
t_r	Rise Time			21	190	
$t_{d(off)}$	Turn-off Delay Time			38	170	
t_f	Fall Time			12	130	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			12	Amps
I_{SM}	Pulsed Source Current ^① (Body Diode)			48	
V_{SD}	Diode Forward Voltage ^② ($V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$)			1.7	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$)		296	1600	ns
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D [\text{Cont.}], di_S/dt = 100A/\mu s$)		3.5	8.8	μC

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.83	K/W ^③
$R_{\theta JA}$	Junction to Ambient			31	

① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig.1)

② Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%

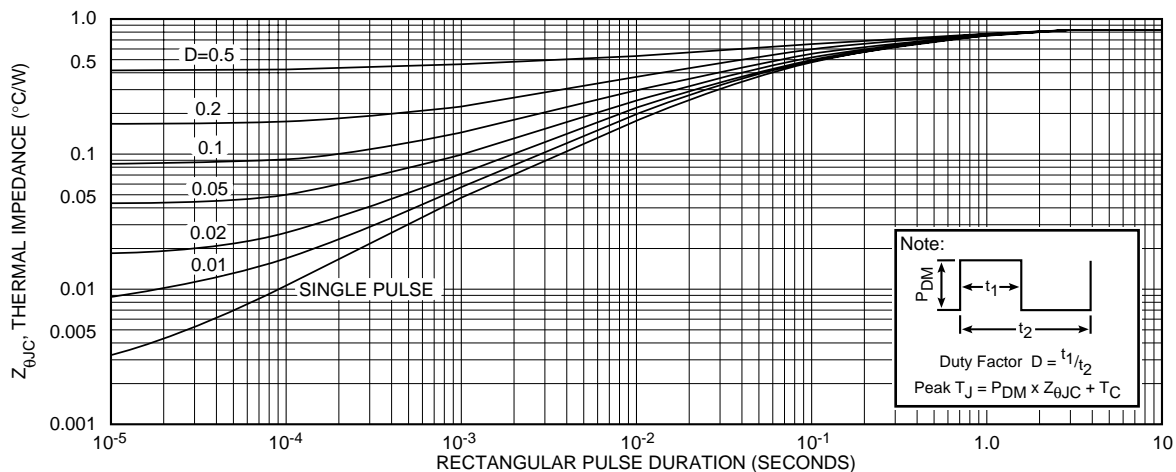


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

2N7228

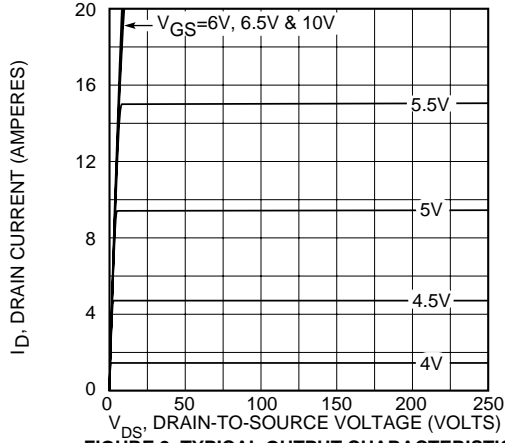


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

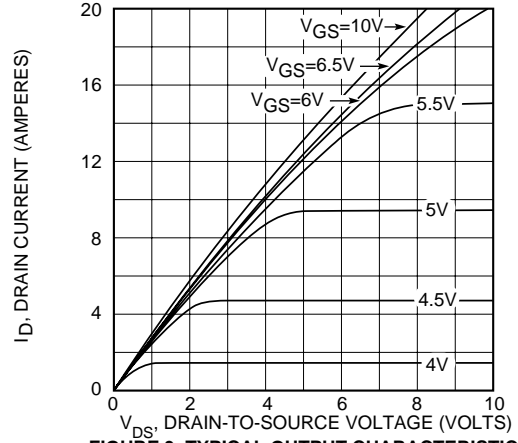


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

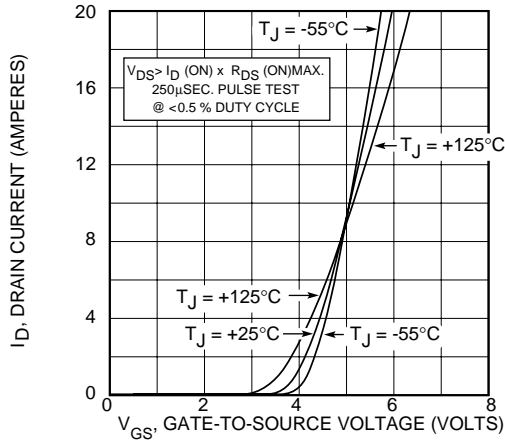


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

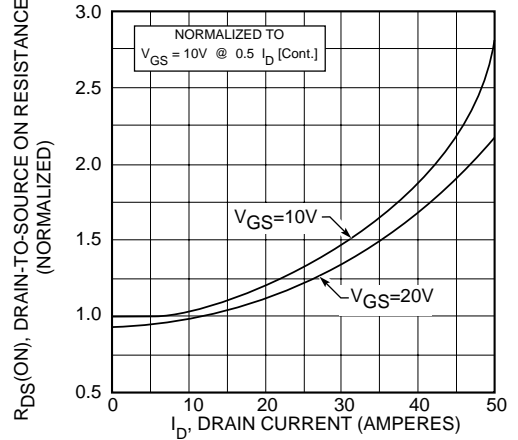


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

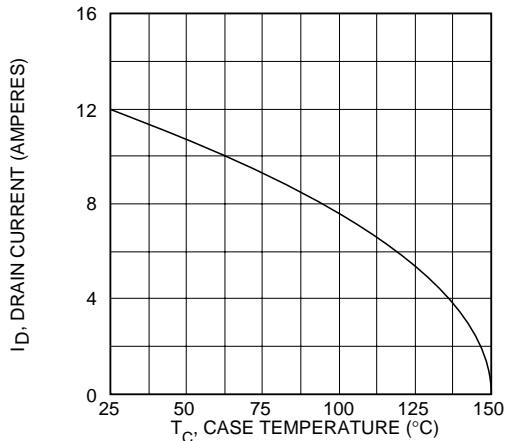


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

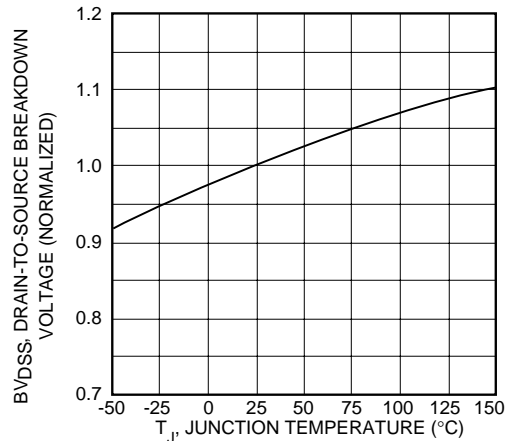


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

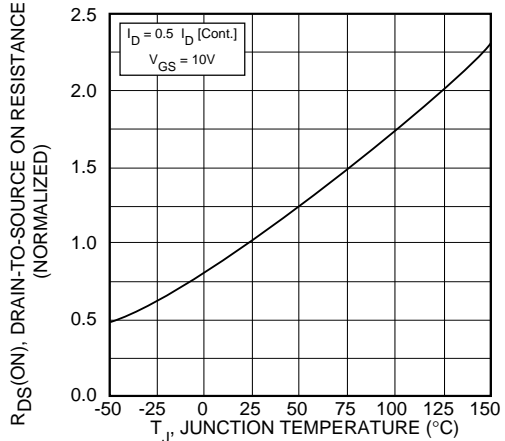


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

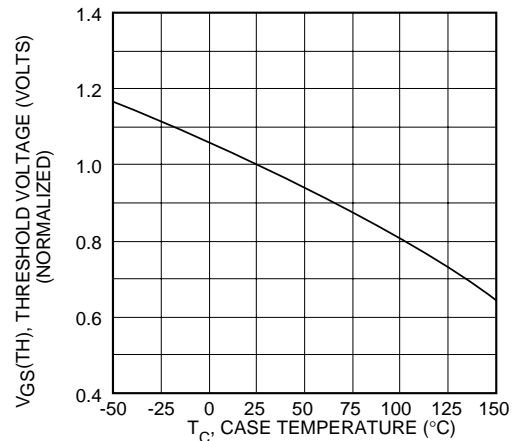


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

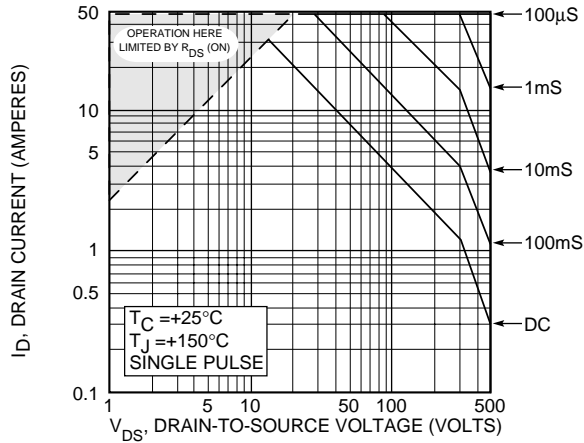


FIGURE 10, MAXIMUM SAFE OPERATING AREA

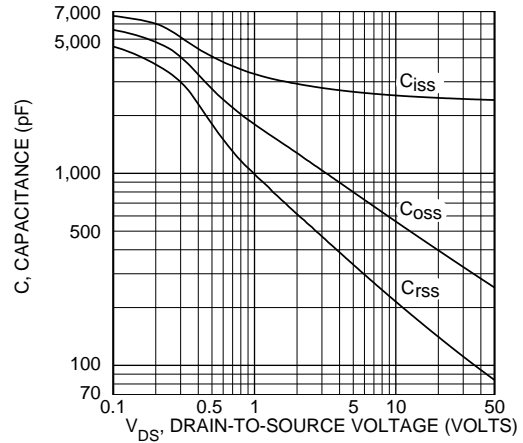


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

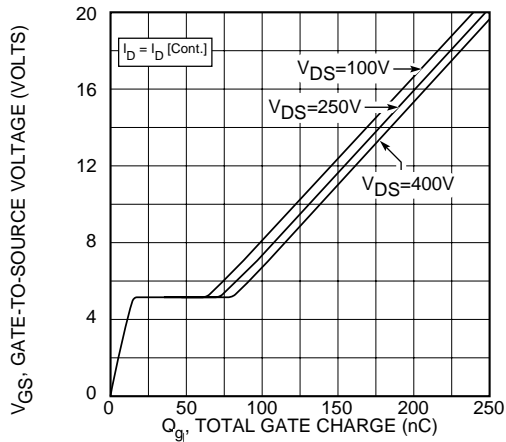


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

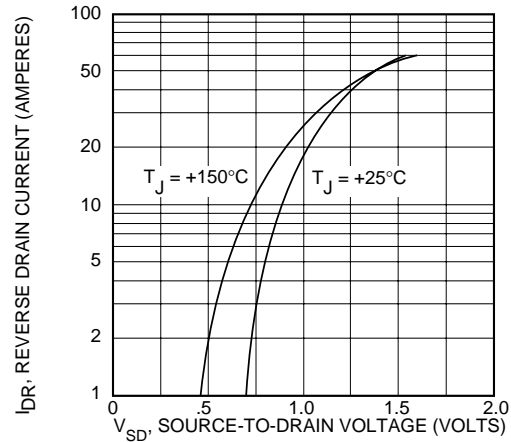
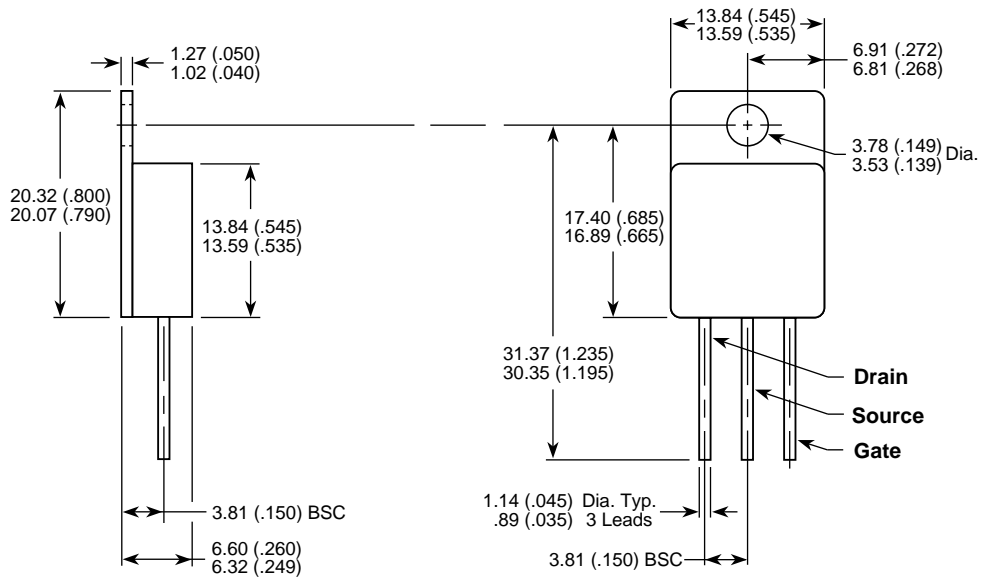


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-254AA Package Outline



Dimensions in Millimeters and (Inches)