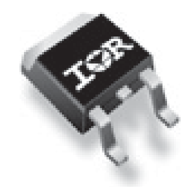
International
IOR Rectifier

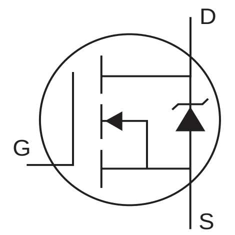
PD-94021C

IRLR8103V

- N-Channel Application-Specific MOSFETs
- Ideal for CPU Core DC-DC Converters
- Low Conduction Losses
- Low Switching Losses
- Minimizes Parallel MOSFETs for high current applications
- 100% R_G Tested



D-Pak



Description

This new device employs advanced HEXFET Power MOSFET technology to achieve an unprecedented balance of on-resistance and gate charge. The reduced conduction and switching losses make it ideal for high efficiency DC-DC converters that power the latest generation of microprocessors.

The IRLR8103V has been optimized for all parameters that are critical in synchronous buck converters including $R_{DS(on)}$, gate charge and Cdv/dt-induced turn-on immunity. The IRLR8103V offers an extremely low combination of Q_{sw} & $R_{DS(on)}$ for reduced losses in both control and synchronous FET applications.

The package is designed for vapor phase, infra-red, convection, or wave soldering techniques. Power dissipation of greater than 2W is possible in a typical PCB mount application.

DEVICE CHARACTERISTICS⑤

	IRLR8103V
$R_{DS(on)}$	7.9 mΩ
Q_G	27 nC
Q_{SW}	12 nC
Q_{OSS}	29nC

Absolute Maximum Ratings

Parameter		Symbol	IRLR8103V	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain or Source Current	TC = 25°C	I_D	91	A
(V_{GS} > 10V)	TC= 90°C		63	
Pulsed Drain Current ①		I_{DM}	363	
Power Dissipation ③	TC = 25°C	P_D	115	W
	TC = 90°C		60	
Junction & Storage Temperature Range		T_J , T_{STG}	-55 to 150	°C
Continuous Source Current (Body Diode)		I_S	91	A
Pulsed Source Current ①		I_{SM}	363	

Thermal Resistance

Parameter	Symbol	Typ.	Max.	Units
Maximum Junction-to-Ambient ③⑥	$R_{\theta JA}$	—	50	°C/W
Maximum Junction-to-Case ⑥	$R_{\theta JC}$	—	1.09	

10/22/04

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Conditions
Drain-to-Source Breakdown Voltage	BV_{DSS}	30	——	——	V	V_{GS} = 0V, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(on)}$	——	6.9	9.0	mΩ	V_{GS} = 10V, I_D = 15A ②
		——	7.9	10.5		V_{GS} = 4.5V, I_D = 15A ②
Gate Threshold Voltage	$V_{GS(th)}$	1.0	——	3.0	V	V_{DS} = V_{GS}, I_D = 250µA
Drain-to-Source Leakage Current	I_{DSS}	——	——	50	µA	V_{DS} = 30V, V_{GS} = 0V
		——	——	20	µA	V_{DS} = 24V, V_{GS} = 0
		——	——	100		V_{DS} = 24V, V_{GS} = 0, T_J = 100°C
Gate-Source Leakage Current	I_{GSS}	——	——	±100	nA	V_{GS} = ± 20V
Total Gate Charge, Control FET	Q_G	——	27	——	nC	V_{GS} = 5V, I_D = 15A, V_{DS} = 16V
Total Gate Charge, Synch FET	Q_G	——	23	——		V_{GS} = 5V, V_{DS} < 100mV
Pre-Vth Gate-Source Charge	Q_{GS1}	——	4.7	——		V_{DS} = 16V, I_D = 15A
Post-Vth Gate-Source Charge	Q_{GS2}	——	2.0	——		
Gate to Drain Charge	Q_{GD}	——	9.7	——		
Switch Charge (Q_{gs2} + Q_{gd})	Q_{SW}	——	12	——		
Output Charge	Q_{OSS}	——	29	——		V_{DS} = 16V, V_{GS} = 0
Gate Resistance	R_G	0.8	——	3.1	Ω	
Turn-On Delay Time	$t_{d(on)}$	——	10	——	ns	V_{DD} = 16V
Rise Time	t_r	——	9	——		I_D = 15A
Turn-Off Delay Time	$t_{d(off)}$	——	24	——		V_{GS} = 5.0V
Fall Time	t_f	——	18	——		Clamped Inductive Load
Input Capacitance	C_{iss}	——	2672	——	pF	V_{GS} = 16V, V_{GS}=0
Output Capacitance	C_{oss}	——	1064	——		
Reverse Transfer Capacitance	C_{rss}	——	109	——		

Source-Drain Rating & Characteristics

Parameter	Symbol	Min	Typ	Max	Units	Conditions
Diode Forward Voltage	V_{SD}	——	0.9	1.3	V	IS = 15A②, V_{GS} = 0V
Reverse Recovery Charge ④	Q_{rr}	——	103	——	nC	di/dt ~ 700A/µs V_{DS} = 16V, V_{GS} = 0V, I_F = 15A
Reverse Recovery Charge (with Parallel Schottky) ④	$Q_{rr(s)}$	——	96	——	nC	di/dt = 700A/µs , (with 10BQ040) V_{DS}= 16V, V_{GS} = 0V, I_F = 15A

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.
② Pulse width ≤ 400 µs; duty cycle ≤ 2%.
③ When mounted on 1 inch square copper board, t < 10 sec.
④ Typ = measured - Q_{oss}
⑤ Typical values of R_{DS}(on) measured at V_{GS} = 4.5V, Q_G, Q_{SW} and Q_{OSS} measured at V_{GS} = 5.0V, I_F = 15A.
⑥ R_θ is measured at T_J approximately 90°C

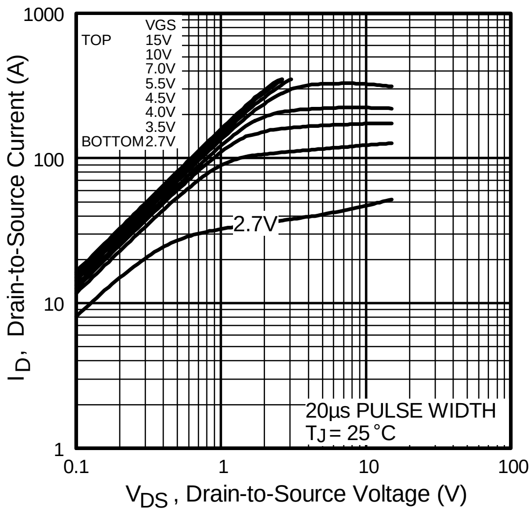


Fig 1. Typical Output Characteristics

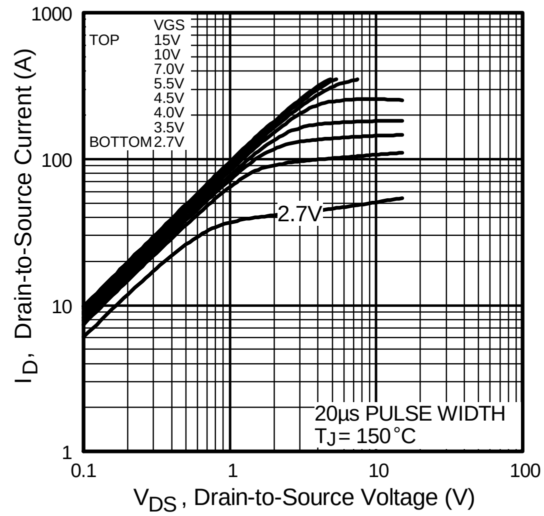


Fig 2. Typical Output Characteristics

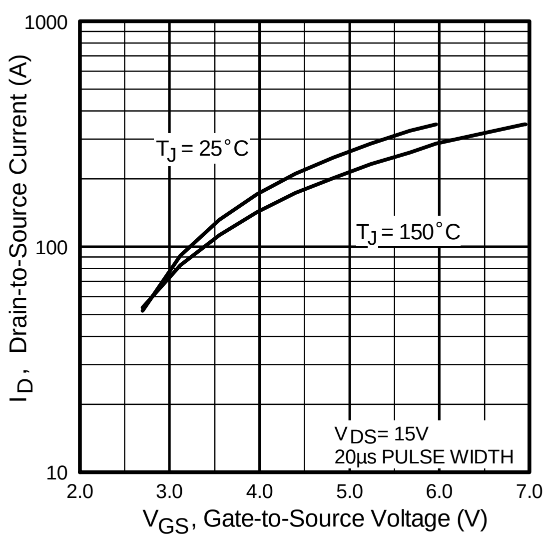


Fig 3. Typical Transfer Characteristics

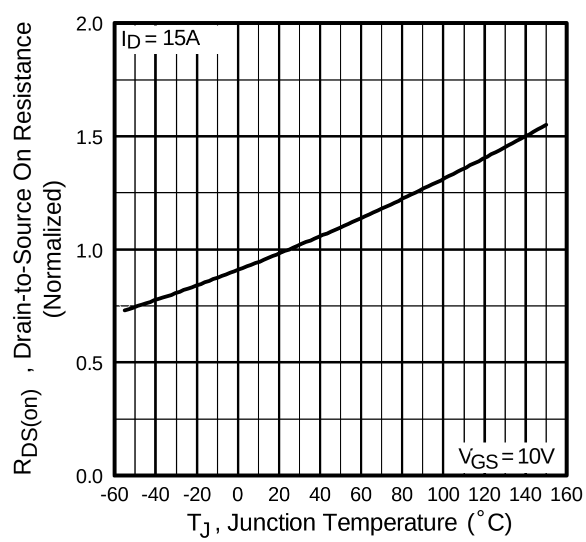
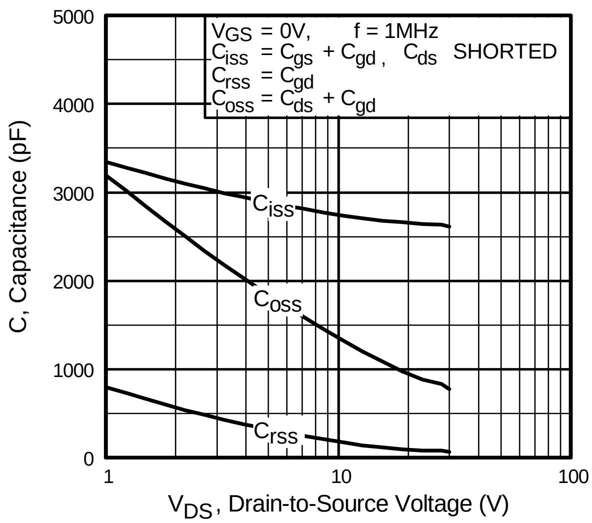


Fig 4. Normalized On-Resistance Vs. Temperature



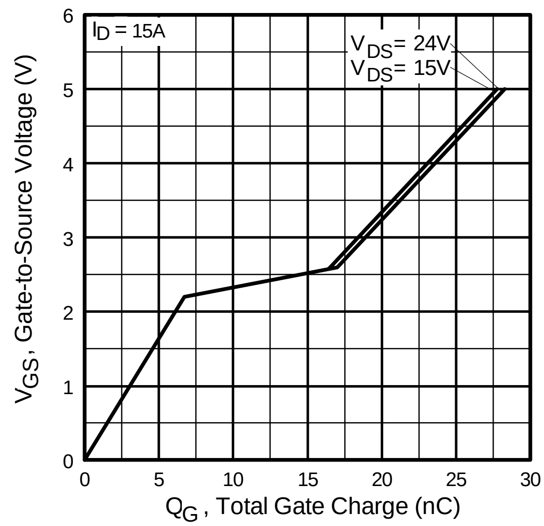
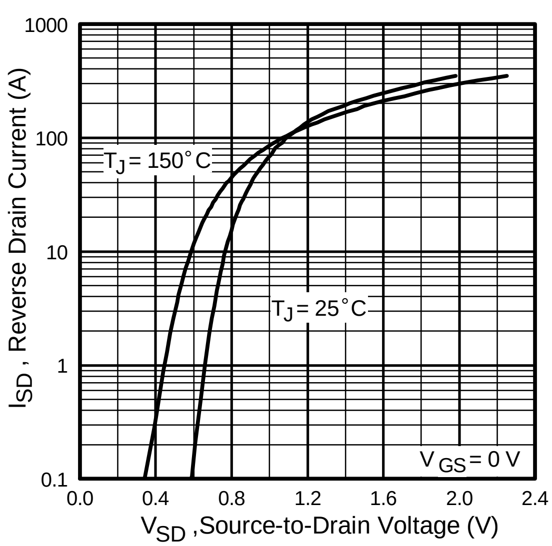


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

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



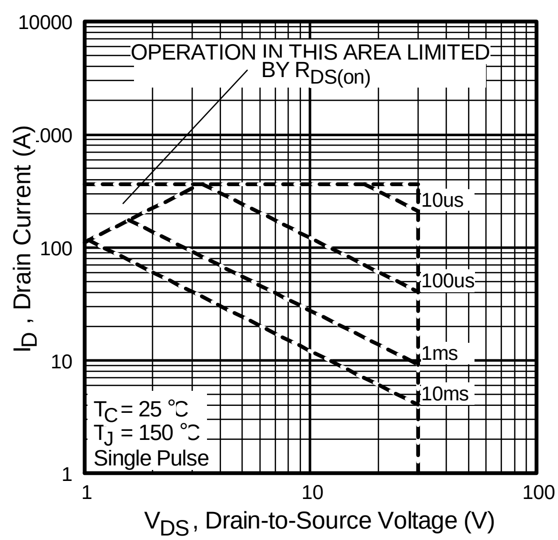


Fig 7. Typical Source-Drain Diode Forward Voltage

Fig 8. Maximum Safe Operating Area

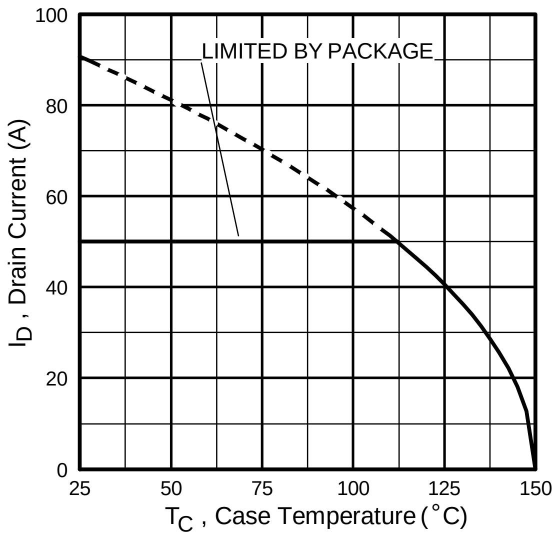


Fig 9. Maximum Drain Current Vs. Case Temperature

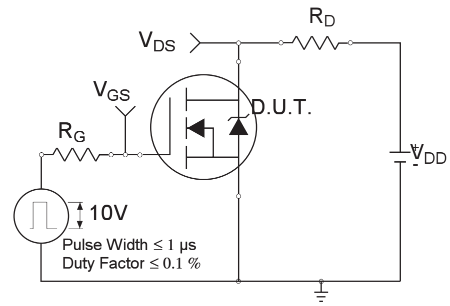


Fig 10a. Switching Time Test Circuit

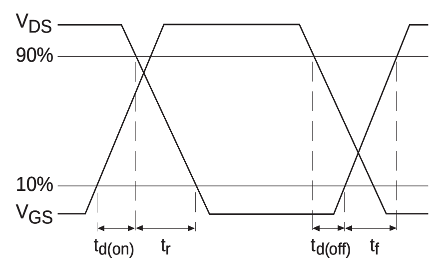


Fig 10b. Switching Time Waveforms

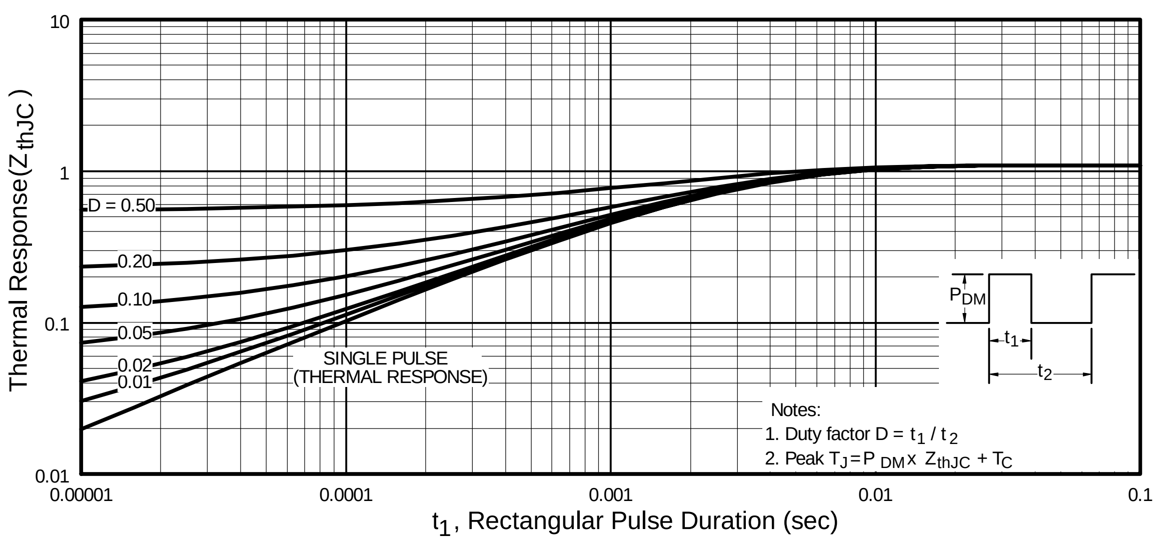


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

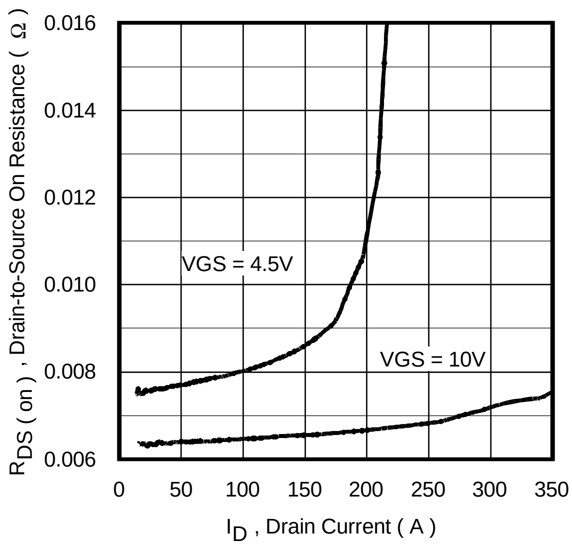


Fig 12. On-Resistance Vs. Drain Current

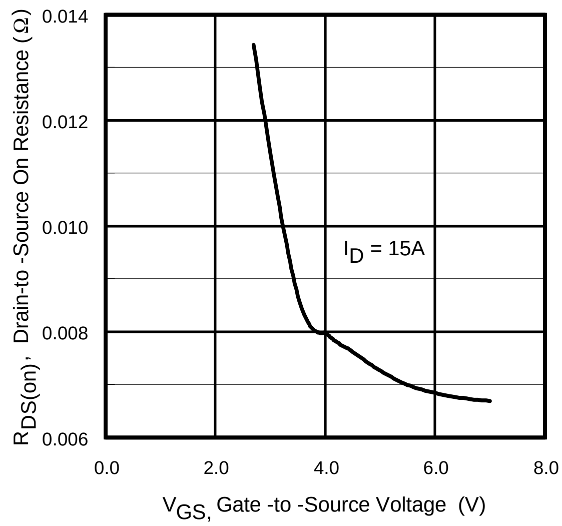


Fig 13. On-Resistance Vs. Gate Voltage

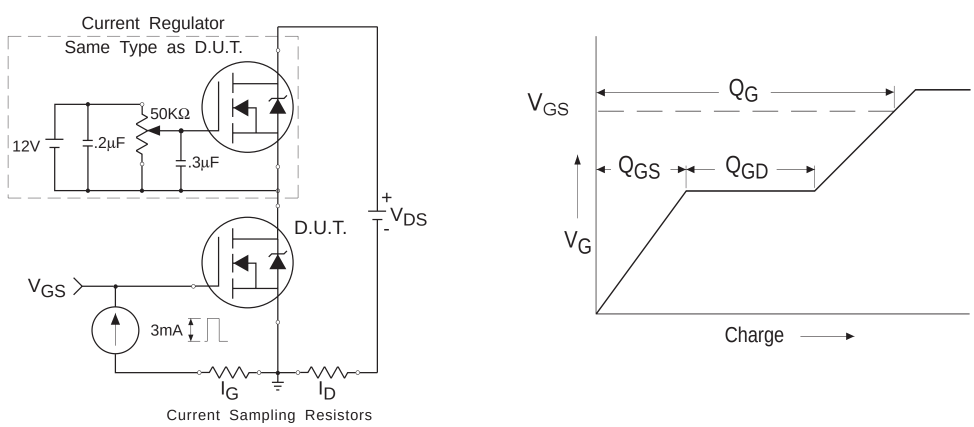
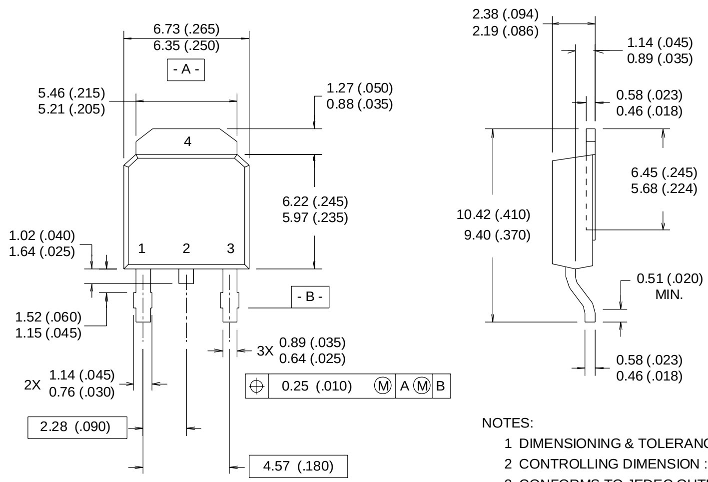


Fig 14a&b. Basic Gate Charge Test Circuit and Waveform

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



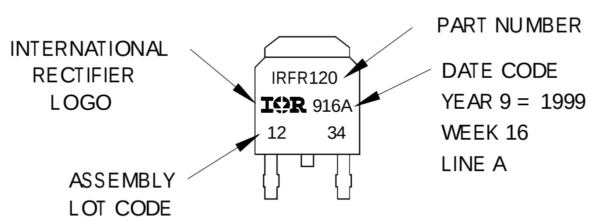
LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

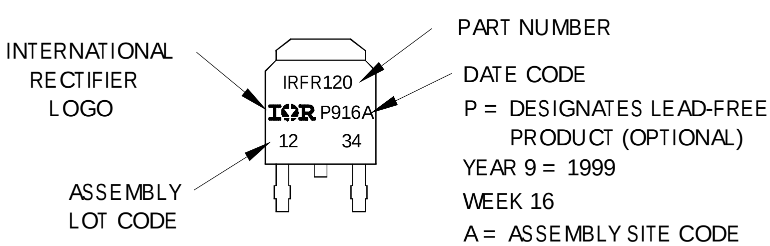
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 1999
IN THE ASSEMBLY LINE "A"

Note: "P" in assembly line position indicates "Lead-Free"

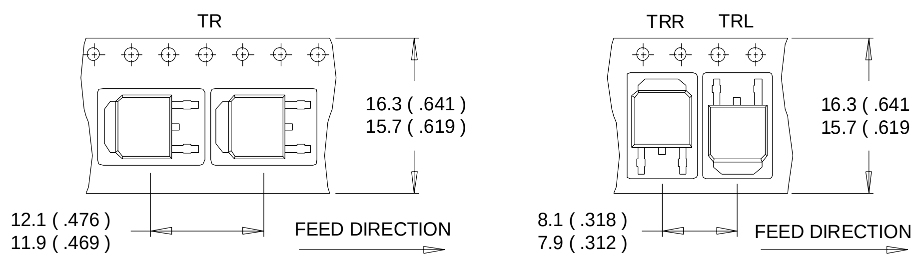


OR

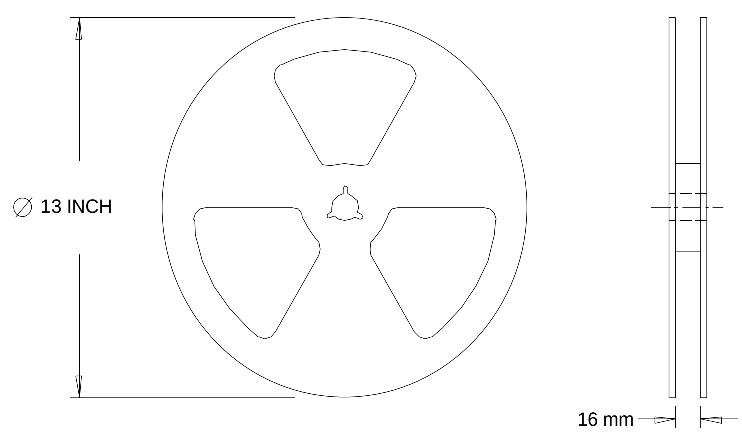


D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :
1. OUTLINE CONFORMS TO EIA-481.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

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