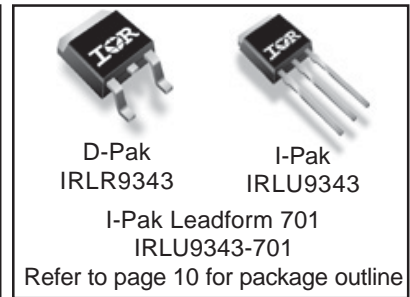
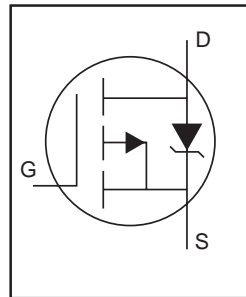


**Features**

- Advanced Process Technology
- Key Parameters Optimized for Class-D Audio Amplifier Applications
- Low  $R_{DS(ON)}$  for Improved Efficiency
- Low  $Q_g$  and  $Q_{sw}$  for Better THD and Improved Efficiency
- Low  $Q_{rr}$  for Better THD and Lower EMI
- 175°C Operating Junction Temperature for Ruggedness
- Repetitive Avalanche Capability for Robustness and Reliability
- Multiple Package Options
- Lead-Free

Key Parameters		
$V_{DS}$	-55	V
$R_{DS(ON)}$ typ. @ $V_{GS} = -10V$	93	mΩ
$R_{DS(ON)}$ typ. @ $V_{GS} = -4.5V$	150	mΩ
$Q_g$ typ.	31	nC
$T_J$ max	175	°C



**Description**

This Digital Audio HEXFET<sup>®</sup> is specifically designed for Class-D audio amplifier applications. This MosFET utilizes the latest processing techniques to achieve low on-resistance per silicon area. Furthermore, Gate charge, body-diode reverse recovery and internal Gate resistance are optimized to improve key Class-D audio amplifier performance factors such as efficiency, THD and EMI. Additional features of this MosFET are 175°C operating junction temperature and repetitive avalanche capability. These features combine to make this MosFET a highly efficient, robust and reliable device for Class-D audio amplifier applications.

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$V_{DS}$	Drain-to-Source Voltage	-55	V
$V_{GS}$	Gate-to-Source Voltage	±20	
$I_D$ @ $T_C = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ -10V	-20	A
$I_D$ @ $T_C = 100^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	-14	
$I_{DM}$	Pulsed Drain Current ①	-60	
$P_D$ @ $T_C = 25^\circ C$	Power Dissipation	79	W
$P_D$ @ $T_C = 100^\circ C$	Power Dissipation	39	
	Linear Derating Factor	0.53	W/°C
$T_J$	Operating Junction and	-40 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Clamping Pressure ⑥	—	N

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑤	—	1.9	
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted) ⑤⑧	—	50	°C/W
$R_{\theta JA}$	Junction-to-Ambient (free air) ⑤	—	110	

Notes ① through ⑧ are on page 10

## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

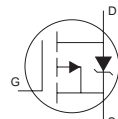
	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	-55	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-52	—	mV/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = -1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	93	105	m $\Omega$	$V_{GS} = -10V, I_D = -3.4A$ ③
		—	150	170		$V_{GS} = -4.5V, I_D = -2.7A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	-1.0	—	—	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-3.7	—	mV/ $^\circ\text{C}$	
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	-2.0	$\mu A$	$V_{DS} = -55V, V_{GS} = 0V$
		—	—	-25		$V_{DS} = -55V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	-100	nA	$V_{GS} = -20V$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS} = 20V$
$g_{fs}$	Forward Transconductance	5.3	—	—	S	$V_{DS} = -25V, I_D = -14A$
$Q_g$	Total Gate Charge	—	31	47		$V_{DS} = -44V$
$Q_{gs}$	Gate-to-Source Charge	—	7.1	—		$V_{GS} = -10V$
$Q_{gd}$	Gate-to-Drain Charge	—	8.5	—		$I_D = -14A$
$Q_{godr}$	Gate Charge Overdrive	—	15	—		See Fig. 6 and 19
$t_{d(on)}$	Turn-On Delay Time	—	9.5	—	ns	$V_{DD} = -28V, V_{GS} = -10V$ ③
$t_r$	Rise Time	—	24	—		$I_D = -14A$
$t_{d(off)}$	Turn-Off Delay Time	—	21	—		$R_G = 2.5\Omega$
$t_f$	Fall Time	—	9.5	—		
$C_{iss}$	Input Capacitance	—	660	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	160	—		$V_{DS} = -50V$
$C_{rss}$	Reverse Transfer Capacitance	—	72	—		$f = 1.0\text{MHz}$ , See Fig. 5
$C_{oss}$	Effective Output Capacitance	—	280	—		$V_{GS} = 0V, V_{DS} = 0V$ to $-44V$
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact ④
$L_S$	Internal Source Inductance	—	7.5	—		

## Avalanche Characteristics

	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②	—	120	mJ
$I_{AR}$	Avalanche Current ⑦	See Fig. 14, 15, 17a, 17b		A
$E_{AR}$	Repetitive Avalanche Energy ⑦			mJ

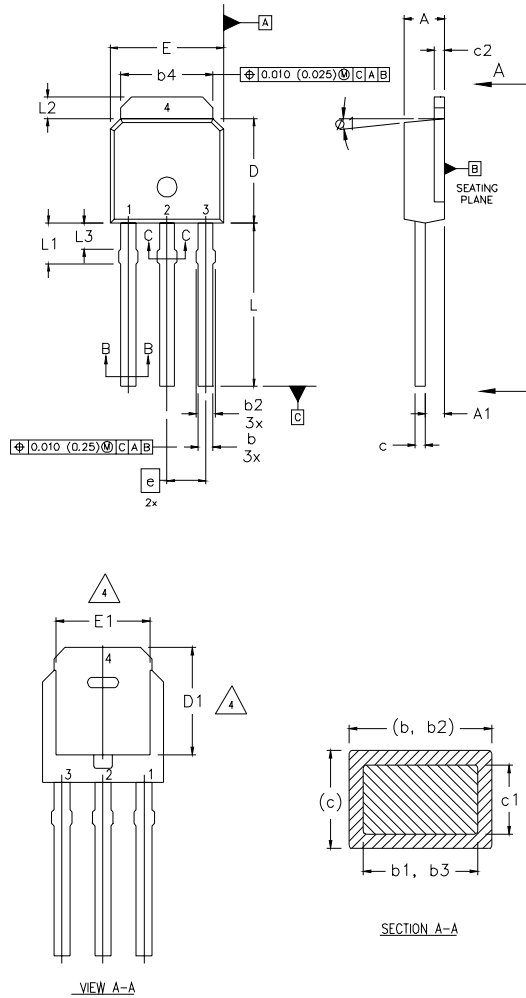
## Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S @ T_C = 25^\circ\text{C}$	Continuous Source Current (Body Diode)	—	—	-20	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	-60		
$V_{SD}$	Diode Forward Voltage	—	—	-1.2	V	$T_J = 25^\circ\text{C}, I_S = -14A, V_{GS} = 0V$ ③
$t_{rr}$	Reverse Recovery Time	—	57	86	ns	$T_J = 25^\circ\text{C}, I_F = -14A$
$Q_{rr}$	Reverse Recovery Charge	—	120	180	nC	$di/dt = 100A/\mu s$ ③



## I-Pak (TO-251AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
- 2 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- 3 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 4 THERMAL PAD CONTOUR OPTION WITHIN DIMENSION b4, L2, E1 & D1.
- 5 LEAD DIMENSION UNCONTROLLED IN L3.
- 6 DIMENSION b1, b3 APPLY TO BASE METAL ONLY.
- 7 OUTLINE CONFORMS TO JEDEC OUTLINE TO-251AA.
- 8 CONTROLLING DIMENSION : INCHES.

LEAD ASSIGNMENTS

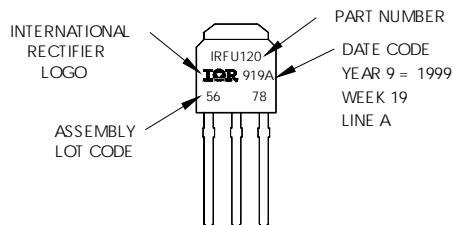
HEXFET

- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	0.086	.094	
A1	0.89	1.14	0.035	0.045	
b	0.64	0.89	0.025	0.035	
b1	0.64	0.79	0.025	0.031	4
b2	0.76	1.14	0.030	0.045	
b3	0.76	1.04	0.030	0.041	
b4	5.00	5.46	0.195	0.215	4
c	0.46	0.61	0.018	0.024	
c1	0.41	0.56	0.016	0.022	
c2	.046	0.86	0.018	0.035	
D	5.97	6.22	0.235	0.245	3, 4
D1	5.21	-	0.205	-	4
E	6.35	6.73	0.250	0.265	3, 4
E1	4.32	-	0.170	-	4
e	2.29		0.090 BSC		
L	8.89	9.60	0.350	0.380	
L1	1.91	2.29	0.075	0.090	
L2	0.89	1.27	0.035	0.050	4
L3	1.14	1.52	0.045	0.060	5
ø1	Ø	15'	Ø	15'	

## I-Pak (TO-251AA) Part Marking Information

EXAMPLE: THIS IS AN IRFU120  
WITH ASSEMBLY  
LOT CODE 5678  
ASSEMBLED ON WW 19, 1999  
IN THE ASSEMBLY LINE "A"  
**Note:** "P" in assembly line  
position indicates "Lead-Free"



OR

