UMW IRF540N

100V N-Channel MOSFET

1.Description

The IRF540N uses advanced trench technology toprovide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

2.Application

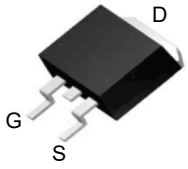
- Power switching application
- Hard switched and High frequency circuits
- Uninterruptible power supply

3.Features

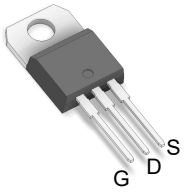
- V_{DS}=100V, I_D=30A
- $R_{DS(ON)}$<40mΩ @ V_{GS}=10V
- High density cell design for lower Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation

4.Pinning information

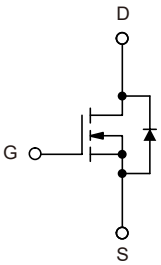
Pin	Symbol	Description
1	G	GATE
2	D	DRAIN
3	S	SOURCE



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5.Absolute Maximum Ratings T_A= 25°C

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	30	A
Drain Current-Pulsed (Note 1)	I_{DM}	100	A
Maximum Power Dissipation (T_C=25°C)	P_D	70	W
Single pulse avalanche energy (Note 2)	E_{AS}	96	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	°C

6.Thermal Characteristic

Parameter	Symbol	Limit	Units
Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	3.5	°C/W

7.Electrical Characteristics (T_A= 25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_{DS}=250μA	100			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=100V, V_{GS}=0V			1	μA
Gate-Body Leakage	I_{GSS}	V_{GS}=±20V, V_{DS}=0V			±100	nA
On Characteristic						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2	3	4	V
Drain-Source On-State Resistance (Note 3)	$R_{DS(ON)}$	V_{GS}=10V, I_D=12A		40	44	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V, I_D=15A		22		S
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=25V, V_{GS}=0V, f=1MHz		2550		pF
Output Capacitance	C_{oss}			225		pF
Reverse Transfer Capacitance	C_{rss}			205		pF
Switching Characteristics						
Turn-On Delay Time	$t_{D(on)}$	V_{DD}=50V, I_D=20A R_{GEN}=10Ω, V_{GS}=10V		29		nS
Rise Time	t_r			13		nS
Turn-Off Delay Time	$t_{D(off)}$			58.2		nS
Fall Time	t_f			13.4		nS
Total Gate Charge	Q_g	V_{DS}=80V, I_D=20A, V_{GS}=10V		55		nC
Gate-Source Charge	Q_{gs}			15		nC
Gate-Drain Charge	Q_{gd}			20		nC

Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=20A			1.2	V
Reverse Recovery Time	t_{rr}	T_J=25°C, I_F=10A		58		nS
Reverse Recovery Charge	Q_{rr}	di/dt=100A/μs (Notes 3)		110		nC

Notes:

1: Repetitive rating, pulse width limited by maximum junction temperature.

2: E_{AS} condition :T_J=25°C, V_{DD}=50V, V_{GS}=10V, L=0.5mH, R_g=25Ω.

3: Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

4: Guaranteed by design, not subject to production.

8.1 Typical Characterisitics

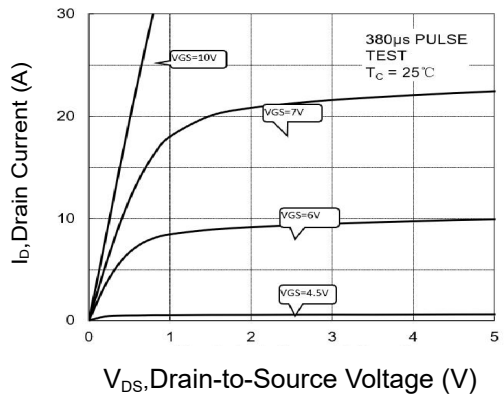


Figure 1: Output Characteristics

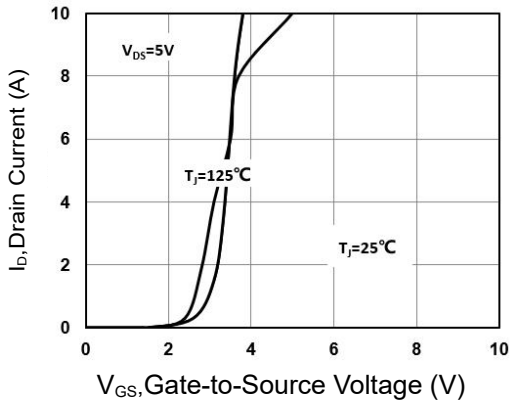


Figure 2: Transfer Characteristics

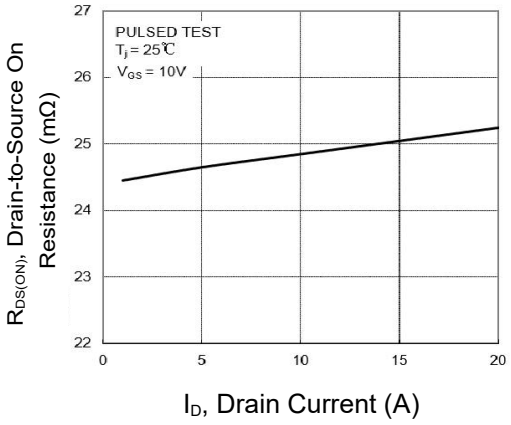


Figure 3: On-Resistance vs. I_D and V_{GS}

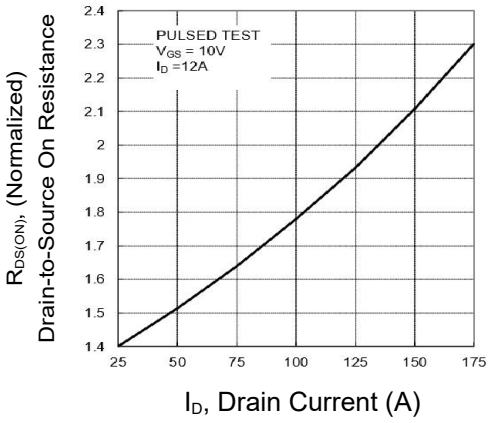


Figure 4: On-Resistance vs. Junction Temperature

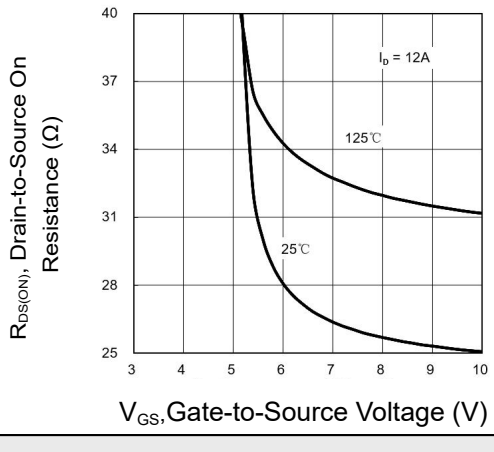


Figure 5: On-Resistance vs. V_{GS}

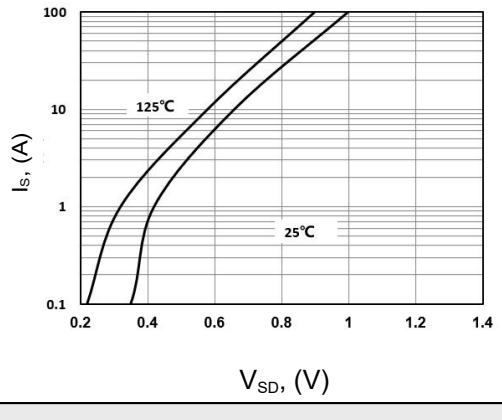


Figure 6: Body Diode Forward Voltage

8.2 Typical Characterisitics

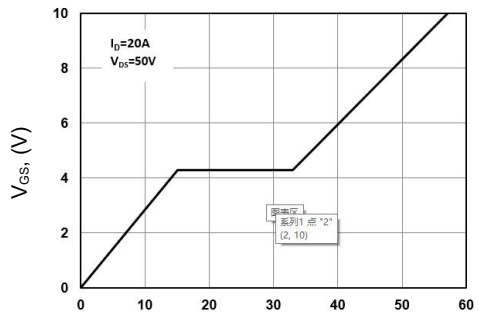


Figure 7: Gate-Charge Characteristics

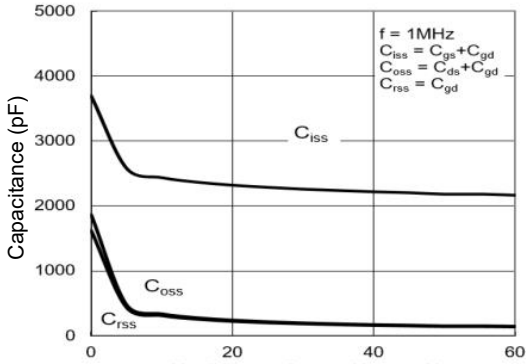


Figure 8: Source-Drain Diode Forward Voltage

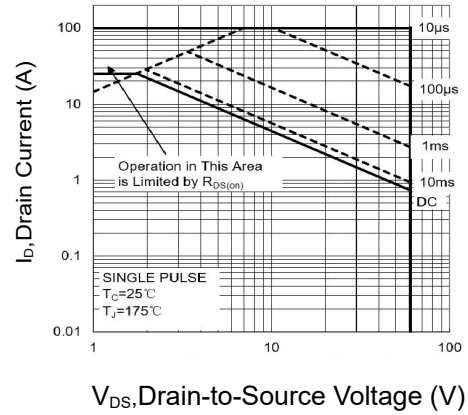


Figure 9: Maximum Forward Biased Safe Operation Area

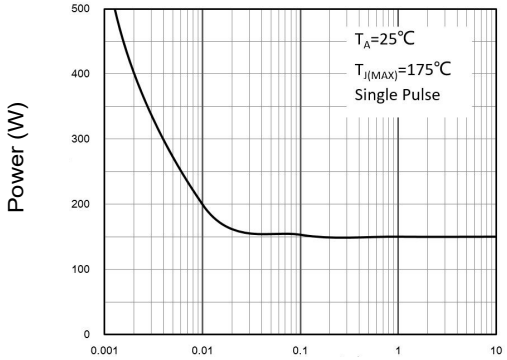


Figure 10: Single Pulse Power Rating Junction-to-Ambient

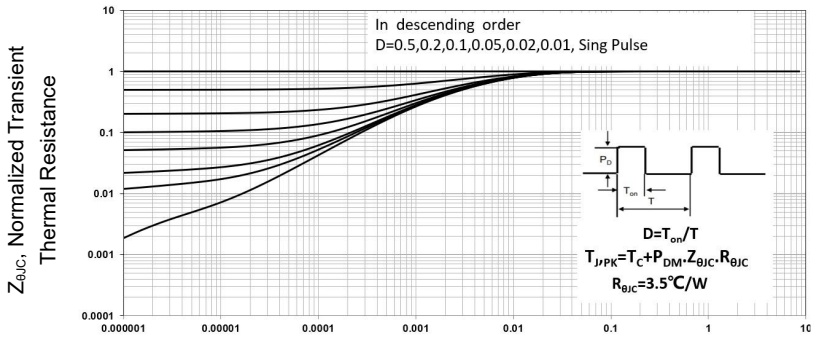
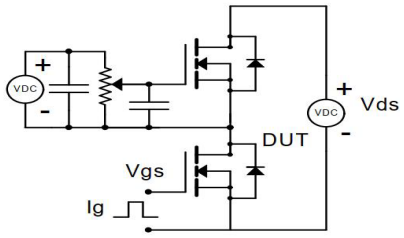
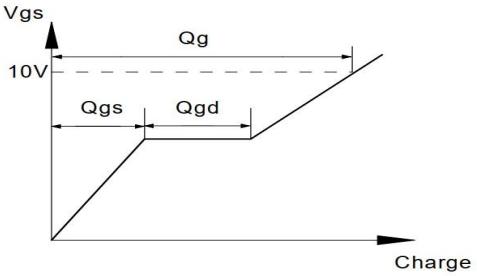


Figure 11: Normalized Maximum Transient Thermal Impedance

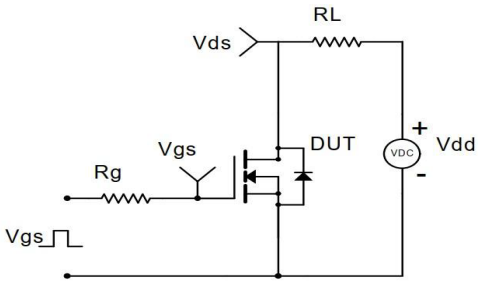
8.3 Typical Characterisitics



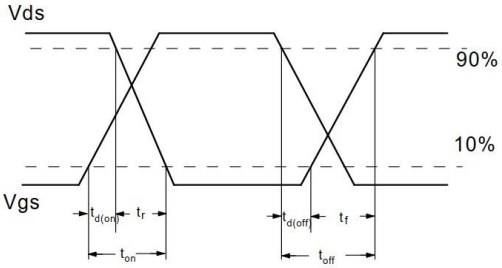
Gate Charge Test Circuit



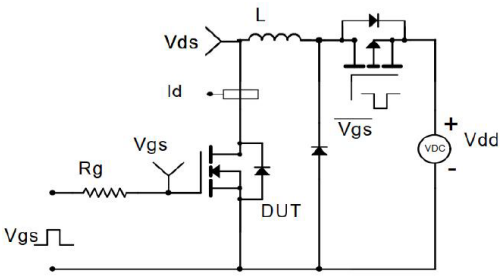
Gate Charge Test Waveform



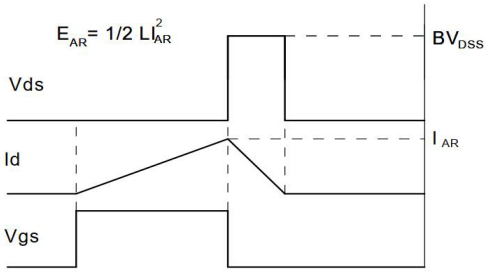
Resistive Switching Test Circui



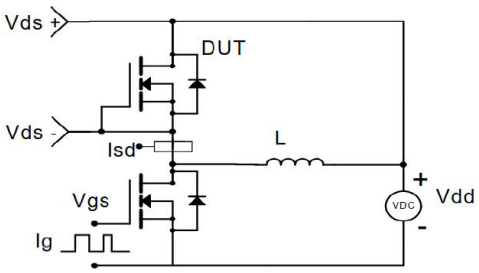
Resistive Switching Test Waveforms



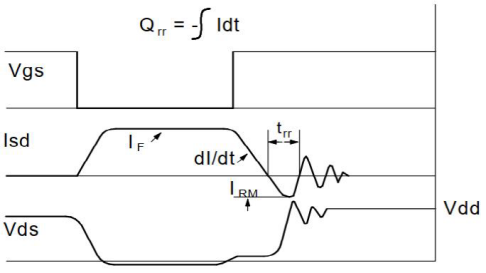
Unclamped Inductive Switching (UIS) Test Circuit



Unclamped Inductive Switching (UIS) Test Waveforms

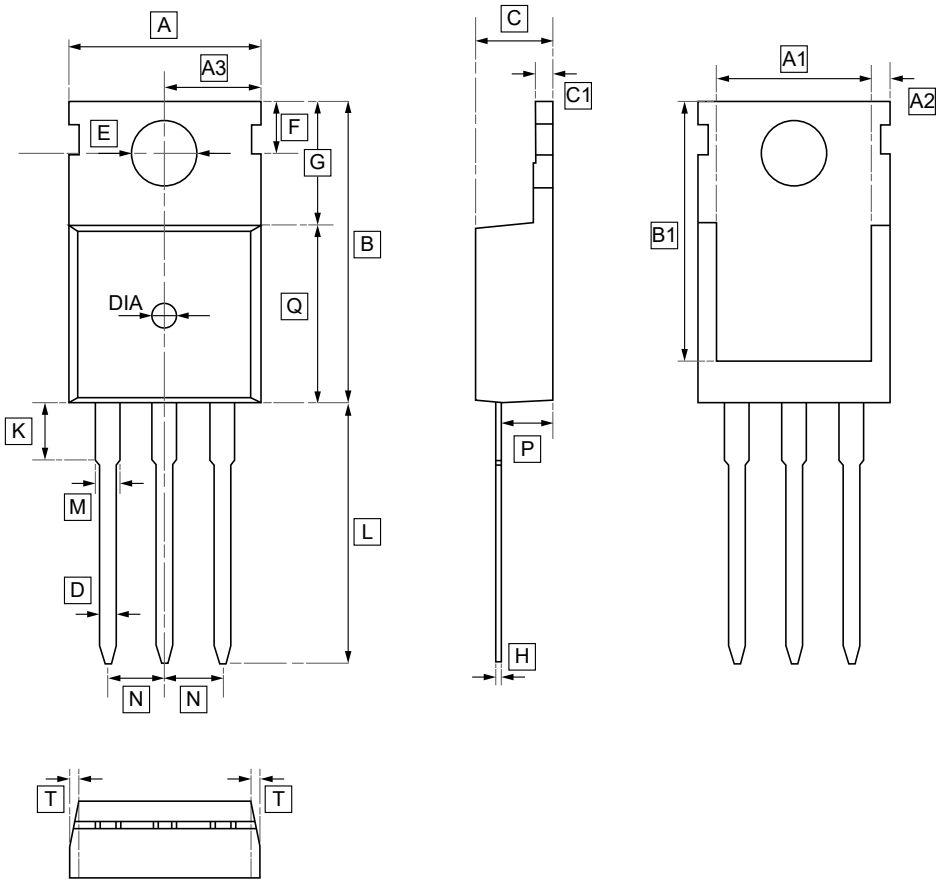


Diode Recovery Test Circuit



Diode Recovery Test Waveforms

9.1 TO-220 Package Outline Dimensions

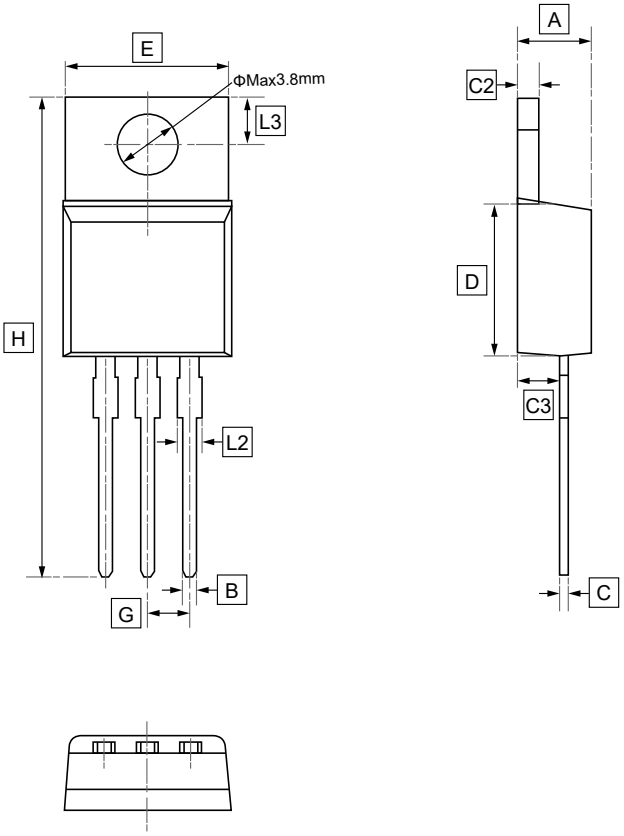


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	B	B1	C	C1	D	E	F	G
Min	9.7	8.44	1.05	4.8	15.4	12.9	4.28	1.1	0.6	3.4	2.65	5.2
Max	10.3	8.84	1.25	5.2	16.2	13.5	4.68	1.5	1.0	3.8	3.25	5.8

Symbol	H	K	L	L1	M	N	P	Q	T	DIA
Min	0.4	2.9	12.8	2.7	1.15	2.49	2.1	8.7	W:0.35	⊙1.5
Max	0.6	3.3	13.6	3.3	1.35	2.59	2.7	9.3		(deep 0.2)

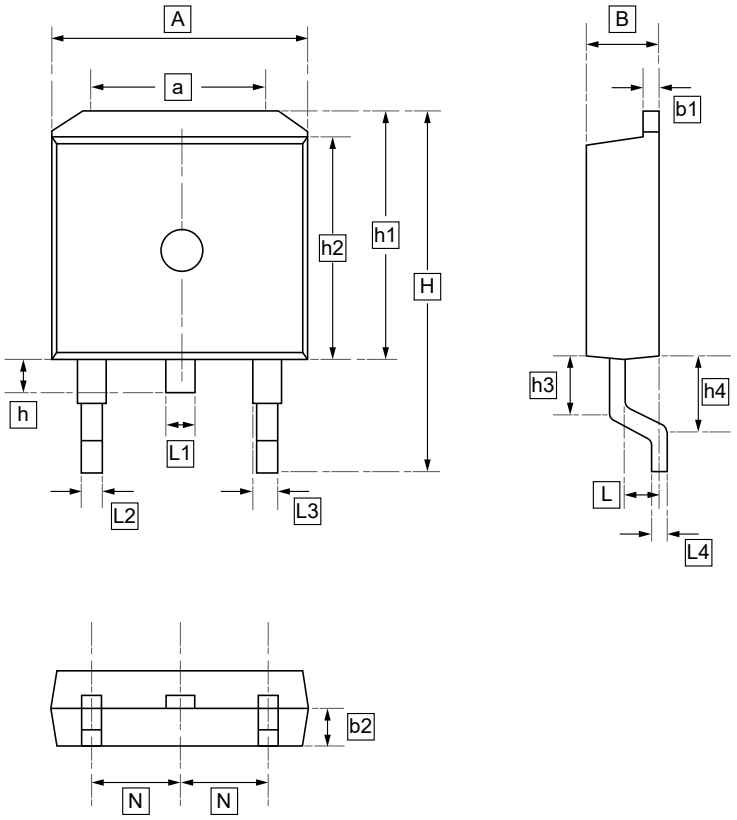
9.2 TO-220 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	C2	C3	D	E	G	H	L2	L3
Min	4.30	0.60	0.28	1.17	2.30	8.80	9.80	2.44	28.55	1.10	2.59
Max	4.70	1.00	0.48	1.37	2.70	9.20	10.20	2.64	29.15	1.50	2.89

9.3 TO-263 Package Outline Dimensions

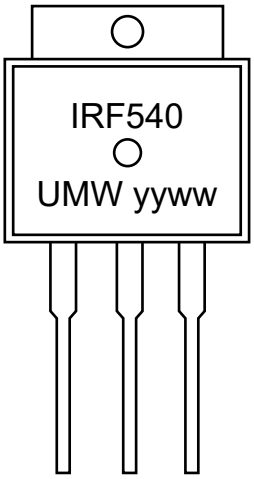


DIMENSIONS (mm are the original dimensions)

Symbol	A	a	B	b1	b2	H	h	h1	h2	h3	h4	L	L1	L2	L3
Min	9.6	7.2	4.3	1.25	2.2	15.2	1.34	10.3	9.1	1.34	2.5	2.2	1.2	0.7	1.2
Max	10.0	7.6	4.7	1.35	2.6	15.8	1.74	10.7	9.3	1.74	2.9	2.6	1.4	0.9	1.4

Symbol	L4	N
Min	0.4	2.4
Max	0.6	2.5

10.Ordering Information



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW IRF540N	IRF540	TO-220	1000	Tape and reel
UMW IRF540NSTRL	F540NS	TO-263	800	Tape and box

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