UMW IRFR2405TR

55V N-Channel MOSFET

1.Description

- Advanced Process Technology
- Dynamic dv/dt Rating
- Fast Switching
- Fully Avalanche Rated
- Lead-Free

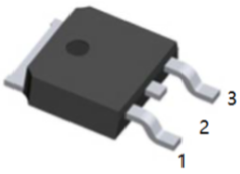
2.Features

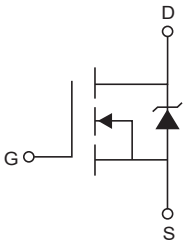
- $V_{DS\ (V)}$=55V
- I_D=56A
- $R_{DS(ON)}$<16mΩ(V_{GS}=10V)

3.Pinning information

Pin	Symbol	Description
1	G	GATE
3	S	SOURCE
2	D	DRAIN

TO-252(DPAK)
top view





4.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Continuous Drain Current, V_{GS}=10V	T_C=25°C	I_D	56 ⑥	A
Continuous Drain Current, V_{GS}=10V	T_C=100°C		40 ⑥	A
Pulsed Drain Current ①		I_{DM}	220	A
Power Dissipation	T_C=25°C	P_D	110	W
Linear Derating Factor			0.71	W/°C
Gate-to-Source Voltage		V_{GS}	±20	V
Single Pulse Avalanche Energy ②		E_{AS}	130	mJ
Avalanche Current ①		I_{AR}	34	A
Repetitive Avalanche Energy ①		E_{AR}	11	mJ
Peak Diode Recovery dv/dt ③		dv/dt	5	V/ns
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C
Soldering Temperature, for 10 seconds			300 (1.6mm from case)	°C

5.Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Case	$R_{\theta JC}$		1.4	°C/W
Junction-to-Ambient (PCB Mount) *	$R_{\theta JA}$		50	°C/W
Junction-to-Ambient	$R_{\theta JA}$		110	°C/W

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=250μA, V_{GS}=0V	55			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D=1mA,Reference to 25°C		0.052		V/°C
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=34A ④		11.8	16	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=10V, I_D=250μA	2		4	V
Forward Transconductance	g_{FS}	V_{DS}=25V, I_D=34A	30			S
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=55V, V_{GS}=0V			20	μA
		V_{DS}=44V,V_{GS}=0V,T_J=150°C			250	μA
Gate-to-Source Forward Leakage	I_{GSS}	V_{GS}=20V			200	nA
Gate-to-Source Reverse Leakage		V_{GS}=-20V			-200	nA
Total Gate Charge	Q_g	I_D=34A		70	110	nC
Gate-to-Source Charge	Q_{gs}	V_{DS}=44V		16	23	nC
Gate-to-Drain ("Miller") Charge	Q_{gd}	V_{GS}=10V ④		19	29	nC
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=28V, I_D=34A R_G=6.8Ω, V_{GS}=10V ④		15		ns
Rise Time	t_r			130		ns
Turn-Off Delay Time	$t_{D(off)}$			55		ns
Fall Time	t_f			78		ns
Internal Drain inductance	L_D	Between lead, 6mm (0.25in.)from package and center of die contact		4.5		nH
Internal Source inductance	L_S			7.5		nH
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V f=1MHz, See Fig. 5 V_{GS}=0V, V_{DS}=1V, f=1MHz V_{GS}=0V, V_{DS}=44V, f=1MHz V_{GS}=0V, V_{DS}=0V to 44V		2430		pF
Output Capacitance	C_{oss}			470		pF
Reverse Transfer Capacitance	C_{rss}			100		pF
Output Capacitance	C_{oss}			2040		pF
Output Capacitance	C_{oss}			350		pF
Effective Output Capacitance ⑤	C_{oss} eff.			350		pF

Source-Drain Ratings and Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			56 ⑥	A
Pulsed Source Current (Body Diode) ①	I_{SM}				220	
Diode Forward Voltage	V_{SD}	T_J=25°C, I_S=34A, V_{GS}=0V ④			1.3	V
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=34A dI/dt=100A/μs ④		62	93	ns
Reverse Recovery Charge	Q_{rr}			170	260	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J=25°C, L=0.22mH, R_G=25Ω, I_{AS}=34A.

③ ISD ≤ 34A, di/dt ≤ 190A/μs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

⑤ C_{oss} eff. is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑥ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 30A.

7.1Typical Characterisitics

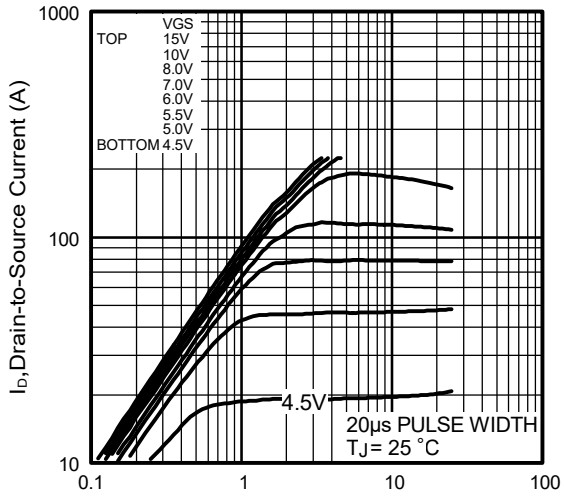


Figure 1: Typical Output Characteristics

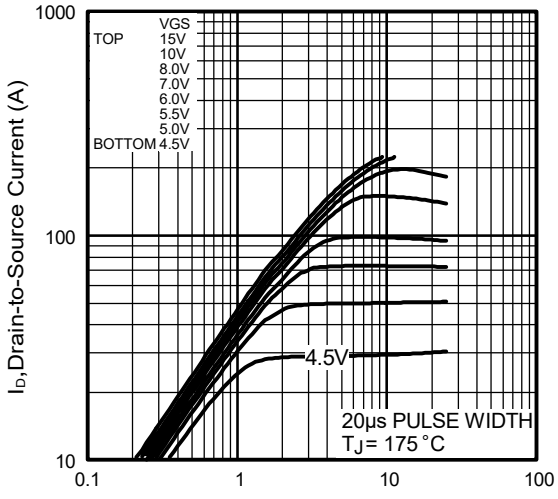


Figure 2: Typical Output Characteristics

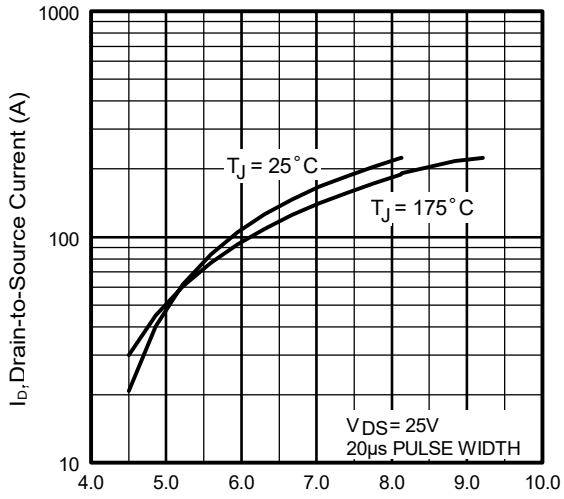


Figure 3: Typical Transfer Characteristics

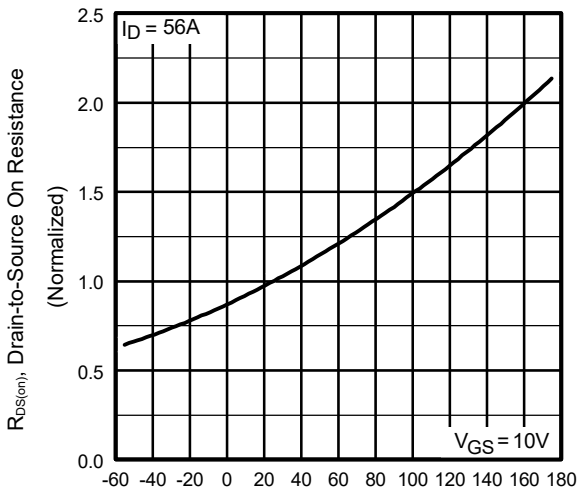
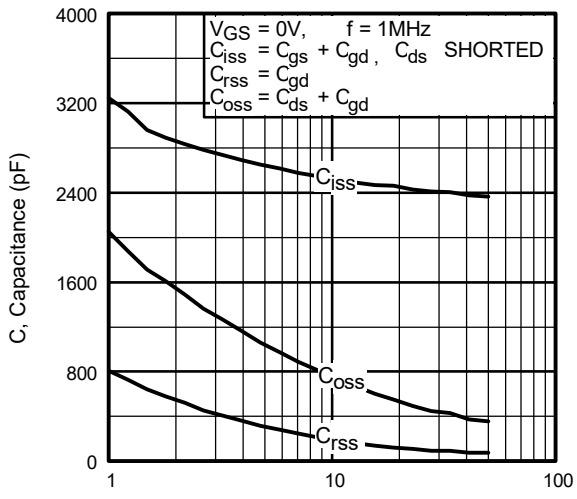


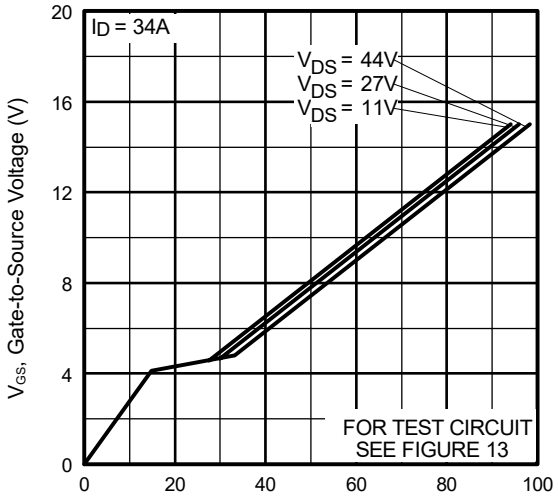
Figure 4: Nomalized On-ResistanceVs. Temperature

7.2Typical Characterisitics



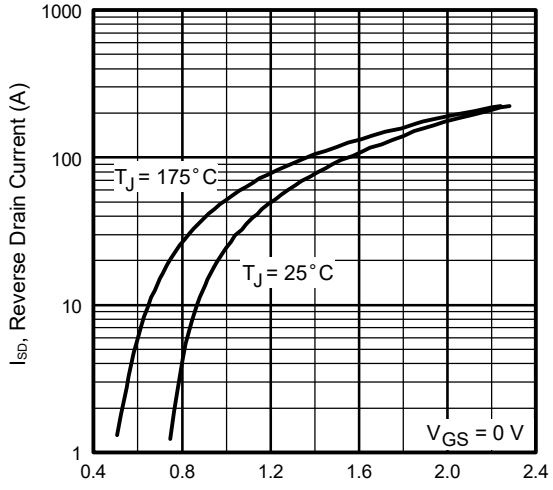
V_{DS} ,Drain-to-Source Voltage (V)

Figure 5: Typical Capacitance Vs. Drain-to-Source Voltage



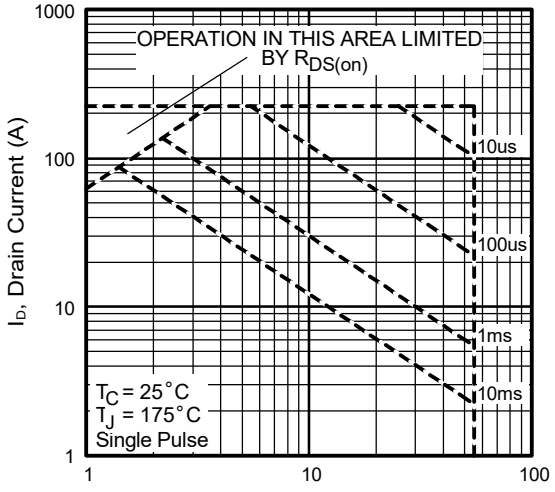
Q_G, Total Gate Charge (nC)

Figure 6: Typical Gate Charge Vs. Gate-to-Source Voltage



V_{SD}, Source-to-Drain Voltage (V)

Figure 7: Typical Source-Drain Diode Forward Voltage



V_{DS}, Drain-to-Source Voltage (V)

Figure 8: Maximum Safe Operating Area

7.3Typical Characterisitics

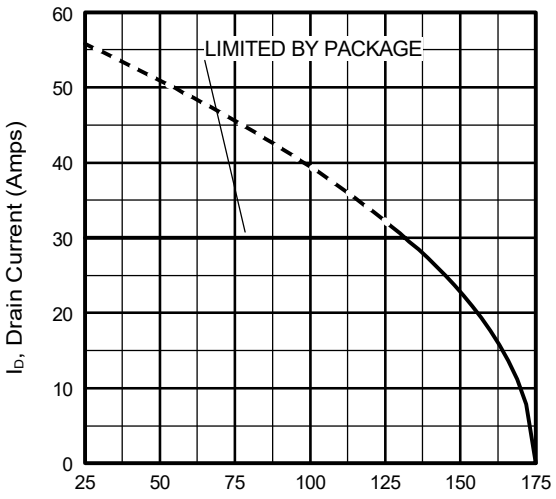


Figure 9: Maximum Drain Current Vs. Case Temperature

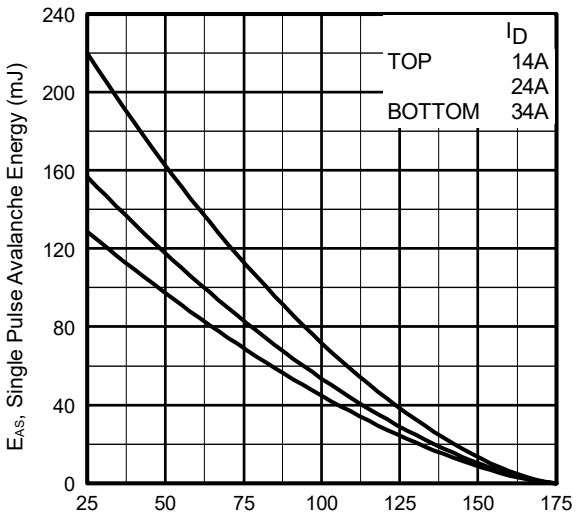


Figure 10: Maximum Avalanche Energy Vs. Drain Current

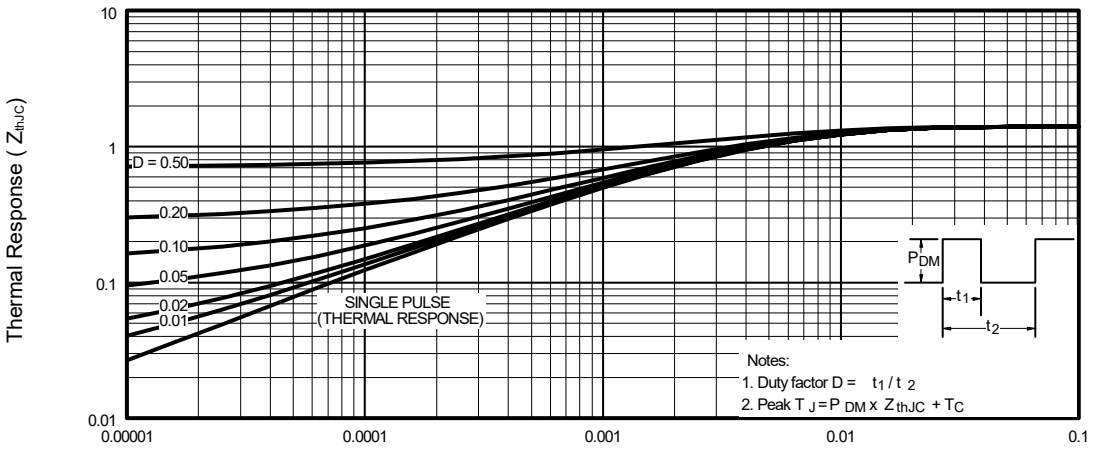


Figure 11: Maximum Effective Transient Thermal Impedance, Junction-to-Case

7.4Typical Characterisitics

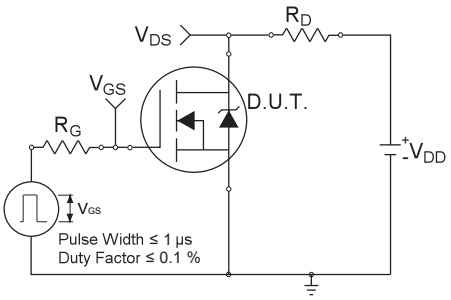


Figure 12a: Switching Time Test Circuit

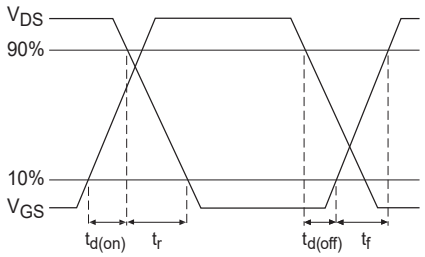


Figure 12b: Switching Time Waveforms

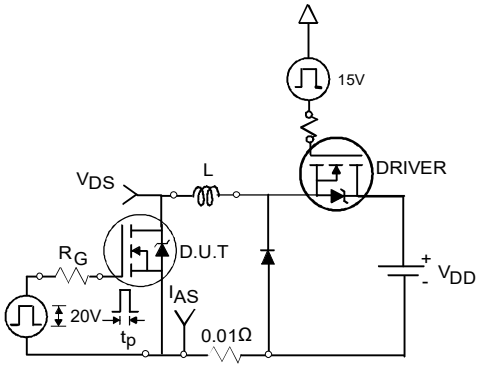


Figure 13a: Unclamped Inductive Test Circuit

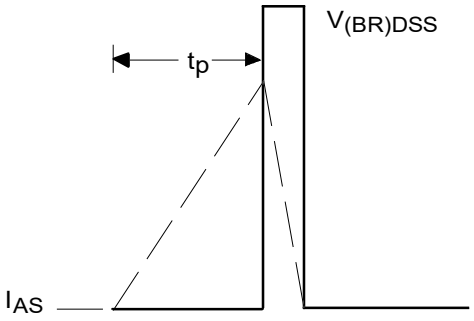


Figure 13b: Unclamped Inductive Waveforms

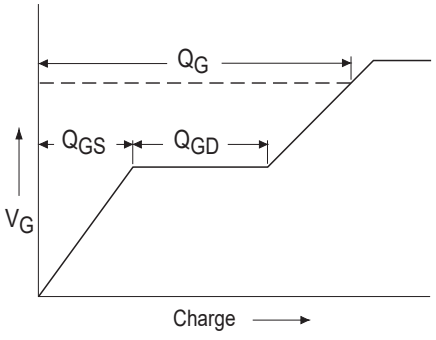


Figure 14a: Basic Gate Charge Waveform

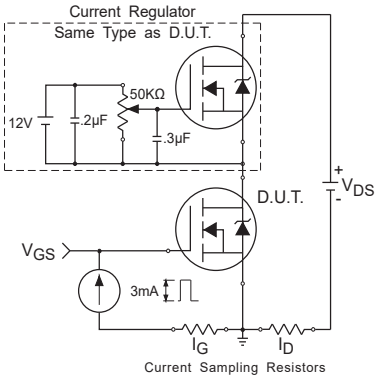
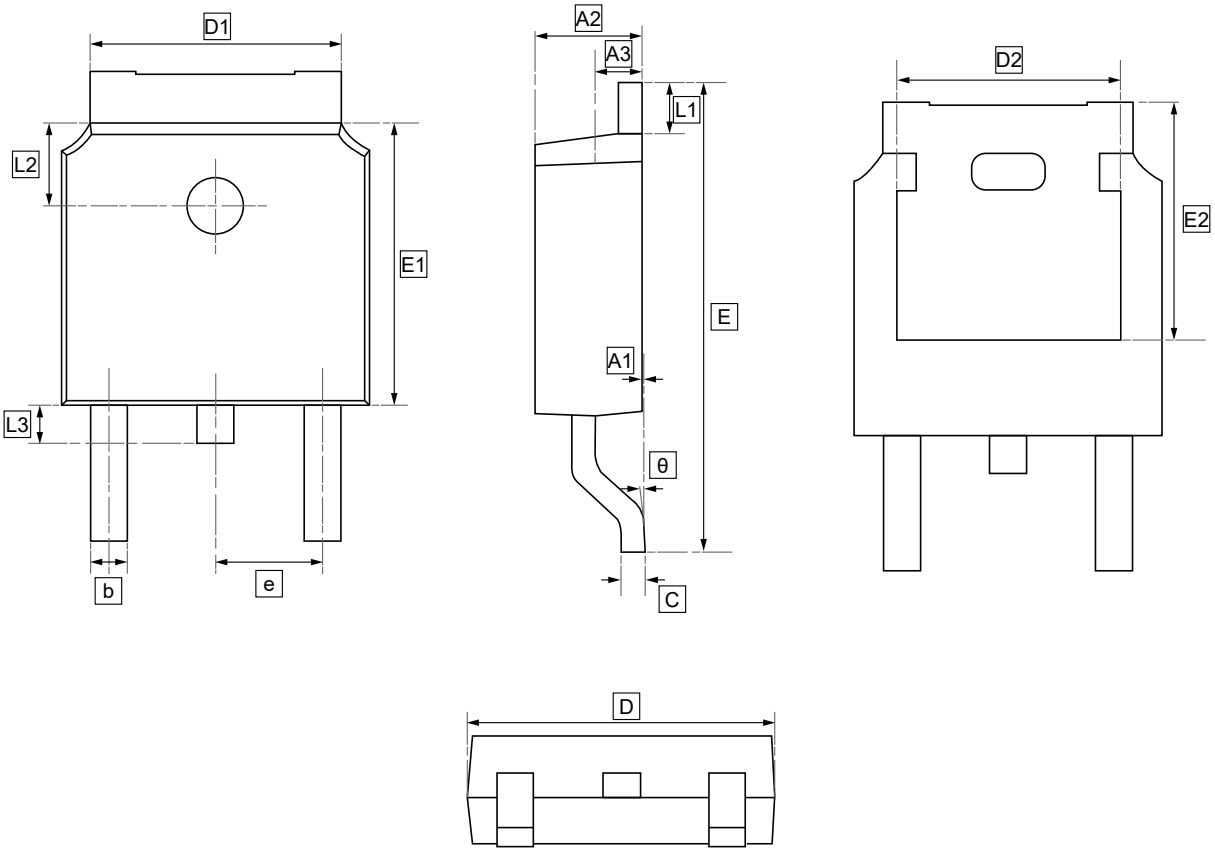


Figure 14b: Gate Charge Test Circuit

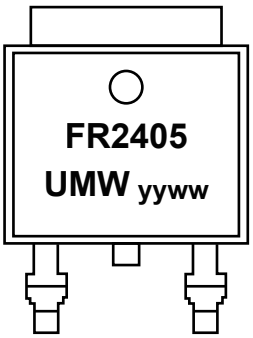
8.TO-252 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A1	A2	A3	b	c	D	D1	D2	E	E1	E2	e	L1	L2	L3	θ
Min	0.00	2.18	0.90	0.65	0.46	6.35	4.95	4.32	9.40	5.97	5.21	2.286	0.89	1.70	0.60	0.00
Max	0.13	2.39	1.10	0.85	0.61	6.73	5.46	4.90	10.41	6.22	5.38	BSC	1.27	1.90	1.00	8.00

9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRFR2405TR	TO-252	2500	Tape and reel

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