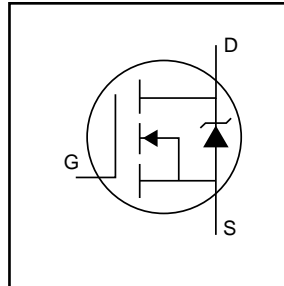


IRLML2402

HEXFET® Power MOSFET

- Generation V Technology
- Ultra Low On-Resistance
- N-Channel MOSFET
- SOT-23 Footprint
- Low Profile (<1.1mm)
- Available in Tape and Reel
- Fast Switching



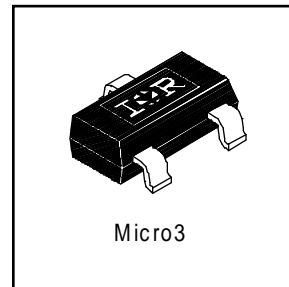
$V_{DS} = 20V$

$R_{DS(on)} = 0.25\Omega$

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

A customized leadframe has been incorporated into the standard SOT-23 package to produce a HEXFET Power MOSFET with the industry's smallest footprint. This package, dubbed the Micro3, is ideal for applications where printed circuit board space is at a premium. The low profile (<1.1mm) of the Micro3 allows it to fit easily into extremely thin application environments such as portable electronics and PCMCIA cards.



Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	1.2	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	0.95	
I_{DM}	Pulsed Drain Current ①	7.4	
$P_D @ T_A = 25^\circ C$	Power Dissipation	540	mW
	Linear Derating Factor	4.3	mW/°C
V_{GS}	Gate-to-Source Voltage	± 12	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

Thermal Resistance

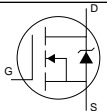
	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ④	—	230	°C/W

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	20	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.024	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.25	Ω	$V_{GS} = 4.5V, I_D = 0.93A$ ③
		—	—	0.35		$V_{GS} = 2.7V, I_D = 0.47A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	0.70	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	1.3	—	—	S	$V_{DS} = 10V, I_D = 0.47A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{DS} = 16V, V_{GS} = 0V$
		—	—	25		$V_{DS} = 16V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	-100	nA	$V_{GS} = -12V$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS} = 12V$
Q_g	Total Gate Charge	—	2.6	3.9	nC	$I_D = 0.93A$
Q_{gs}	Gate-to-Source Charge	—	0.41	0.62		$V_{DS} = 16V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	1.1	1.7		$V_{GS} = 4.5V$, See Fig. 6 and 9 ③
$t_{d(on)}$	Turn-On Delay Time	—	2.5	—	ns	$V_{DD} = 10V$
t_r	Rise Time	—	9.5	—		$I_D = 0.93A$
$t_{d(off)}$	Turn-Off Delay Time	—	9.7	—		$R_G = 6.2\Omega$
t_f	Fall Time	—	4.8	—		$R_D = 11\Omega$, See Fig. 10 ③
C_{iss}	Input Capacitance	—	110	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	51	—		$V_{DS} = 15V$
C_{riss}	Reverse Transfer Capacitance	—	25	—		$f = 1.0MHz$, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	0.54	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	7.4		
V_{SD}	Diode Forward Voltage	—	—	1.2	V	$T_J = 25^\circ\text{C}, I_S = 0.93A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	25	38	ns	$T_J = 25^\circ\text{C}, I_F = 0.93A$
Q_{rr}	Reverse Recovery Charge	—	16	24	nC	$di/dt = 100A/\mu s$ ③



Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

③ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

② $I_{SD} \leq 0.93A, di/dt \leq 90A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$

④ Surface mounted on FR-4 board, $t \leq 5sec.$

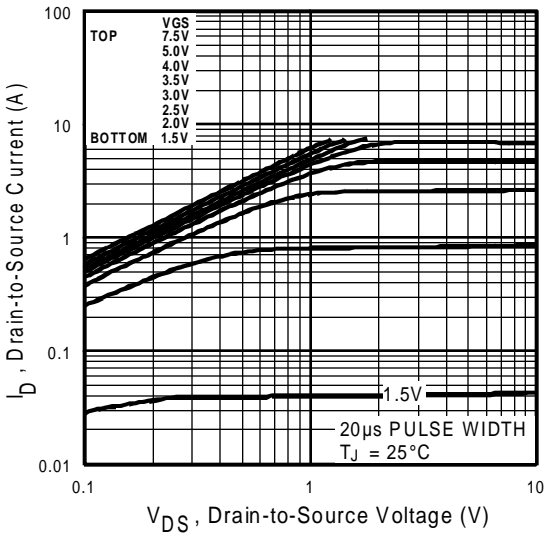


Fig 1. Typical Output Characteristics

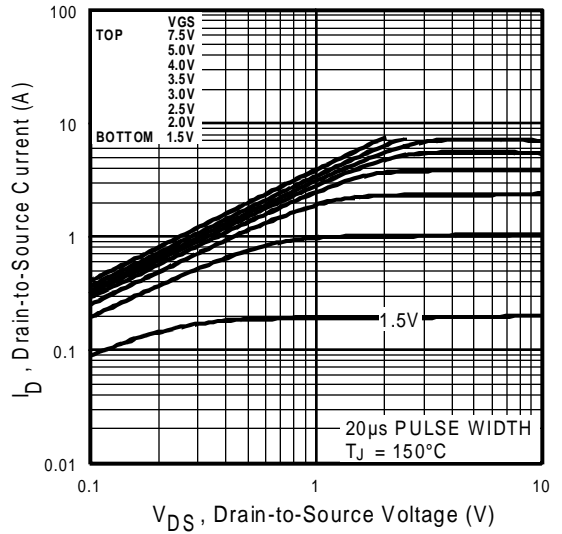


Fig 2. Typical Output Characteristics

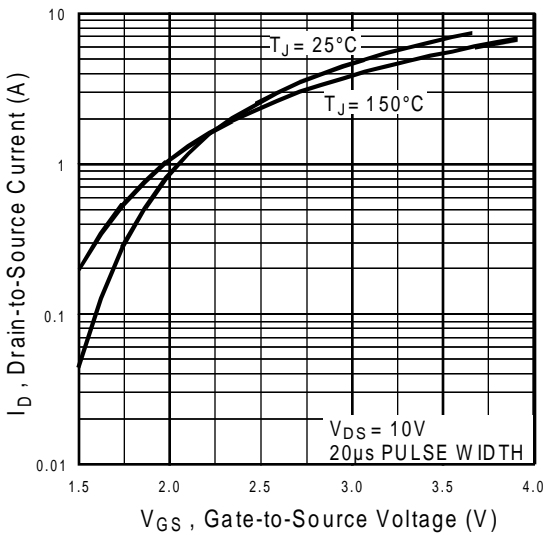


Fig 3. Typical Transfer Characteristics

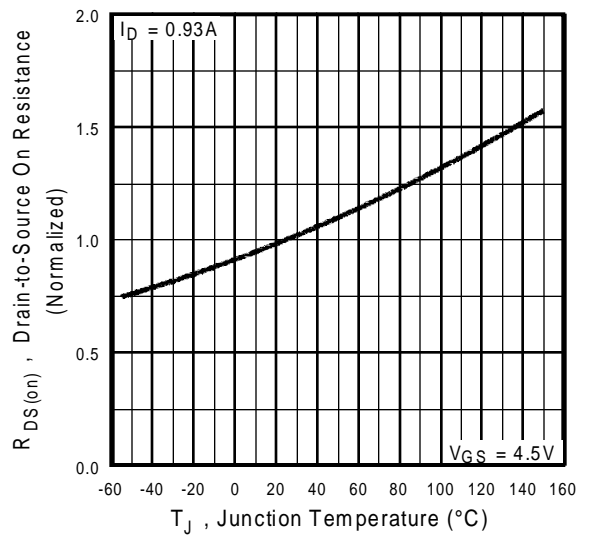


Fig 4. Normalized On-Resistance Vs. Temperature

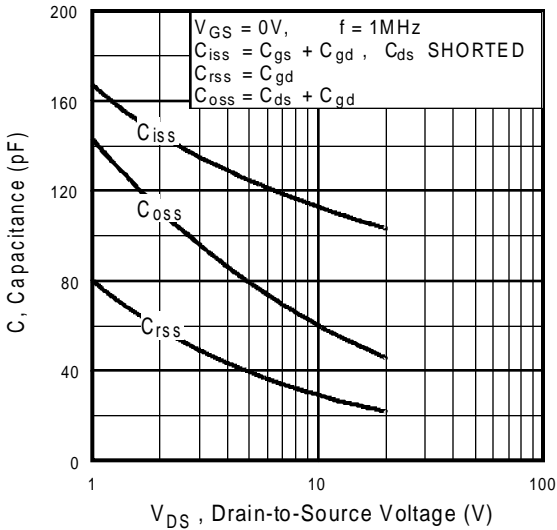


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

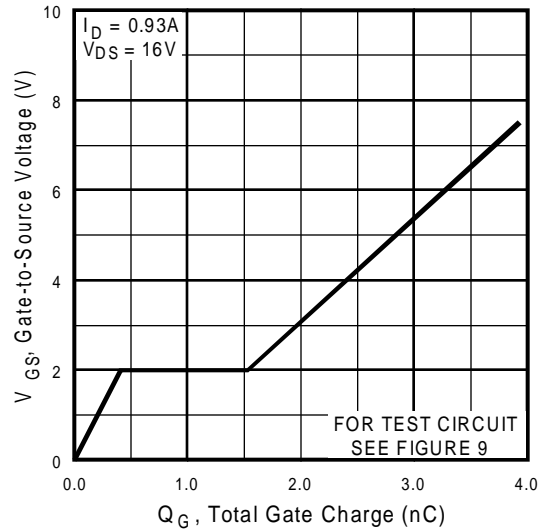


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

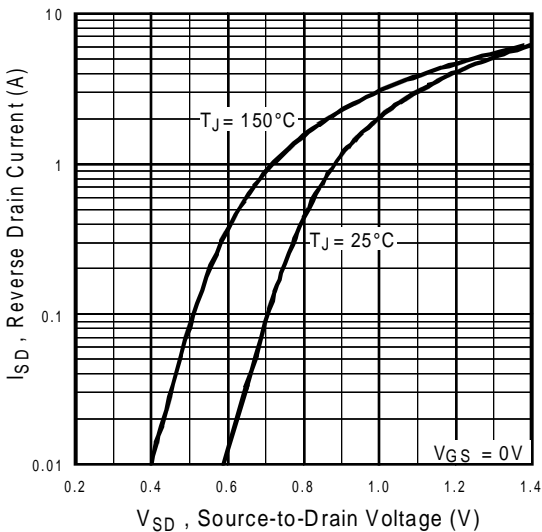


Fig 7. Typical Source-Drain Diode Forward Voltage

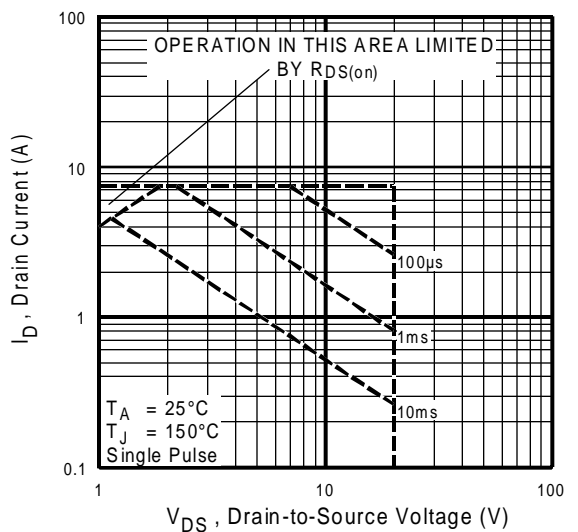


Fig 8. Maximum Safe Operating Area

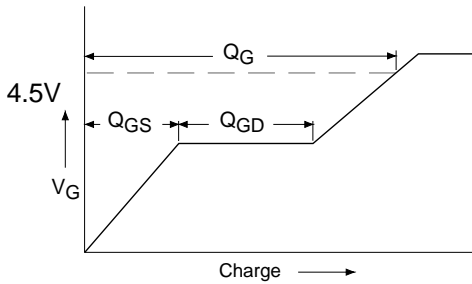


Fig 9a. Basic Gate Charge Waveform

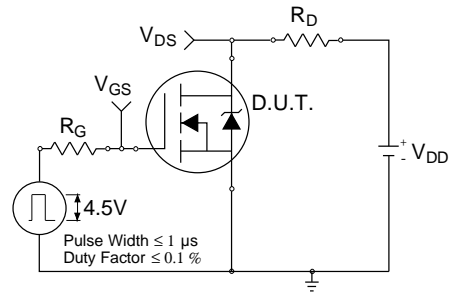


Fig 10a. Switching Time Test Circuit

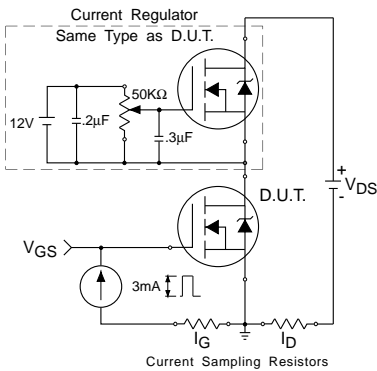


Fig 9b. Gate Charge Test Circuit

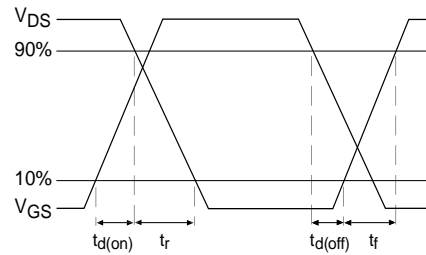


Fig 10b. Switching Time Waveforms

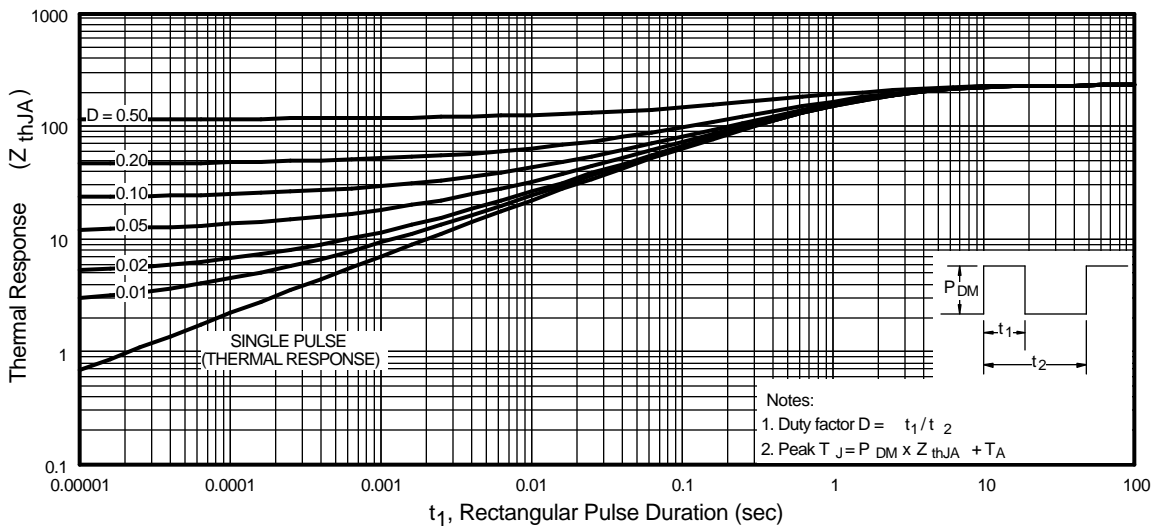
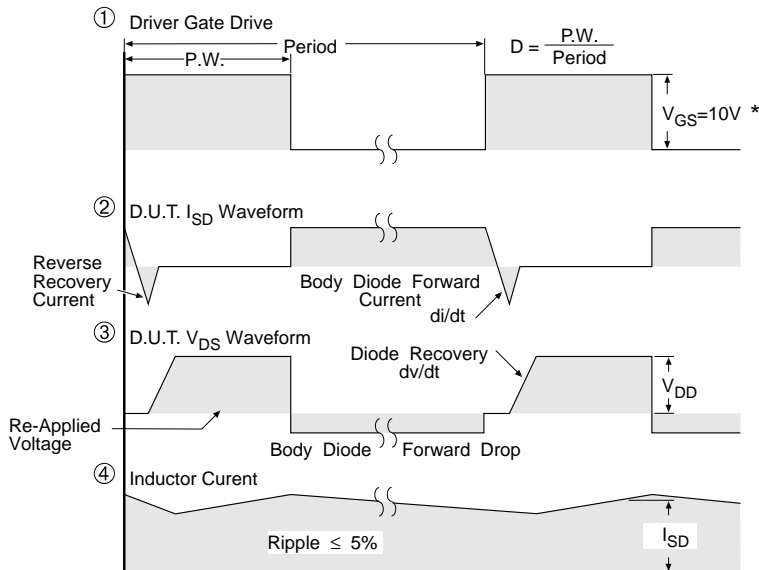
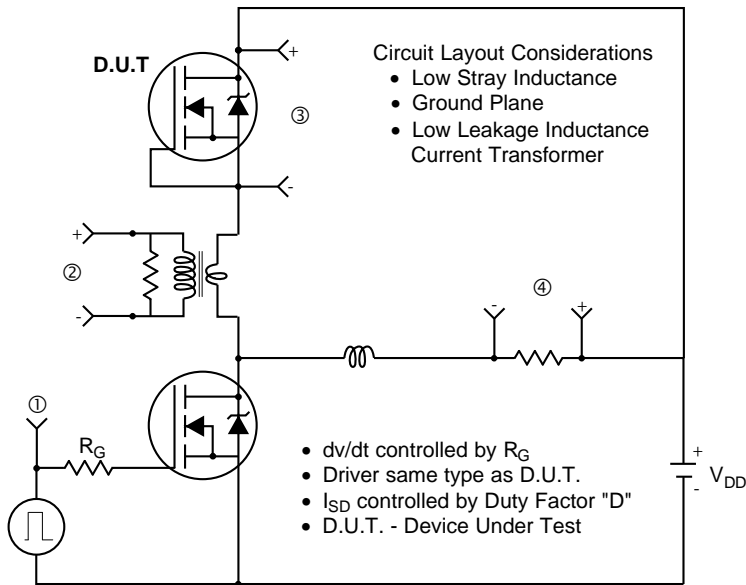


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Peak Diode Recovery dv/dt Test Circuit



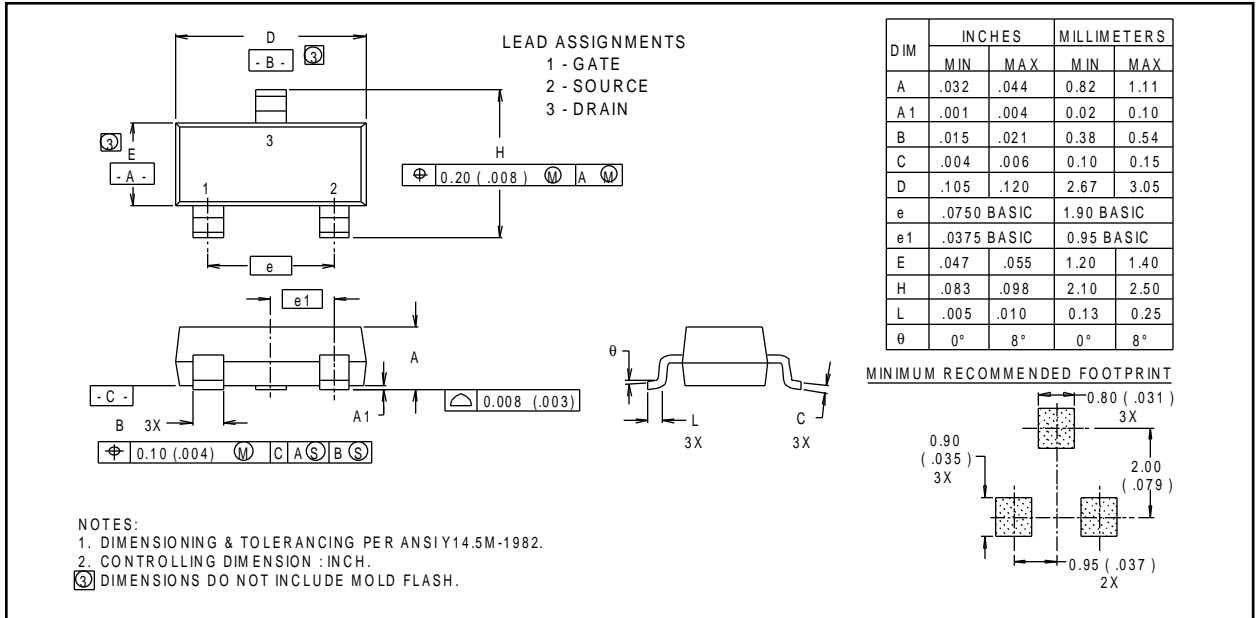
* $V_{GS} = 5V$ for Logic Level Devices

Fig 12. For N-Channel HEXFETS

Package Outline

SOT-23 Outline

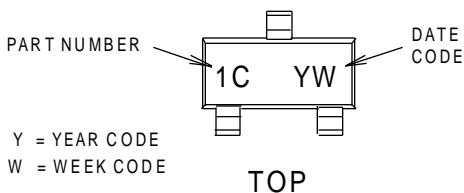
Dimensions are shown in millimeters (inches)



Part Marking Information

SOT-23

EXAMPLE : THIS IS AN IRLML6302



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

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

PART NUMBER EXAMPLES:
 1A = IRLML2402
 1B = IRLML2803
 1C = IRLML6302
 1D = IRLML5103

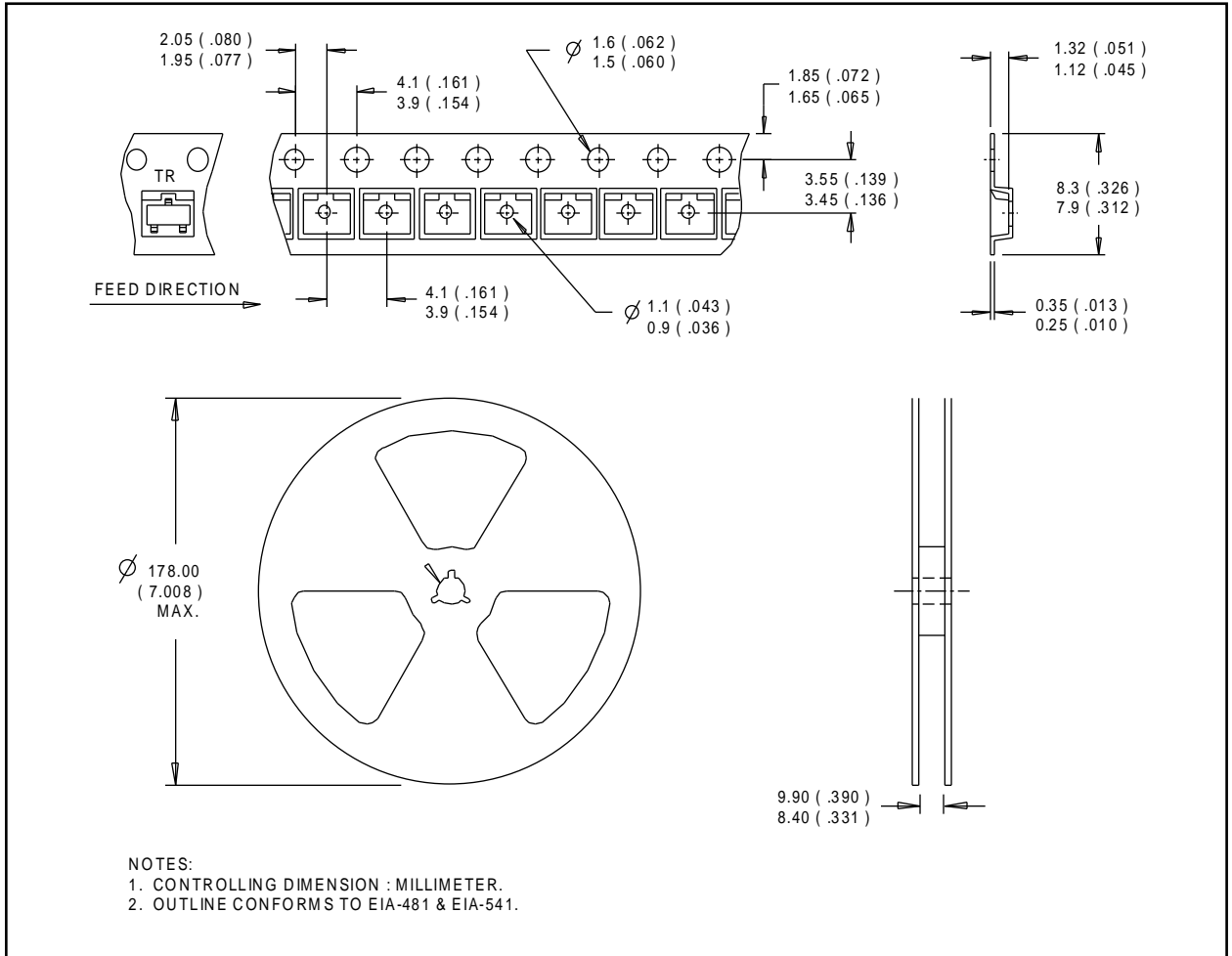
DATE CODE EXAMPLES:
 YWW = 9503 = 5C
 YWW = 9532 = EF

WORK WEEK = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDER YEAR
 WORK WEEK = (27-52) IF PRECEDED BY LETTER

Tape & Reel Information

SOT-23

Dimensions are shown in millimeters (inches)



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EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020

IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 2Z8, Tel: (905) 475 1897

IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590

IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111

IR FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086

IR SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 0316 Tel: 65 221 8371