HARRIS Semiconductor

HP4936DY

5.8A, 30V, 0.037 Ohm, Dual N-Channel, Logic Level Power MOSFET

May 1998

Features

- **Logic Level Gate Drive**
- **5.8A, 30V**
- **$r_{DS(ON)}$ = 0.037Ω at I_D = 5.8A, V_{GS} = 10V**
- **$r_{DS(ON)}$ = 0.055Ω at I_D = 4.7A, V_{GS} = 4.5V**
- **Related Literature**
  - **TB334, "Guidelines for Soldering Surface Mount Components to PC Boards"**

Ordering Information

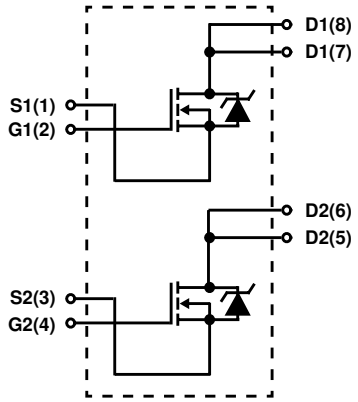
PART NUMBER	PACKAGE	BRAND
HP4936DY	SO-8	P4936DY

NOTE: When ordering, use the entire part number. Add the suffix T to obtain the variant in tape and reel, e.g., HP4936DYT.

Description

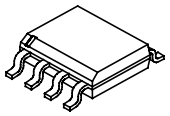
This power MOSFET is manufactured using an innovative process. This advanced process technology achieves the lowest possible on-resistance per silicon area, resulting in outstanding performance. This device is capable of withstanding high energy in the avalanche mode and the diode exhibits very low reverse recovery time and stored charge. It was designed for use in applications where power efficiency is important, such as switching regulators, switching converters, motor drivers, relay drivers, low-voltage bus switches, and power management in portable and battery-operated products.

Symbol



Packaging

SO-8



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper ESD Handling Procedures.

File Number **4469.2**

Absolute Maximum Ratings $T_A = 25^oC$, Unless Otherwise Specified

Drain to Source Voltage (Note 1)	V_{DSS}	30	V
Drain to Gate Voltage (R_{GS} = 20kΩ) (Note 1)	V_{DGR}	30	V
Gate to Source Voltage	V_{GS}	±16	V
Drain Current			
Continuous	I_D	5.8	A
Pulsed Drain Current (10μs Pulse Width)	I_{DM}	30	A
Power Dissipation	P_D	2	W
Derate Above 25^oC		0.02	$W/^oC$
Operating and Storage Temperature	T_J, T_{STG}	-55 to 150	^oC
Maximum Temperature for Soldering			
Leads at 0.063in (1.6mm) from Case for 10s	T_L	300	^oC
Package Body for 10s, See Techbrief 334	T_{pkg}	260	^oC

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

1. $T_A = 25^oC$ to 125^oC.

Electrical Specifications $T_A = 25^oC$, Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Drain to Source Breakdown Voltage	BV_{DSS}	I_D = 250μA, V_{GS} = 0V	30	-	-	V
Gate to Source Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250μA (Figure 9)	1	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 30V, V_{GS} = 0V, $T_A = 55^oC$	-	-	25	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±16V	-	-	100	nA
Drain to Source On Resistance	$r_{DS(ON)}$	I_D = 4.7A, V_{GS} = 4.5V (Figures 6, 8)	-	0.042	0.055	Ω
		I_D = 5.8A, V_{GS} = 10V (Figures 6, 8)	-	0.030	0.037	Ω
Turn-On Delay Time	$t_{d(ON)}$	V_{DD} = 15V, $I_D \cong$ 1A, R_L = 15Ω, V_{GEN} = 10V, R_{GS} = 6Ω (Figures 12, 13)	-	10	16	ns
Rise Time	t_r		-	10	16	ns
Turn-Off Delay Time	$t_{d(OFF)}$		-	27	40	ns
Fall Time	t_f		-	24	35	ns
Total Gate Charge	Q_g	V_{DS} = 15V, V_{GS} = 10V, $I_D \cong$ 5.8A (Figures 14, 15)	-	18	25	nC
Gate to Source Charge	Q_{gs}		-	4.5	-	nC
Gate to Drain Charge	Q_{gd}		-	2.5	-	nC
Input Capacitance	C_{ISS}	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz (Figure 4)	-	625	-	pF
Output Capacitance	C_{OSS}		-	270	-	pF
Reverse Transfer Capacitance	C_{RSS}		-	50	-	pF
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	Pulse Width <10s (Figure 11) Device Mounted on FR-4 Material	-	-	62.5	$^oC/W$

Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage	V_{SD}	I_{SD} = 1.7A (Figure 7)	-	0.8	1.2	V
Reverse Recovery Time	t_{rr}	I_{SD} = 1.7A, dI_{SD}/dt = 100A/μs	-	45	80	ns

Typical Performance Curves Unless Otherwise Specified

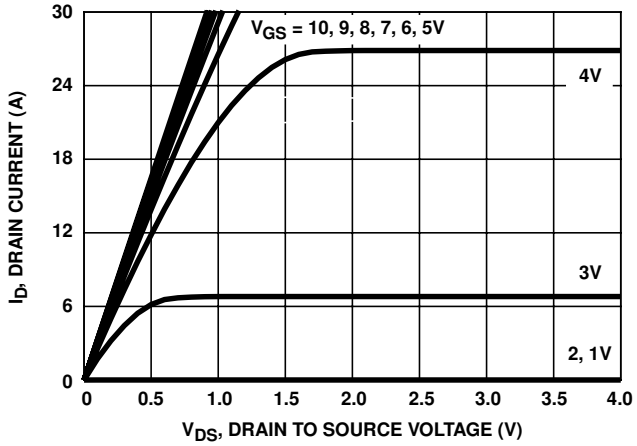


FIGURE 1. OUTPUT CHARACTERISTICS

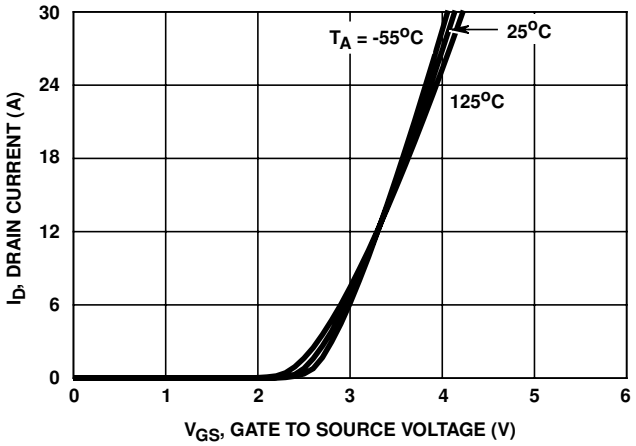


FIGURE 2. TRANSFER CHARACTERISTICS

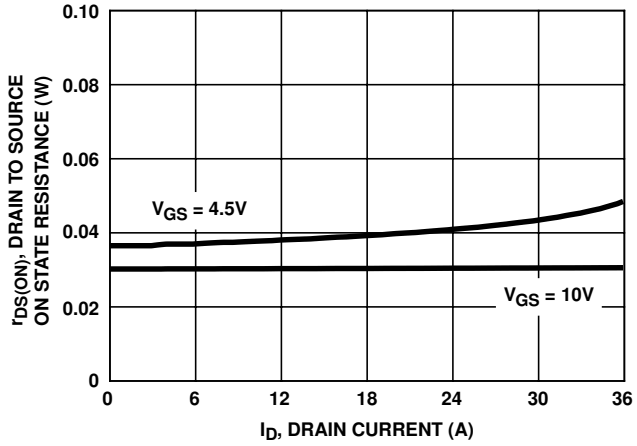


FIGURE 3. DRAIN TO SOURCE ON RESISTANCE vs GATE VOLTAGE AND DRAIN CURRENT

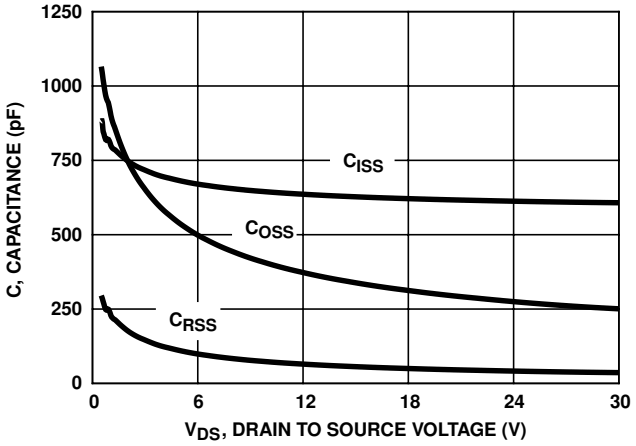


FIGURE 4. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE

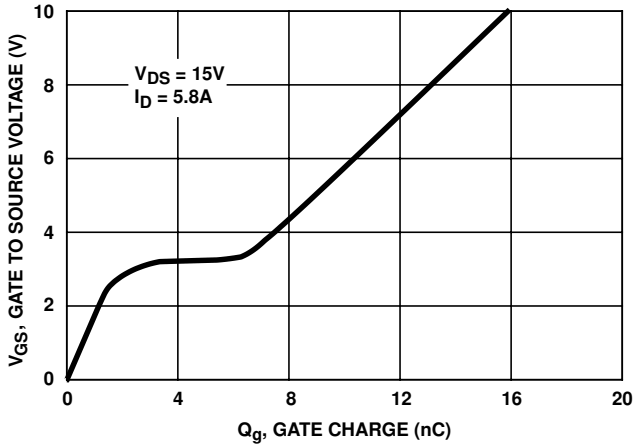


FIGURE 5. GATE TO SOURCE VOLTAGE vs GATE CHARGE

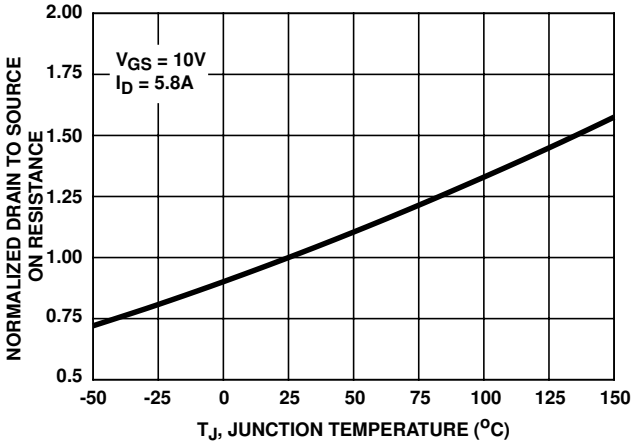


FIGURE 6. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

Typical Performance Curves Unless Otherwise Specified (Continued)

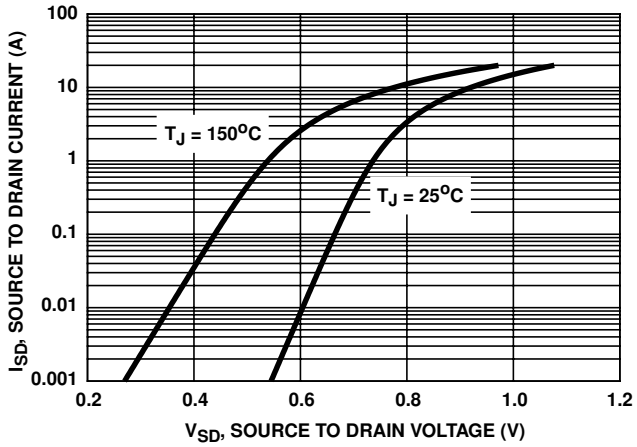


FIGURE 7. SOURCE TO DRAIN DIODE VOLTAGE

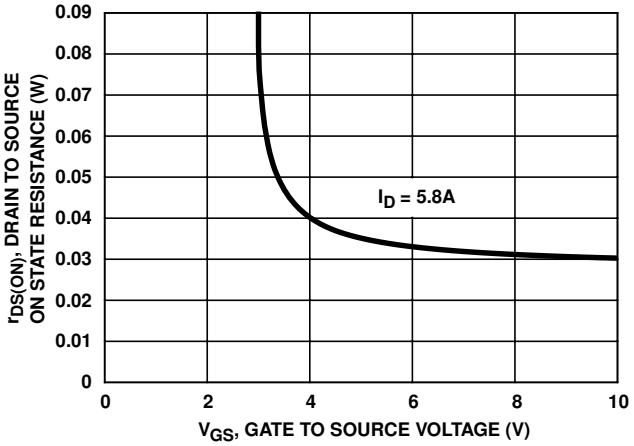


FIGURE 8. DRAIN TO SOURCE ON RESISTANCE vs GATE TO SOURCE VOLTAGE

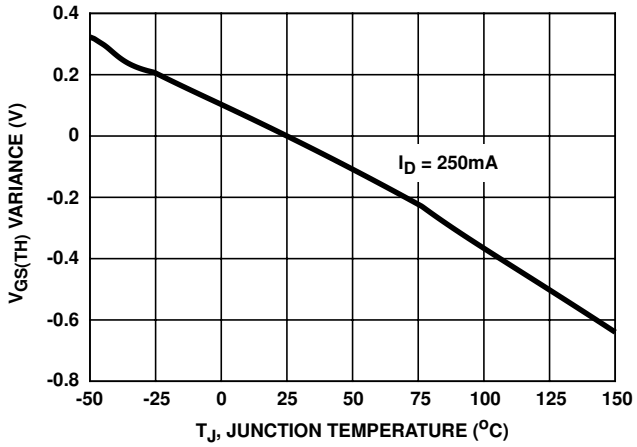


FIGURE 9. GATE THRESHOLD VOLTAGE VARIANCE vs JUNCTION TEMPERATURE

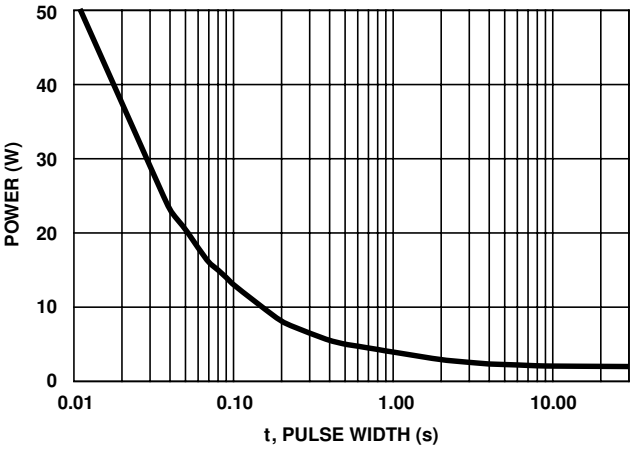


FIGURE 10. SINGLE PULSE POWER CAPABILITY vs PULSE WIDTH

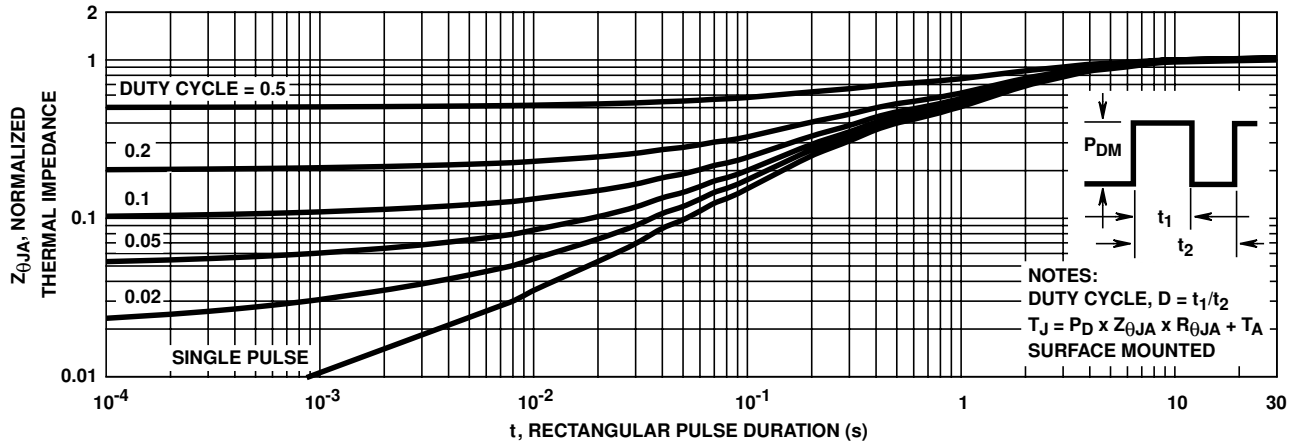


FIGURE 11. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

Test Circuits and Waveforms

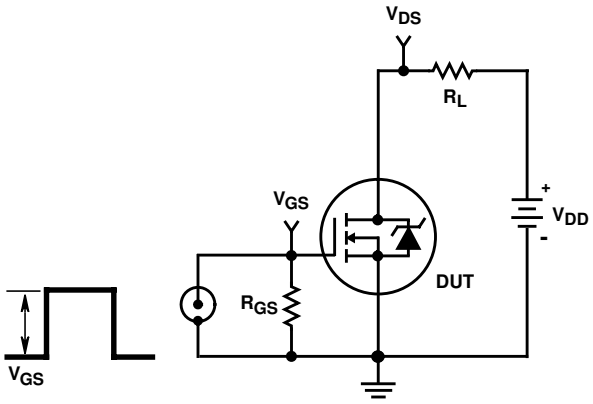


FIGURE 12. SWITCHING TIME TEST CIRCUIT

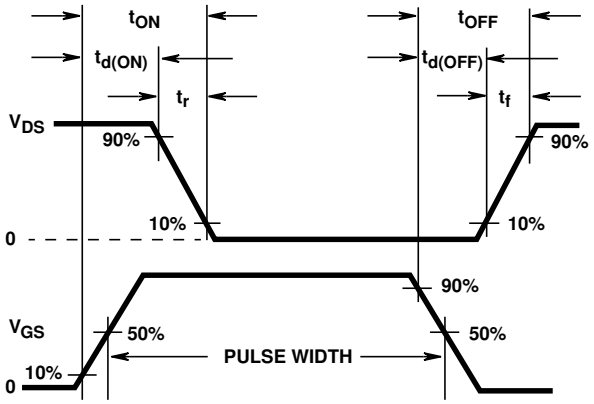


FIGURE 13. SWITCHING TIME WAVEFORM

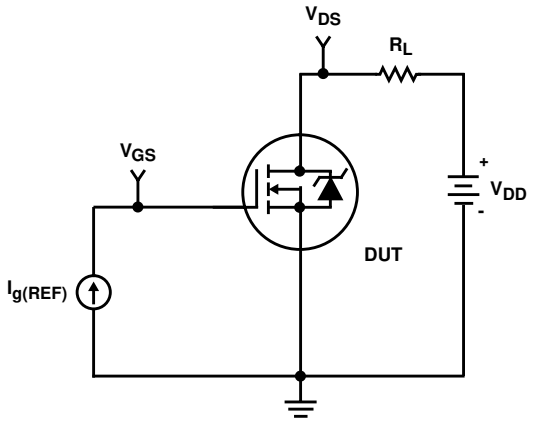


FIGURE 14. GATE CHARGE TEST CIRCUIT

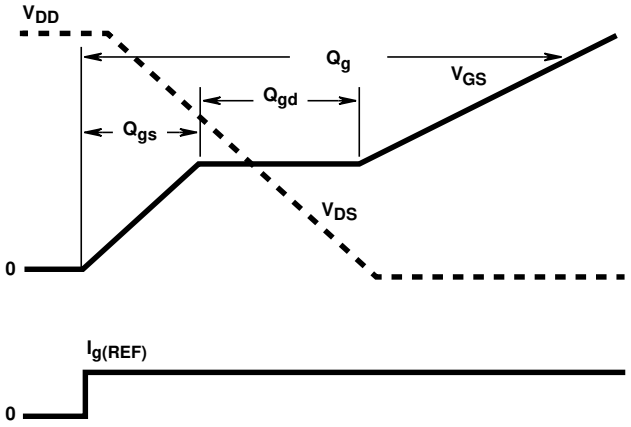
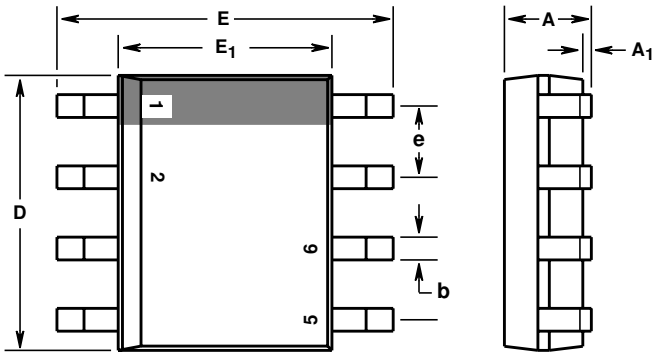
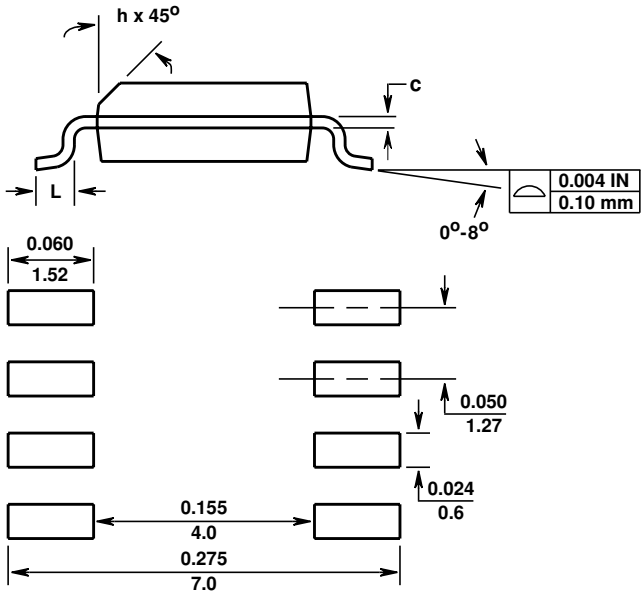


FIGURE 15. GATE CHARGE WAVEFORMS

MS-012AA

8 LEAD JEDEC MS-012AA SMALL OUTLINE PLASTIC PACKAGE





MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE-MOUNTED APPLICATIONS

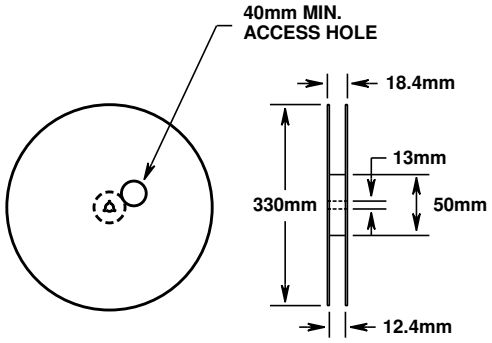
SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.0532	0.0688	1.35	1.75	-
A_1	0.004	0.0098	0.10	0.25	-
b	0.013	0.020	0.33	0.51	-
c	0.0075	0.0098	0.19	0.25	-
D	0.189	0.1968	4.80	5.00	2
E	0.2284	0.244	5.80	6.20	-
E_1	0.1497	0.1574	3.80	4.00	3
e	0.050 BSC		1.27 BSC		-
H	0.0099	0.0196	0.25	0.50	-
L	0.016	0.050	0.40	1.27	4

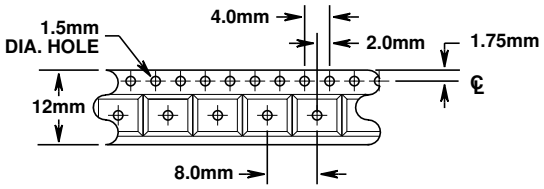
NOTES:

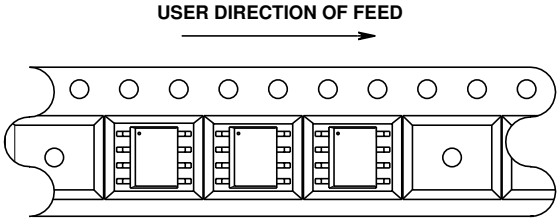
1. All dimensions are within allowable dimensions of Rev. C of JEDEC MS-012AA outline dated 5-90.
2. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.006 inches (0.15mm) per side.
3. Dimension “E_1” does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 0.010 inches (0.25mm) per side.
4. “L” is the length of terminal for soldering.
5. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
6. Controlling dimension: Millimeter.
7. Revision 7 dated 1-98.

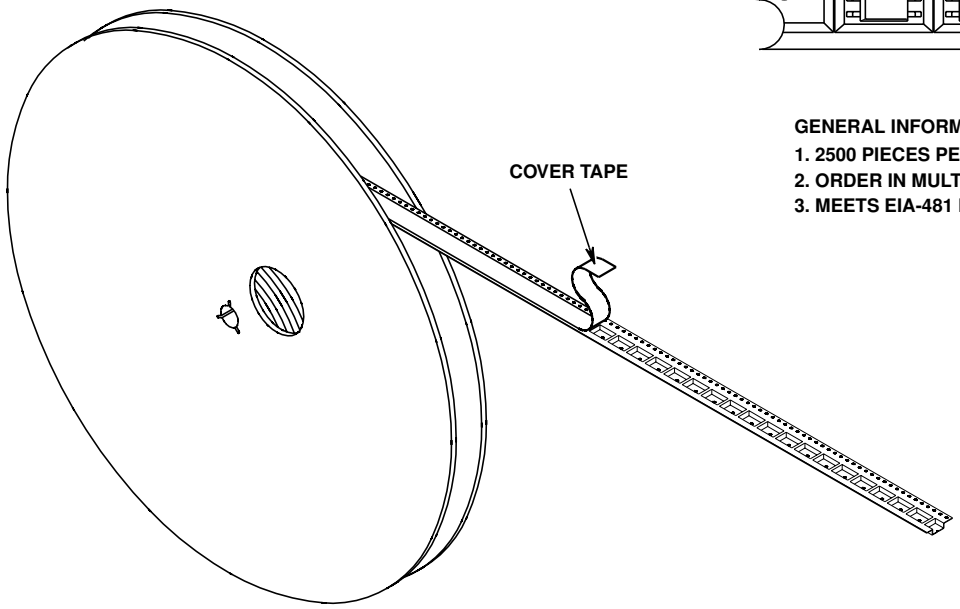
MS-012AA

12mm TAPE AND REEL









GENERAL INFORMATION

1. 2500 PIECES PER REEL.

2. ORDER IN MULTIPLES OF FULL REELS ONLY.

3. MEETS EIA-481 REVISION "A" SPECIFICATIONS.

Revision 7 dated 1-98