



POWER-MOS FET

FIELD EFFECT POWER TRANSISTOR

**IRF330,331
D86DQ2,Q1**

**5.5 AMPERES
400, 350 VOLTS
 $R_{DS(ON)} = 1.0 \Omega$**

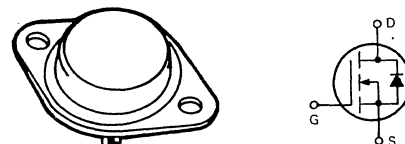
This series of N-Channel Enhancement-mode Power MOSFETs utilizes GE's advanced Power DMOS technology to achieve low on-resistance with excellent device ruggedness and reliability.

This design has been optimized to give superior performance in most switching applications including: switching power supplies, inverters, converters and solenoid/relay drivers. Also, the extended safe operating area with good linear transfer characteristics makes it well suited for many linear applications such as audio amplifiers and servo motors.

Features

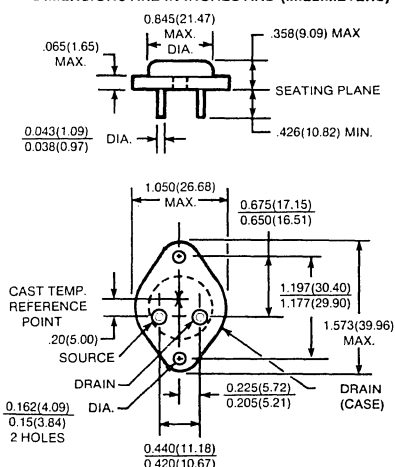
- Polysilicon gate — Improved stability and reliability
- No secondary breakdown — Excellent ruggedness
- Ultra-fast switching — Independent of temperature
- Voltage controlled — High transconductance
- Low input capacitance — Reduced drive requirement
- Excellent thermal stability — Ease of paralleling

N-CHANNEL



CASE STYLE TO-204AA (TO-3)

DIMENSIONS ARE IN INCHES AND (MILLIMETERS)



maximum ratings ($T_C = 25^\circ\text{C}$) (unless otherwise specified)

RATING	SYMBOL	IRF330/D86DQ2	IRF331/D86DQ1	UNITS
Drain-Source Voltage	V_{DS}	400	350	Volts
Drain-Gate Voltage, $R_{GS} = 1M\Omega$	V_{DGR}	400	350	Volts
Continuous Drain Current @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	I_D	5.5 3.5	5.5 3.5	A A
Pulsed Drain Current ⁽¹⁾	I_{DM}	22	22	A
Gate-Source Voltage	V_{GS}	± 20	± 20	Volts
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above 25°C	P_D	75 0.6	75 0.6	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

thermal characteristics

Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.67	1.67	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	30	30	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes: $\frac{1}{8}$ " from Case for 5 Seconds	T_L	260	260	$^\circ\text{C}$

(1) Repetitive Rating; Pulse width limited by max. junction temperature.

electrical characteristics ($T_C = 25^\circ\text{C}$) (unless otherwise specified)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
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off characteristics

Drain-Source Breakdown Voltage ($V_{GS} = 0V$, $I_D = 250\mu A$)	IRF330/D86DQ2 IRF331/D86DQ1	BV_{DSS}	400 350	— —	Volts
Zero Gate Voltage Drain Current ($V_{DS} = \text{Max Rating}$, $V_{GS} = 0V$, $T_C = 25^\circ\text{C}$) ($V_{DS} = \text{Max Rating}$, $\times 0.8$, $V_{GS} = 0V$, $T_C = 125^\circ\text{C}$)		I_{DSS}	— —	— 250 1000	μA
Gate-Source Leakage Current ($V_{GS} = \pm 20V$)		I_{GSS}	—	—	± 100 nA

on characteristics*

Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\mu A$)	$T_C = 25^\circ\text{C}$	$V_{GS(TH)}$	2.0	—	4.0	Volts
On-State Drain Current ($V_{GS} = 10V$, $V_{DS} = 10V$)		$I_{D(ON)}$	5.5	—	—	A
Static Drain-Source On-State Resistance ($V_{GS} = 10V$, $I_D = 3A$)		$R_{DS(ON)}$	—	0.8	1.0	Ohms
Forward Transconductance ($V_{DS} = 10V$, $I_D = 3A$)		g_{fs}	2.1	2.5	—	mhos

dynamic characteristics

Input Capacitance	$V_{GS} = 0V$	C_{iss}	—	650	800	pF
Output Capacitance	$V_{DS} = 25V$	C_{oss}	—	100	300	pF
Reverse Transfer Capacitance	$f = 1\text{ MHz}$	C_{rss}	—	15	80	pF

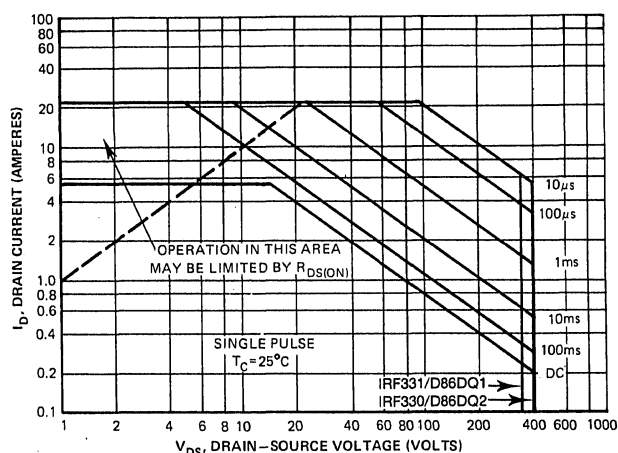
switching characteristics*

Turn-on Delay Time	$V_{DS} = 175V$	$t_{d(on)}$	—	15	—	ns
Rise Time	$I_D = 3A$, $V_{GS} = 15V$	t_r	—	20	—	ns
Turn-off Delay Time	$R_{GEN} = 50\Omega$, $R_{GS} = 12.5\Omega$	$t_{d(off)}$	—	30	—	ns
Fall Time	($R_{GS} \text{ (EQUIV.)} = 10\Omega$)	t_f	—	20	—	ns

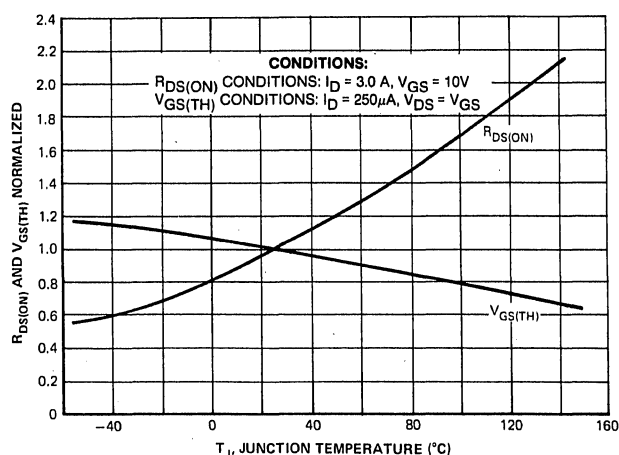
source-drain diode ratings and characteristics*

Continuous Source Current	I_S	—	—	5.5	A
Pulsed Source Current	I_{SM}	—	—	22	A
Diode Forward Voltage ($T_C = 25^\circ\text{C}$, $V_{GS} = 0V$, $I_S = 5.5A$)	V_{SD}	—	1.0	1.6	Volts
Reverse Recovery Time ($I_S = 5.5A$, $dI_S/dt = 100A/\mu s$, $T_C = 125^\circ\text{C}$)	t_{rr} Q_{RR}	—	360 4.0	—	ns μC

*Pulse Test: Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$



MAXIMUM SAFE OPERATING AREA



TYPICAL NORMALIZED $R_{DS(ON)}$ AND $V_{GS(TH)}$ VS. TEMP.