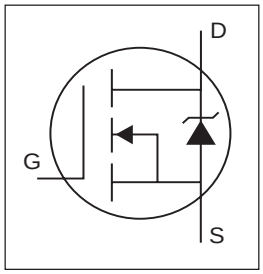
International
IOR Rectifier

PD-94021A

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



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
$R_{DS(on)}$	7.9mΩ
Q_G	27nC
Q_{sw}	12nC
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	T_C = 25°C	I_D	91	A
Current ($V_{GS} \geq 10V$)	T_C = 90°C		63	
Pulsed Drain Current①		I_{DM}	363	
Power Dissipation③	T_C = 25°C	P_D	115	W
	T_C = 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 Current①		I_{SM}	363	

Thermal Resistance

Parameter		Max.	Units
Maximum Junction-to-Ambient③	$R_{\theta JA}$	50	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	1.09	°C/W

Electrical Characteristics

Parameter		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 = 15A②
			7.9	10.5		V_{GS} = 4.5V, I_D = 15A②
Gate Threshold Voltage	$V_{GS(th)}$	1.0			V	V_{DS} = V_{GS}, I_D = 250µA
Drain-Source Leakage Current	I_{DSS}			20	µA	V_{DS} = 24V, V_{GS} = 0
				100		V_{DS} = 24V, V_{GS} = 0, Tj = 100°C
Gate-Source Leakage Current	I_{GSS}			±100	nA	V_{GS} = ±20V
Total Gate Chg Cont FET	Q_G		27		nC	V_{GS}=5V, I_D=15A, V_{DS}=16V
Total Gate Chg Sync 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 Chg(Q_{gs2} + Q_{gd})	Q_{sw}		12			
Output Charge	Q_{oss}		29			V_{DS} = 16V, V_{GS} = 0
Gate Resistance	R_G		2.4		Ω	
Turn-on Delay Time	$t_{d\ (on)}$		10		ns	V_{DD} = 16V, I_D = 15A
Rise Time	t_r		9			V_{GS} = 5V
Turn-off Delay Time	$t_{d\ (off)}$		24			Clamped Inductive Load
Fall Time	t_f		18			
Input Capacitance	C_{iss}	–	2672	–	pF	V_{DS} = 16V, V_{GS} = 0
Output Capacitance	C_{oss}	–	1064	–		
Reverse Transfer Capacitance	C_{rss}	–	109	–		

Source-Drain Rating & Characteristics

Parameter		Min	Typ	Max	Units	Conditions
Diode Forward Voltage	V_{SD}		0.9	1.3	V	I_S = 15A②, V_{GS} = 0V
Reverse Recovery Charge④	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.

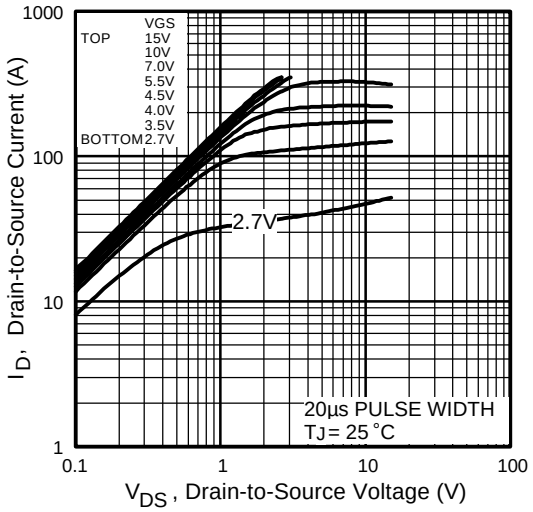


Fig 1. Typical Output Characteristics

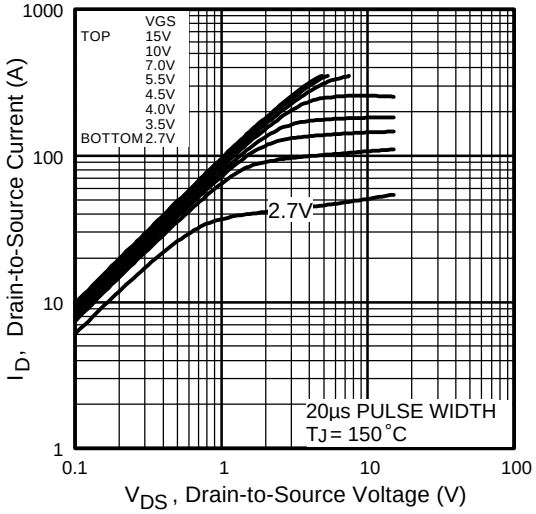


Fig 2. Typical Output Characteristics

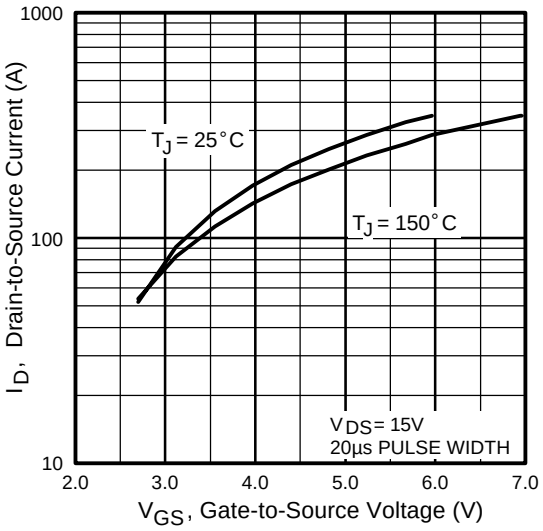


Fig 3. Typical Transfer Characteristics

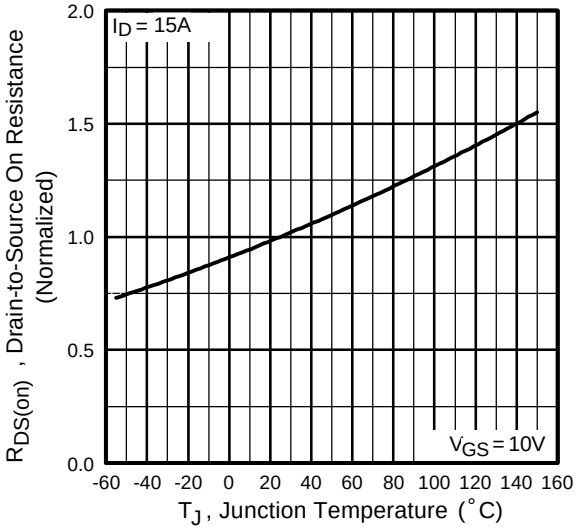


Fig 4. Normalized On-Resistance
Vs. Temperature

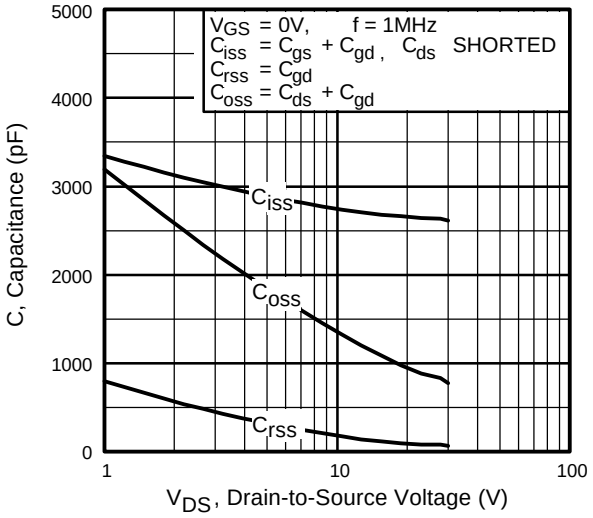


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

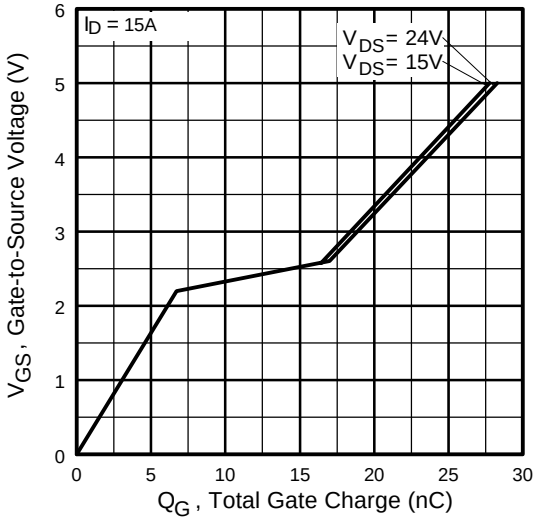


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

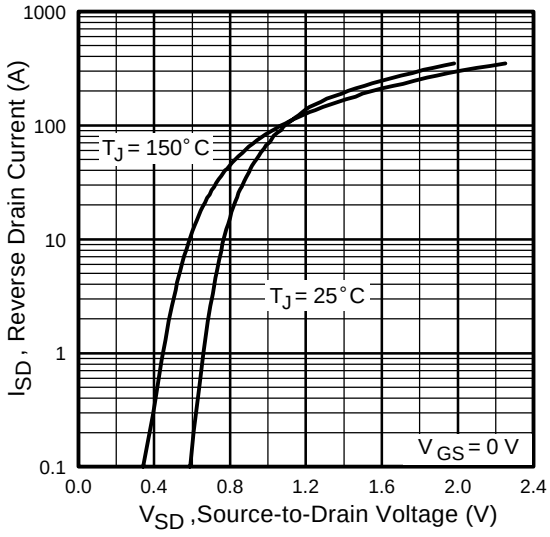


Fig 7. Typical Source-Drain Diode Forward Voltage

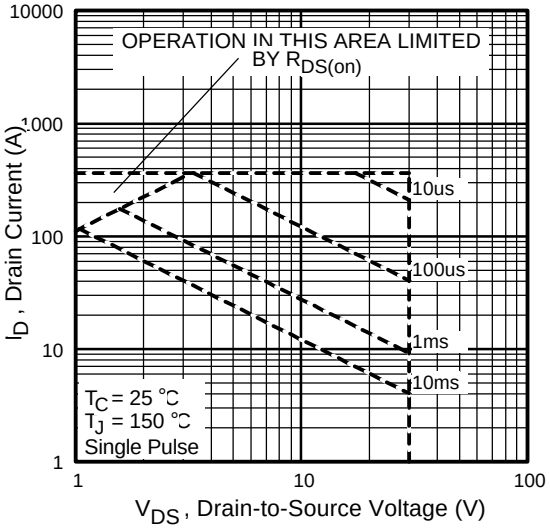


Fig 8. Maximum Safe Operating Area

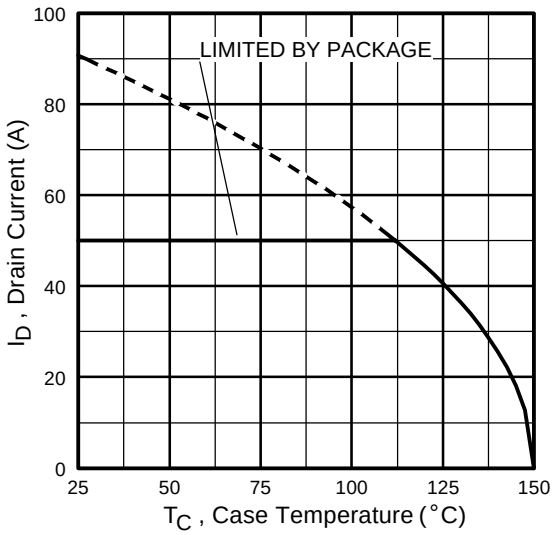


Fig 9. Maximum Drain Current Vs. Case Temperature

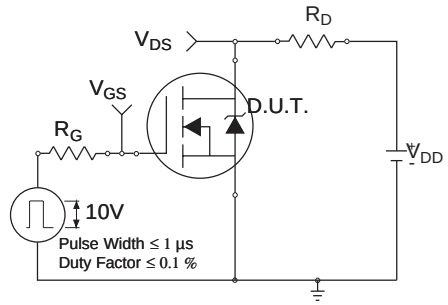


Fig 10a. Switching Time Test Circuit

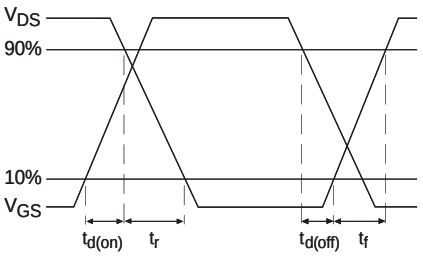


Fig 10b. Switching Time Waveforms

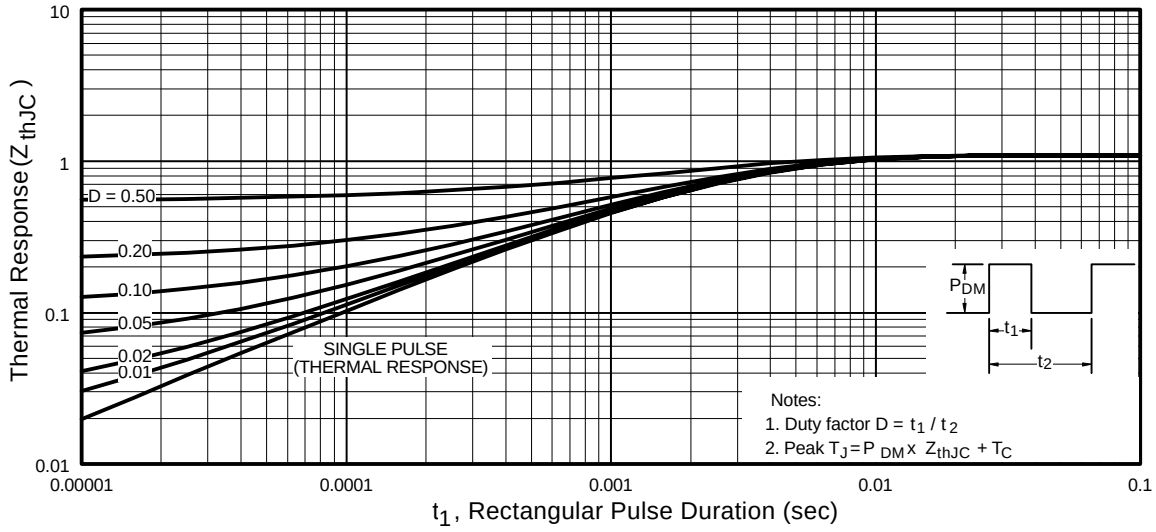


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

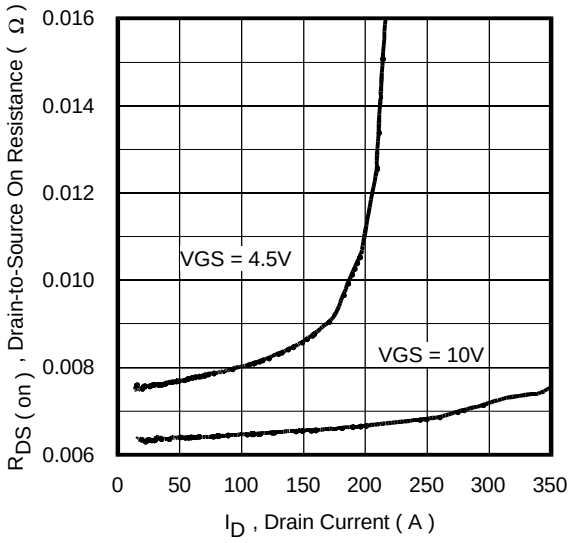


Fig 12. On-Resistance Vs. Drain Current

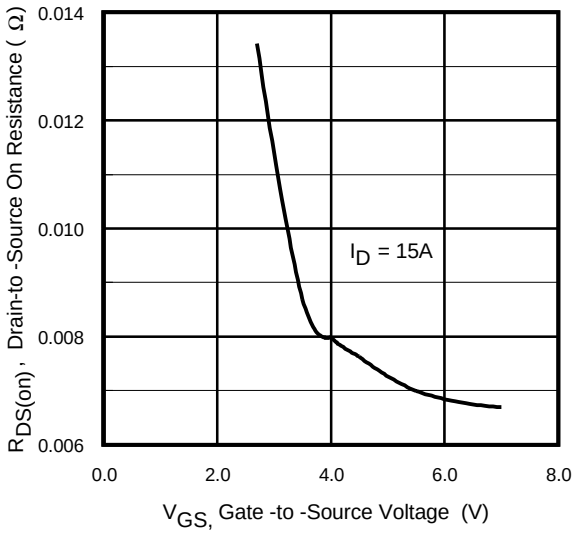
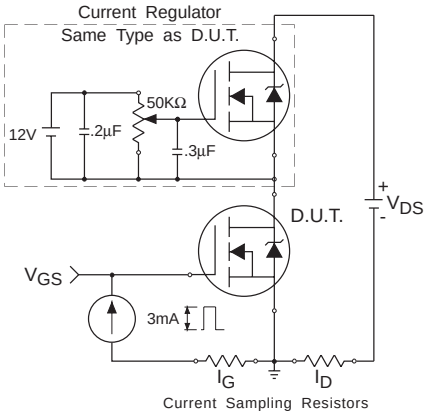


Fig 13. On-Resistance Vs. Gate Voltage



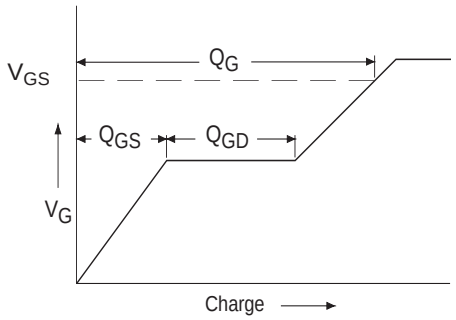
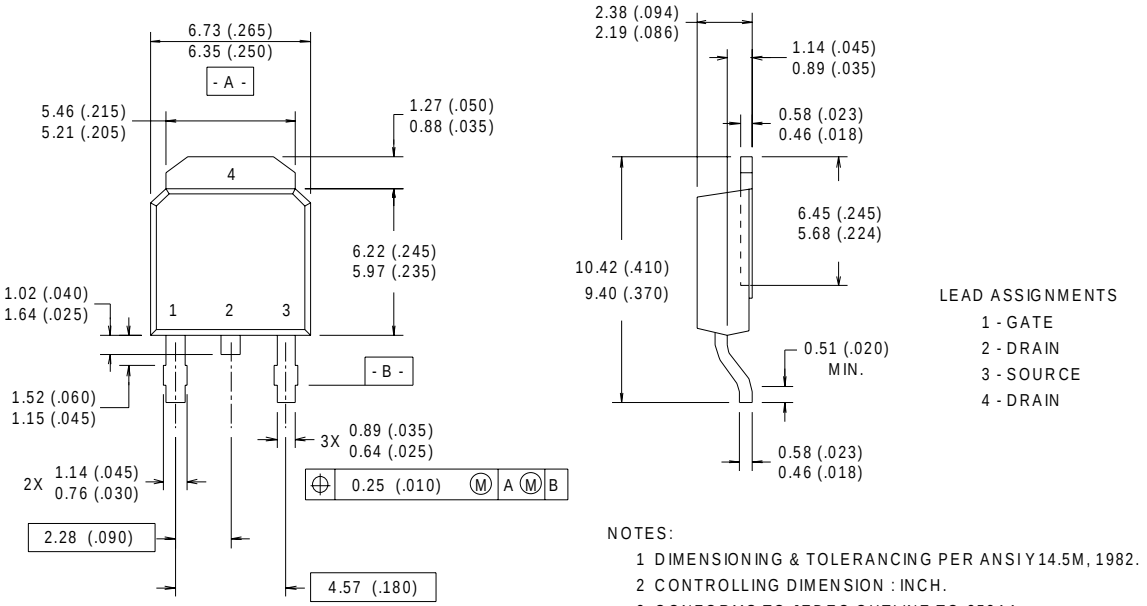


Fig 14a&b. Basic Gate Charge Test Circuit and Waveform

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)

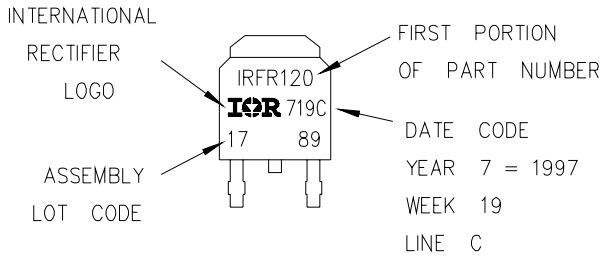


LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE
4 - DRAIN

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).

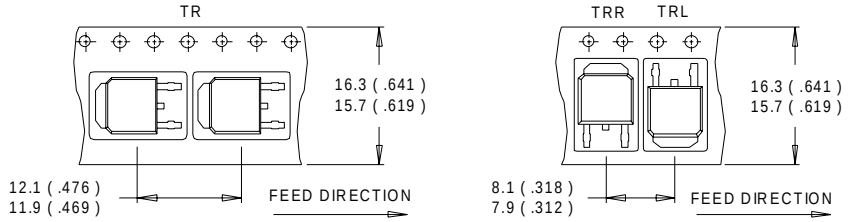
D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

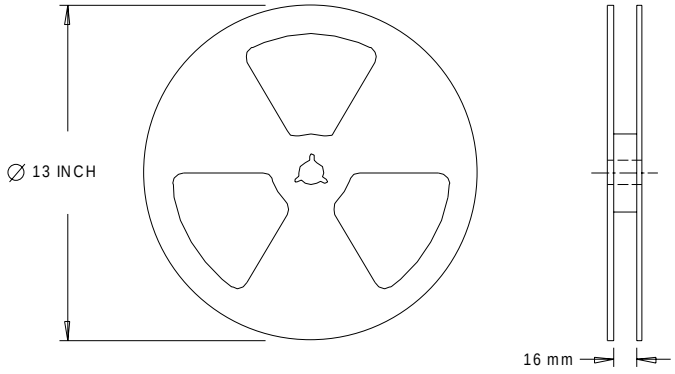


D-Pak (TO-252AA) Tape & Reel Information

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.

International
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IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
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IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo 171 Tel: 81 (0)3 3983 0086
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Data and specifications subject to change without notice.11/00