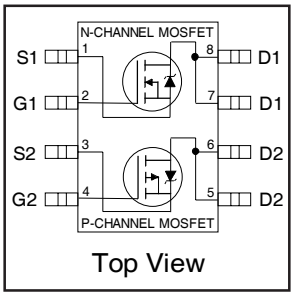
International
IOR Rectifier

IRF7509PbF-1

HEXFET® Power MOSFET

	N-CH	P-CH	
V_{DS}	30	-30	V
$R_{DS(on)\ max}$ (@V_{GS} = 10V)	0.11	0.2	Ω
$Q_{g\ (typical)}$	7.8	7.5	nC
I_D (@T_A = 25°C)	2.7	-2.0	A



Top View


Micro8

Features

Industry-standard pinout Micro-8 Package
Compatible with Existing Surface Mount Techniques
RoHS Compliant, Halogen-Free
MSL1, Industrial qualification

⇒

Benefits

Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRF7509PbF-1	Micro-8	Tube/Bulk	95	IRF7509PbF-1
		Tape and Reel	4000	IRF7509TRPbF-1

Absolute Maximum Ratings

	Parameter	Max.		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	30	-30	V
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS}	2.7	-2.0	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS}	2.1	-1.6	
I_{DM}	Pulsed Drain Current①	21	-16	
P_D @T_A = 25°C	Maximum Power Dissipation④	1.25		W
P_D @T_A = 70°C	Maximum Power Dissipation④	0.8		W
	Linear Derating Factor	10		mW/°C
V_{GS}	Gate-to-Source Voltage	± 20		V
V_{GSM}	Gate-to-Source Voltage Single Pulse tp<10µS	30		V
dv/dt	Peak Diode Recovery dv/dt ②	5.0		V/ns
T_J , T_{STG}	Junction and Storage Temperature Range	-55 to + 150		°C
	Soldering Temperature, for 10 seconds	240 (1.6mm from case)		

Thermal Resistance

	Parameter	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ④	100	°C/W

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter		Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	N-Ch	30	—	—	V	V_{GS} = 0V, I_D = 250µA
		P-Ch	-30	—	—		V_{GS} = 0V, I_D = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	N-Ch	—	0.059	—	V/°C	Reference to 25°C, I_D = 1mA
		P-Ch	—	-0.039	—		Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	N-Ch	—	0.09	0.110	Ω	V_{GS} = 10V, I_D = 1.7A ④
			—	0.14	0.175		V_{GS} = 4.5V, I_D = 0.85A ④
		P-Ch	—	0.17	0.20		V_{GS} = -10V, I_D =-1.2A ④
			—	0.30	0.40		V_{GS} = -4.5V, I_D =-0.6A ④
$V_{GS(th)}$	Gate Threshold Voltage	N-Ch	1.0	—	—	V	V_{DS} = V_{GS}, I_D = 250µA
		P-Ch	-1.0	—	—		V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	N-Ch	1.9	—	—	S	V_{DS} = 10V, I_D = 0.85A ④
		P-Ch	0.92	—	—		V_{DS} = -10V, I_D = -0.6A ④
I_{DSS}	Drain-to-Source Leakage Current	N-Ch	—	—	1.0	µA	V_{DS} = 24 V, V_{GS} = 0V
		P-Ch	—	—	-1.0		V_{DS} = -24V, V_{GS} = 0V
		N-Ch	—	—	25		V_{DS} = 24 V, V_{GS} = 0V, T_J = 125°C
		P-Ch	—	—	-25		V_{DS} = -24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	N-P	—	—	±100		V_{GS} = ± 20V
Q_g	Total Gate Charge	N-Ch	—	7.8	12	nC	N-Channel I_D = 1.7A, V_{DS} = 24V, V_{GS} = 10V ④ P-Channel I_D = -1.2A, V_{DS} = -24V, V_{GS} = -10V
		P-Ch	—	7.5	11		
Q_{gs}	Gate-to-Source Charge	N-Ch	—	1.2	1.8		
		P-Ch	—	1.3	1.9		
Q_{gd}	Gate-to-Drain ("Miller") Charge	N-Ch	—	2.5	3.8		
		P-Ch	—	2.5	3.7		
$t_{d(on)}$	Turn-On Delay Time	N-Ch	—	4.7	—	ns	N-Channel V_{DD} = 15V, I_D = 1.7A, R_G = 6.1Ω, R_D = 8.7Ω ④ P-Channel V_{DD} = -15V, I_D = -1.2A, R_G = 6.2Ω, R_D = 12Ω
		P-Ch	—	9.7	—		
t_r	Rise Time	N-Ch	—	10	—		
		P-Ch	—	12	—		
$t_{d(off)}$	Turn-Off Delay Time	N-Ch	—	12	—		
		P-Ch	—	19	—		
t_f	Fall Time	N-Ch	—	5.3	—		
		P-Ch	—	9.3	—		
C_{iss}	Input Capacitance	N-Ch	—	210	—	pF	N-Channel V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz ③ P-Channel V_{GS} = 0V, V_{DS} = -25V, f = 1.0MHz
		P-Ch	—	180	—		
C_{oss}	Output Capacitance	N-Ch	—	80	—		
		P-Ch	—	87	—		
C_{rss}	Reverse Transfer Capacitance	N-Ch	—	32	—		
		P-Ch	—	42	—		

Source-Drain Ratings and Characteristics

	Parameter		Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	N-Ch	—	—	1.25	A	
		P-Ch	—	—	-1.25		
I_{SM}	Pulsed Source Current (Body Diode) ①	N-Ch	—	—	21		
		P-Ch	—	—	-16		
V_{SD}	Diode Forward Voltage	N-Ch	—	—	1.2	V	T_J = 25°C, I_S = 1.7A, V_{GS} = 0V ③
		P-Ch	—	—	-1.2		T_J = 25°C, I_S = -1.8A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	N-Ch	—	40	60	ns	N-Channel T_J = 25°C, I_F = 1.7A, di/dt = 100A/µs P-Channel ③ T_J = 25°C, I_F = -1.2A, di/dt = -100A/µs
		P-Ch	—	30	45		
Q_{rr}	Reverse Recovery Charge	N-Ch	—	48	72	nC	
		P-Ch	—	37	55		

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 21)

② N-Channel I_{SD} ≤ 1.7A, di/dt ≤ 120A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C
P-Channel I_{SD} ≤ -1.2A, di/dt ≤ 160A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

④ Surface mounted on FR-4 board, t ≤ 10sec.

N - Channel

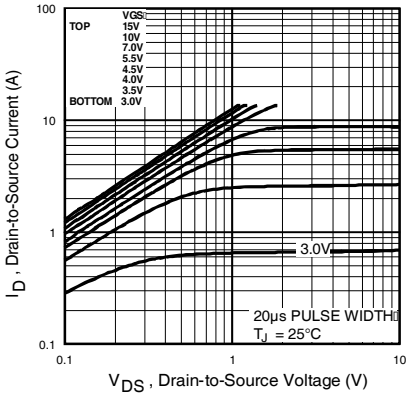


Fig 1. Typical Output Characteristics

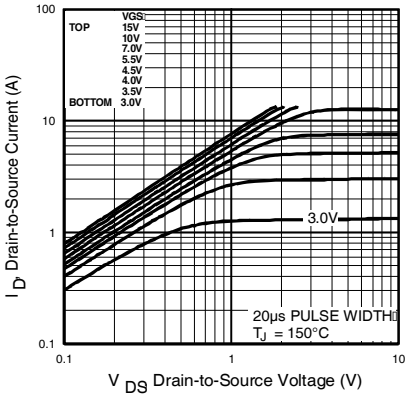


Fig 2. Typical Output Characteristics

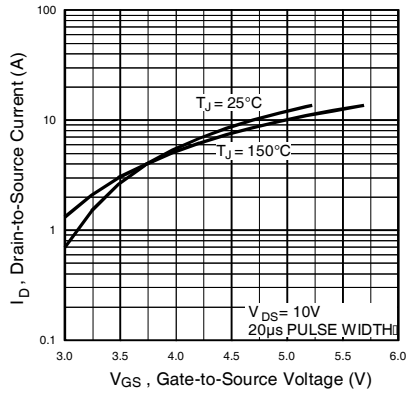


Fig 3. Typical Transfer Characteristics

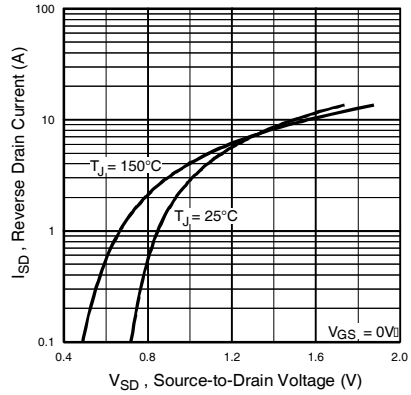


Fig 4. Typical Source-Drain Diode Forward Voltage

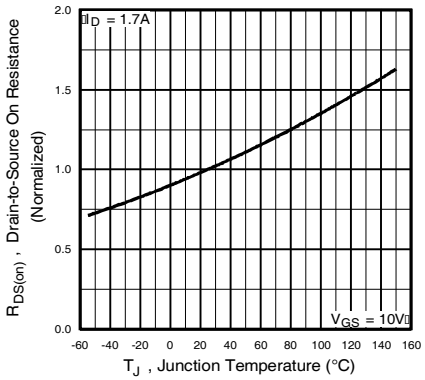


Fig 5. Normalized On-Resistance Vs. Temperature

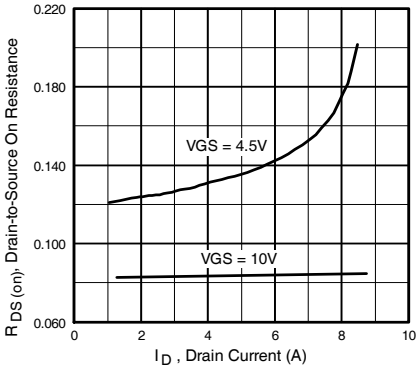


Fig 6. Typical On-Resistance Vs. Drain Current

N - Channel

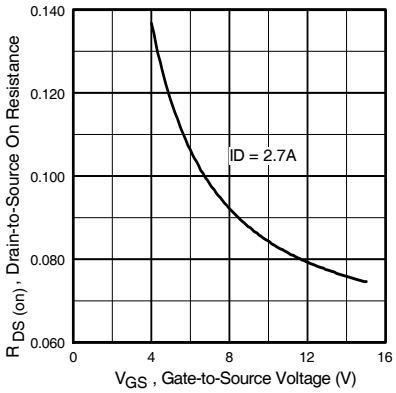


Fig 7. Typical On-Resistance Vs. Gate Voltage

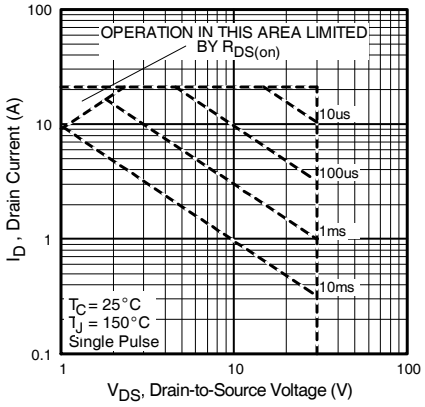


Fig 8. Maximum Safe Operating Area

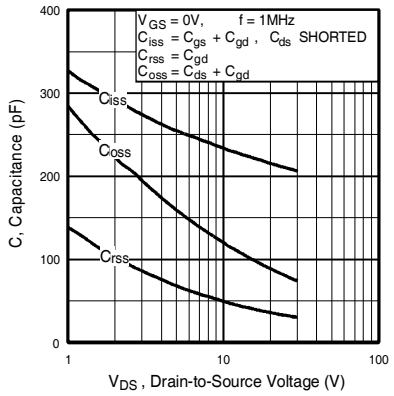


Fig 9. Typical Capacitance Vs. Drain-to-Source Voltage

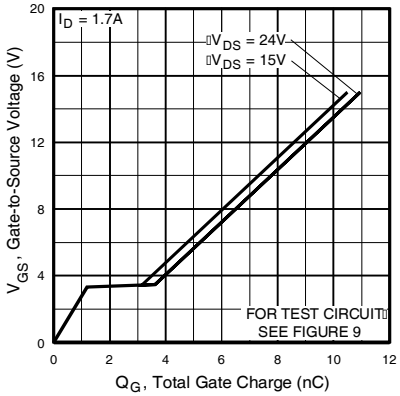


Fig 10. Typical Gate Charge Vs. Gate-to-Source Voltage

P - Channel

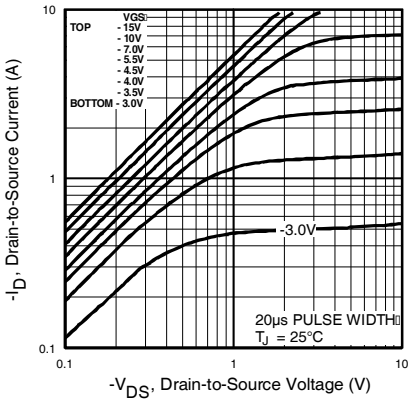


Fig 11. Typical Output Characteristics

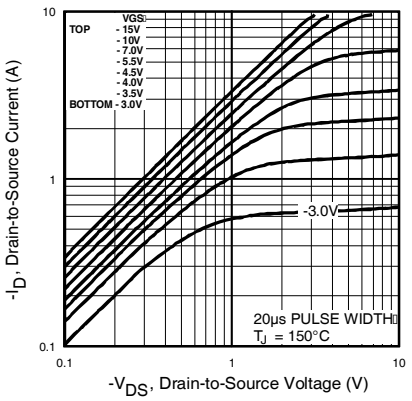


Fig 12. Typical Output Characteristics

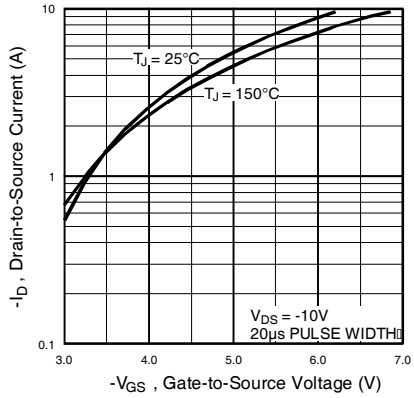


Fig 13. Typical Transfer Characteristics

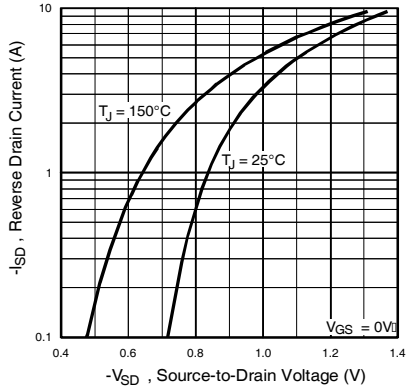


Fig 14. Typical Source-Drain Diode Forward Voltage

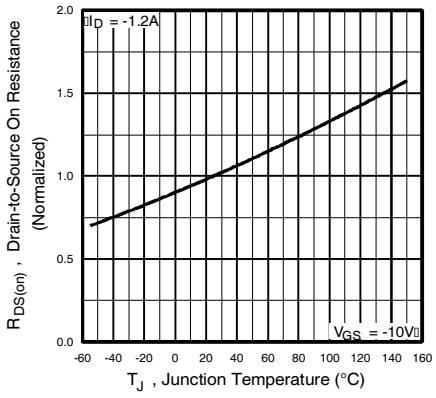


Fig 15. Normalized On-Resistance Vs. Temperature

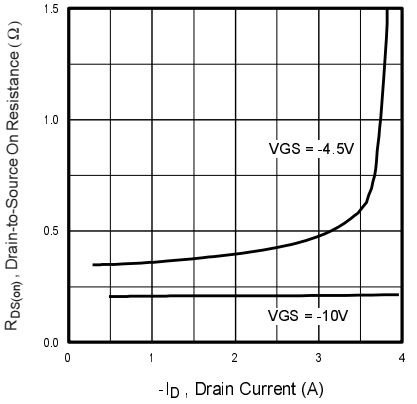


Fig 16. Typical On-Resistance Vs. Drain Current

P - Channel

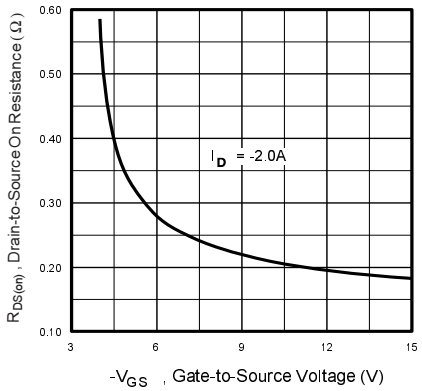


Fig 17. Typical On-Resistance Vs. Gate Voltage

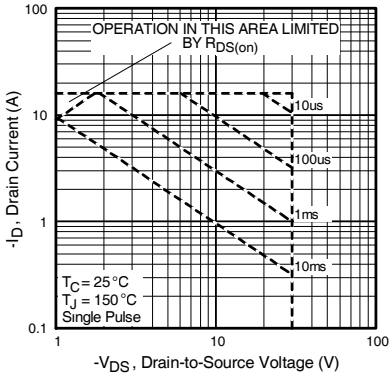


Fig 18. Maximum Safe Operating Area

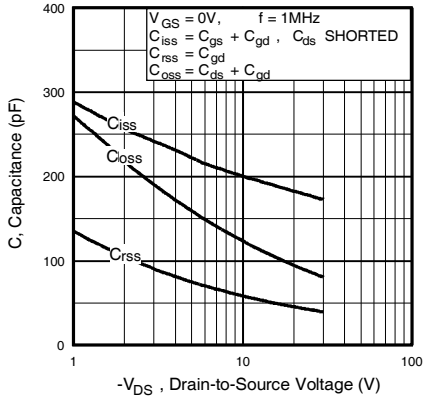


Fig 19. Typical Capacitance Vs. Drain-to-Source Voltage

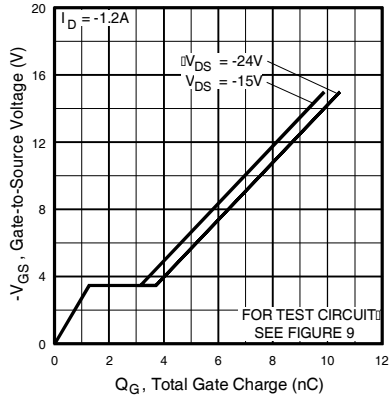


Fig 20. Typical Gate Charge Vs. Gate-to-Source Voltage

N-P - Channel

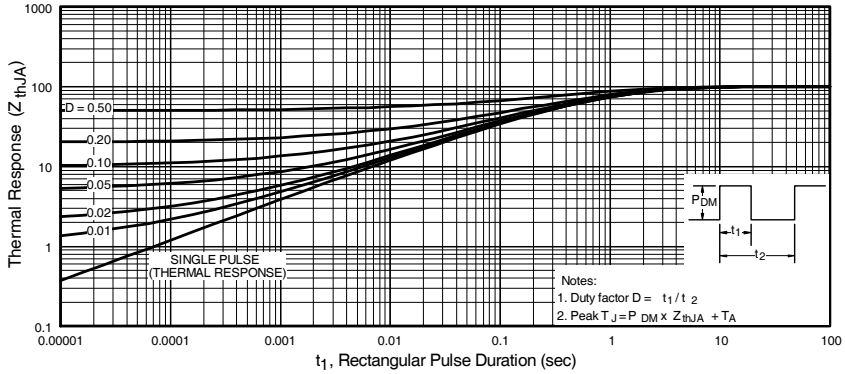
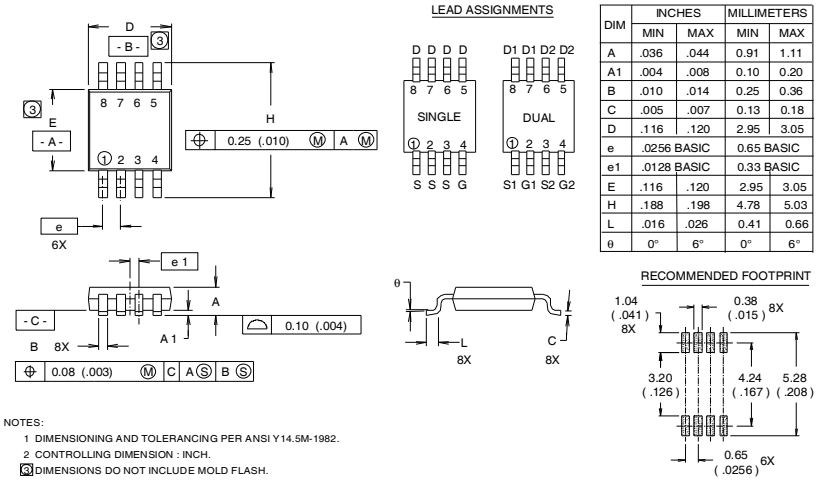


Fig 21. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Micro8 Package Outline

Dimensions are shown in milimeters (inches)

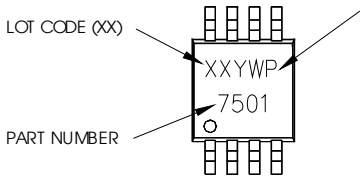


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.036	.044	0.91	1.11
A1	.004	.008	0.10	0.20
B	.010	.014	0.25	0.36
C	.005	.007	0.13	0.18
D	.116	.120	2.95	3.05
e	.0256 BASIC		0.65 BASIC	
e1	.0128 BASIC		0.33 BASIC	
E	.116	.120	2.95	3.05
H	.188	.198	4.78	5.03
L	.016	.026	0.41	0.66
θ	0°	6°	0°	6°

NOTES:
1 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1982.
2 CONTROLLING DIMENSION : INCH.
3 DIMENSIONS DO NOT INCLUDE MOLD FLASH.

Micro8 Part Marking Information (Lead-Free)

EXAMPLE: THIS IS AN IRF7501



DATE CODE (YW)
Y = YEAR
W = WEEK
P = DESIGNATES LEAD-FREE PRODUCT (OPTIONAL)

WW = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR

DATE CODE EXAMPLES:
YWW = 9503 = 5C
YWW = 9532 = EF

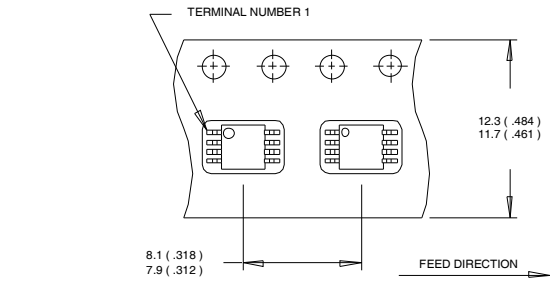
YEAR	Y	WORK WEEK	W
2001	1	01	A
2002	2	02	B
2003	3	03	C
1994	4	04	D
1995	5		
1996	6		
1997	7		
1998	8		
1999	9		
2000	0	24	X
		25	Y
		26	Z

WW = (27-52) IF PRECEDED BY A LETTER

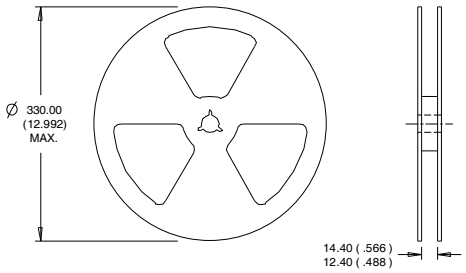
YEAR	Y	WORK WEEK	W
2001	A	27	A
2002	B	28	B
2003	C	29	C
1994	D	30	D
1995	E		
1996	F		
1997	G		
1998	H		
1999	J		
2000	K	50	X
		51	Y
		52	Z

Note: For the most current drawing please refer to IR website at: http://www.irf.com/package/

Micro8 Tape & Reel Information



NOTES:
1. OUTLINE CONFORMS TO EIA-481 & EIA-541.
2. CONTROLLING DIMENSION : MILLIMETER.



NOTES :
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2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

Note: For the most current drawing please refer to IR website at: http://www.irf.com/package/

Qualification information†

Qualification level	Industrial (per JEDEC JESD47F†† guidelines)	
Moisture Sensitivity Level	Micro-8	MSL1 (per JEDEC J-STD-020D††)
RoHS compliant	Yes	

† Qualification standards can be found at International Rectifier's web site: http://www.irf.com/product-info/reliability
†† Applicable version of JEDEC standard at the time of product release

International
IOR Rectifier
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