

Absolute Maximum Ratings

| Symbol | Parameter | Rating | Unit | |
|--|--|---------------------------|--------------------|---|
| Common Ratings ($T_A=25^\circ\text{C}$ Unless Otherwise Noted) | | | | |
| V_{DSS} | Drain-Source Voltage | 20 | V | |
| V_{GSS} | Gate-Source Voltage | ± 16 | | |
| T_J | Maximum Junction Temperature | 150 | $^\circ\text{C}$ | |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ\text{C}$ | |
| I_S | Diode Continuous Forward Current | $T=25^\circ\text{C}$ 8 | A | |
| Mounted on Large Heat Sink | | | | |
| I_{DP} | 300 μs Pulse Drain Current Tested | $T_C=25^\circ\text{C}$ | 50 | A |
| | | $T_C=100^\circ\text{C}$ | 30 | |
| I_D | Continuous Drain Current | $T_C=25^\circ\text{C}$ | 20 | A |
| | | $T_C=100^\circ\text{C}$ | 12 | |
| P_D | Maximum Power Dissipation | $T_C=25^\circ\text{C}$ | 50 | W |
| | | $T_C=100^\circ\text{C}$ | 20 | |
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case | 2.5 | $^\circ\text{C/W}$ | |
| Mounted on PCB of 1in² Pad Area | | | | |
| I_{DP} | 300 μs Pulse Drain Current Tested | $T_A=25^\circ\text{C}$ | 50 | A |
| | | $T_A=100^\circ\text{C}$ | 30 | |
| I_D | Continuous Drain Current | $T_A=25^\circ\text{C}$ | 6 | A |
| | | $T_A=100^\circ\text{C}$ | 4 | |
| P_D | Maximum Power Dissipation | $T_A=25^\circ\text{C}$ | 2.5 | W |
| | | $T_A=100^\circ\text{C}$ | 1 | |
| $R_{\theta JA}$ | Thermal Resistance-Junction to Ambient | 50 | $^\circ\text{C/W}$ | |
| Mounted on PCB of Minimum Footprint | | | | |
| I_{DP} | 300 μs Pulse Drain Current Tested | $T_A=25^\circ\text{C}$ | 50 | A |
| | | $T_A=100^\circ\text{C}$ | 30 | |
| I_D | Continuous Drain Current | $T_A=25^\circ\text{C}$ | 5 | A |
| | | $T_A=100^\circ\text{C}$ | 3 | |
| P_D | Maximum Power Dissipation | $T_A=25^\circ\text{C}$ | 1.6 | W |
| | | $T_A=100^\circ\text{C}$ | 0.6 | |
| $R_{\theta JA}$ | Thermal Resistance-Junction to Ambient | 75 | $^\circ\text{C/W}$ | |

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

| Symbol | Parameter | Test Condition | APM2054NU | | | Unit |
|--|----------------------------------|--|-----------|------|---------|------|
| | | | Min. | Typ. | Max. | |
| Static Characteristics | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _{DS} =250μA | 20 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =16V, V _{GS} =0V T _J =85°C | | | 1 30 | μA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _{DS} =250μA | 0.6 | 0.7 | 1.5 | V |
| I _{GSS} | Gate Leakage Current | V _{GS} =±16V, V _{DS} =0V | | | ±100 | nA |
| R _{DS(ON)} ^a | Drain-Source On-state Resistance | V _{GS} =10V, I _{DS} =12A | | 35 | 40 | mΩ |
| | | V _{GS} =4.5V, I _{DS} =6A | | 45 | 54 | |
| | | V _{GS} =2.5V, I _{DS} =2A | | 110 | 130 | |
| Diode Characteristics | | | | | | |
| V _{SD} ^a | Diode Forward Voltage | I _{SD} =6A, V _{GS} =0V | | 0.7 | 1.3 | V |
| Dynamic Characteristics^b | | | | | | |
| R _G | Gate Resistance | V _{GS} =0V, V _{DS} =0V, F=1MHz | | 2.3 | | Ω |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, Frequency=1.0MHz | | 450 | | pF |
| C _{oss} | Output Capacitance | | | 100 | | |
| C _{rss} | Reverse Transfer Capacitance | | | 60 | | |
| t _{d(ON)} | Turn-on Delay Time | V _{DD} =10V, R _L =10Ω, I _{DS} =1A, V _{GEN} =4.5V, R _G =6Ω | | 7 | 10 | ns |
| T _r | Turn-on Rise Time | | | 15 | 25 | |
| t _{d(OFF)} | Turn-off Delay Time | | | 19 | 26 | |
| T _f | Turn-off Fall Time | | | 6 | 7 | |
| Gate Charge Characteristics^b | | | | | | |
| Q _g | Total Gate Charge | V _{DS} =10V, V _{GS} =4.5V, I _{DS} =12A | | 3.8 | 5 | nC |
| Q _{gs} | Gate-Source Charge | | | 1.2 | | |
| Q _{gd} | Gate-Drain Charge | | | 1.4 | | |

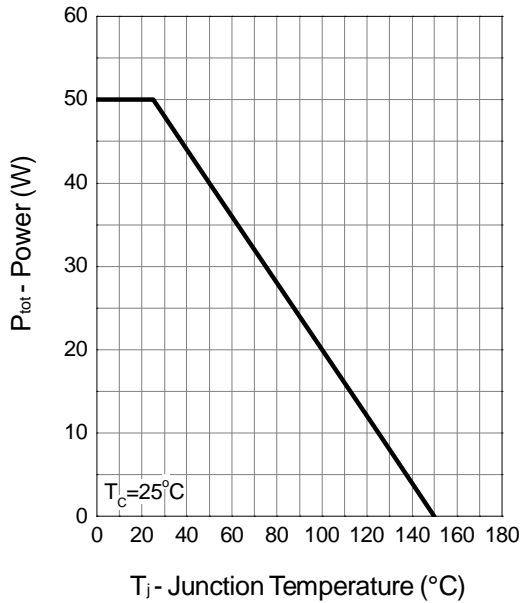
Notes:

a : Pulse test ; pulse width ≤ 300μs, duty cycle ≤ 2%.

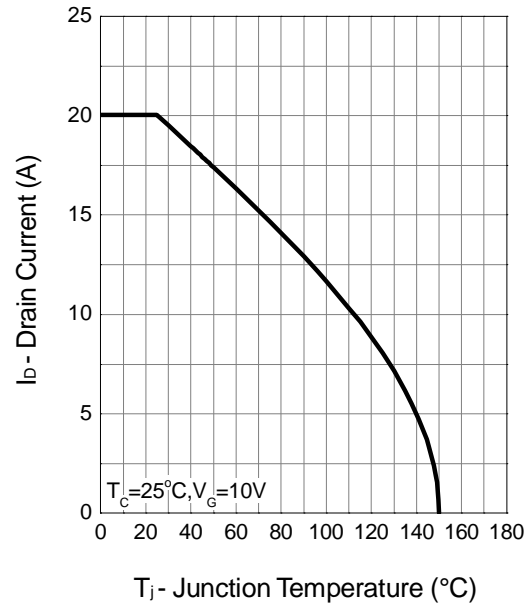
b : Guaranteed by design, not subject to production testing.

Typical Characteristics

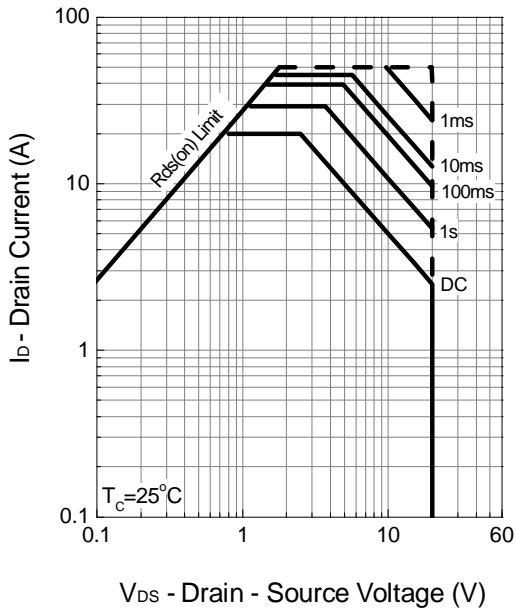
Power Dissipation



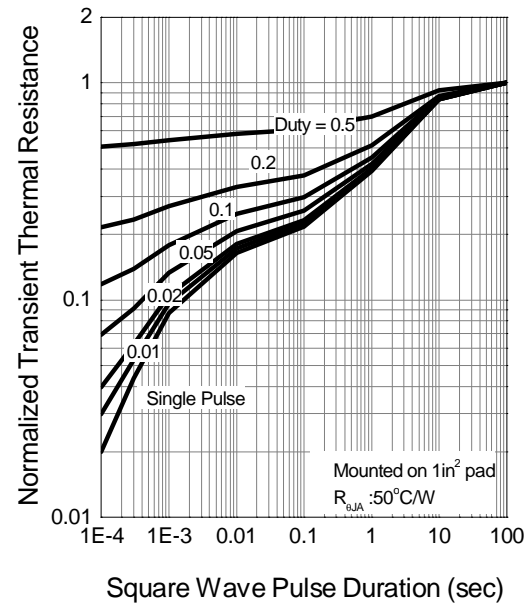
Drain Current



Safe Operation Area

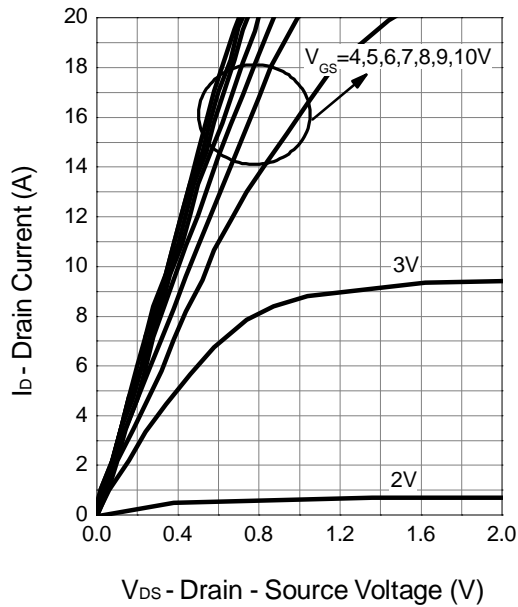


Thermal Transient Impedance

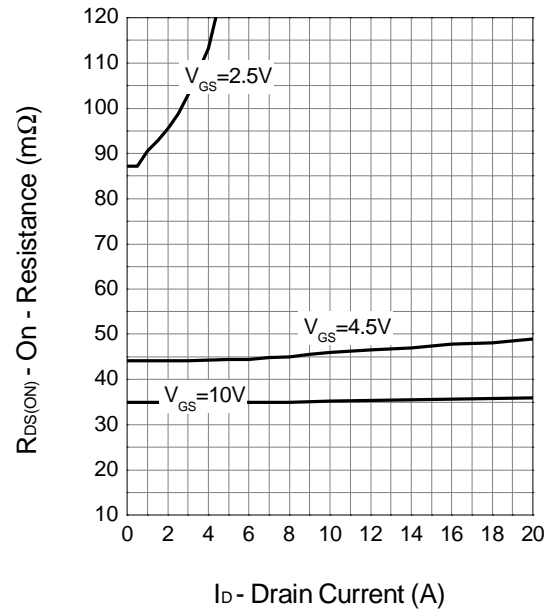


Typical Characteristics (Cont.)

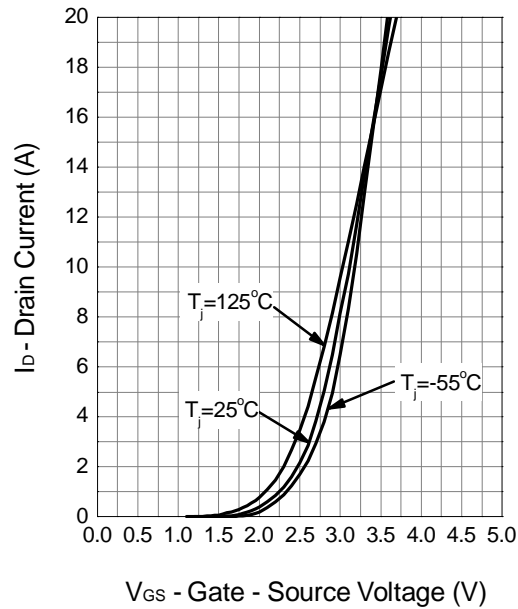
Output Characteristics



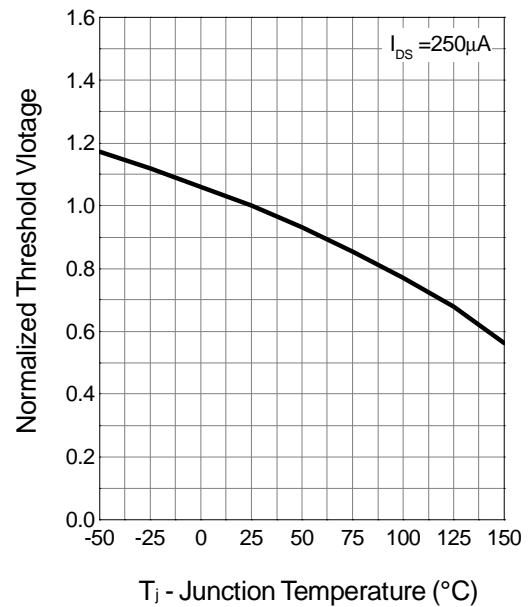
Drain-Source On Resistance



Transfer Characteristics

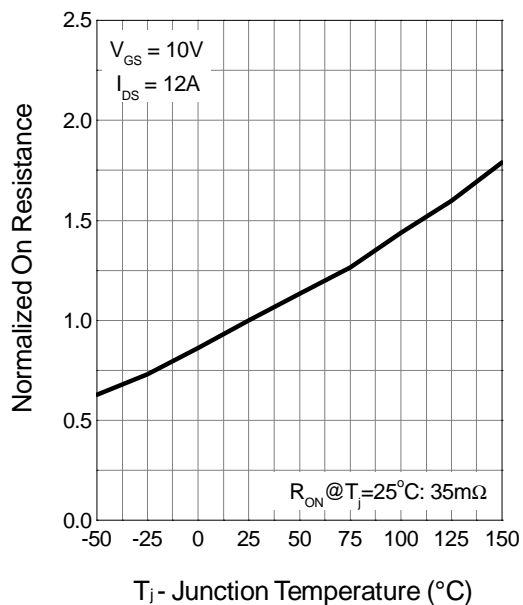


Gate Threshold Voltage

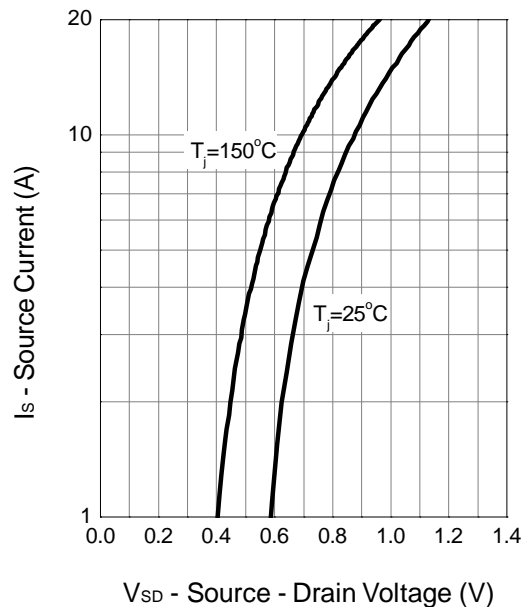


Typical Characteristics (Cont.)

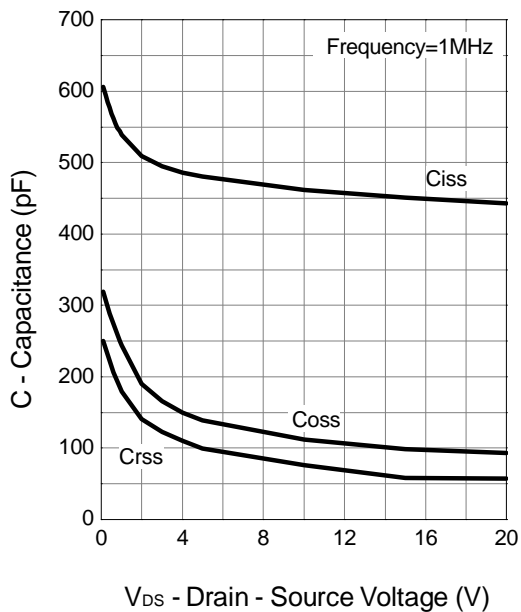
Drain-Source On Resistance



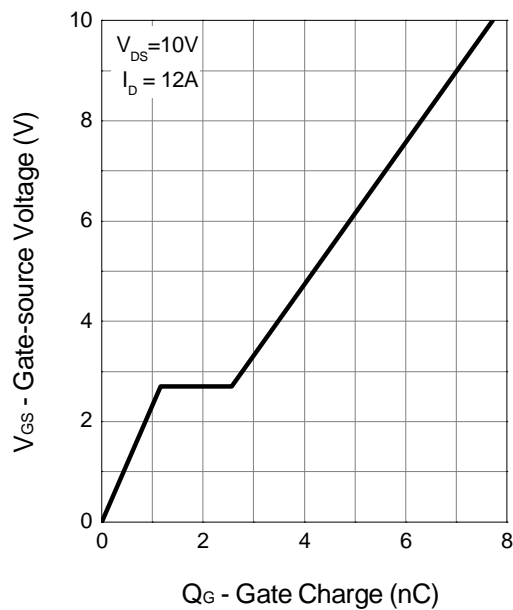
Source-Drain Diode Forward



Capacitance

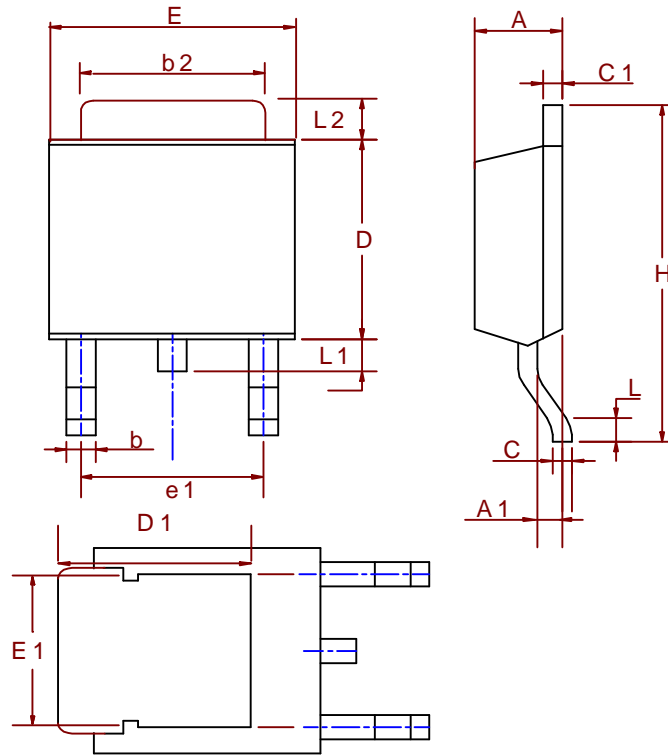


Gate Charge



Package Information

TO-252 (Reference JEDEC Registration TO-252)

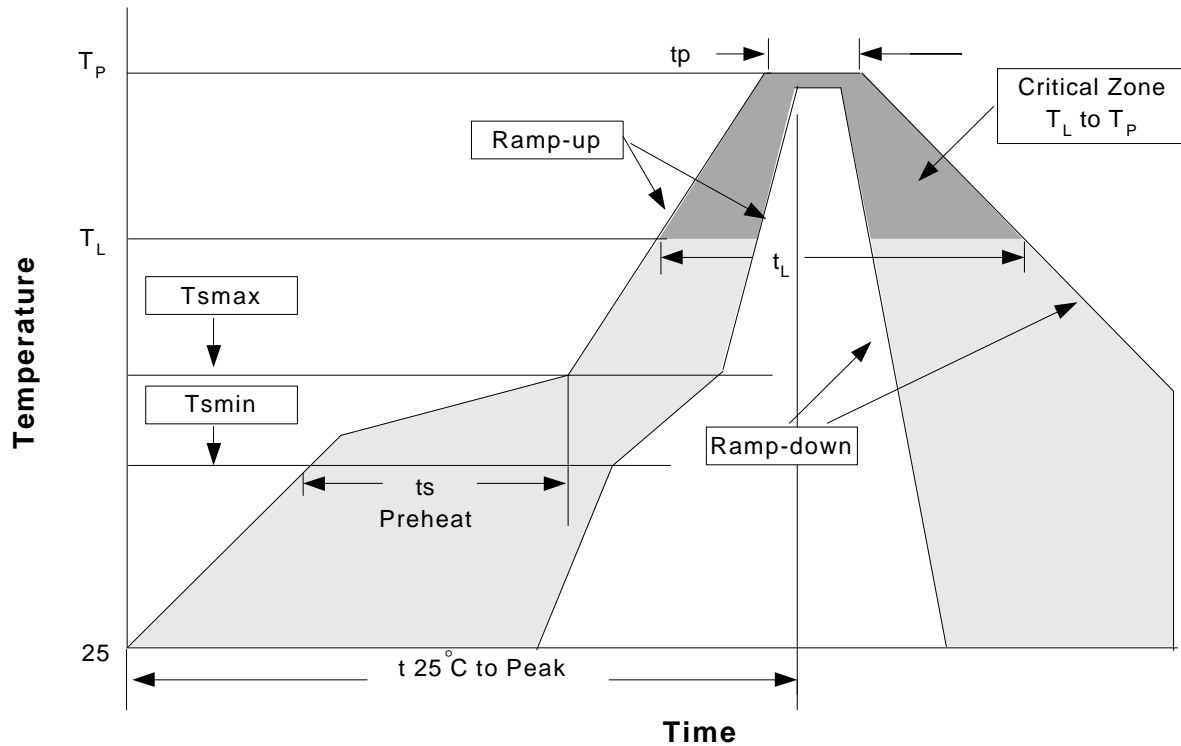


| Dim | Millimeters | | Inches | |
|-----|-------------|-------|-----------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.18 | 2.39 | 0.086 | 0.094 |
| A1 | 0.89 | 1.27 | 0.035 | 0.050 |
| b | 0.508 | 0.89 | 0.020 | 0.035 |
| b2 | 5.207 | 5.461 | 0.205 | 0.215 |
| C | 0.46 | 0.58 | 0.018 | 0.023 |
| C1 | 0.46 | 0.58 | 0.018 | 0.023 |
| D | 5.334 | 6.22 | 0.210 | 0.245 |
| D1 | 5.2 REF | | 0.205 REF | |
| E | 6.35 | 6.73 | 0.250 | 0.265 |
| E1 | 5.3 REF | | 0.209 REF | |
| e1 | 3.96 | 5.18 | 0.156 | 0.204 |
| H | 9.398 | 10.41 | 0.370 | 0.410 |
| L | 0.51 | | 0.020 | |
| L1 | 0.64 | 1.02 | 0.025 | 0.040 |
| L2 | 0.89 | 2.032 | 0.035 | 0.080 |

Physical Specifications

| | |
|--------------------|--|
| Terminal Material | Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb), 100%Sn |
| Lead Solderability | Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3. |

Reflow Condition (IR/Convection or VPR Reflow)



Classification Reflow Profiles

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|-------------------------|------------------|
| Average ramp-up rate (T_L to T_p) | 3°C/second max. | 3°C/second max. |
| Preheat | | |
| - Temperature Min (T_{smin}) | 100°C | 150°C |
| - Temperature Max (T_{smax}) | 150°C | 200°C |
| - Time (min to max) (t_s) | 60-120 seconds | 60-180 seconds |
| Time maintained above: | | |
| - Temperature (T_L) | 183°C | 217°C |
| - Time (t_L) | 60-150 seconds | 60-150 seconds |
| Peak/Classification Temperature (T_p) | See table 1 | See table 2 |
| Time within 5°C of actual Peak Temperature (t_p) | 10-30 seconds | 20-40 seconds |
| Ramp-down Rate | 6°C/second max. | 6°C/second max. |
| Time 25°C to Peak Temperature | 6 minutes max. | 8 minutes max. |

Notes: All temperatures refer to topside of the package .Measured on the body surface.

Classification Reflow Profiles(Cont.)

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

| Package Thickness | Volume mm ³ <350 | Volume mm ³ ≥350 |
|-------------------|--------------------------------|--------------------------------|
| <2.5 mm | 240 +0/-5°C | 225 +0/-5°C |
| ≥2.5 mm | 225 +0/-5°C | 225 +0/-5°C |

Table 2. Pb-free Process – Package Classification Reflow Temperatures

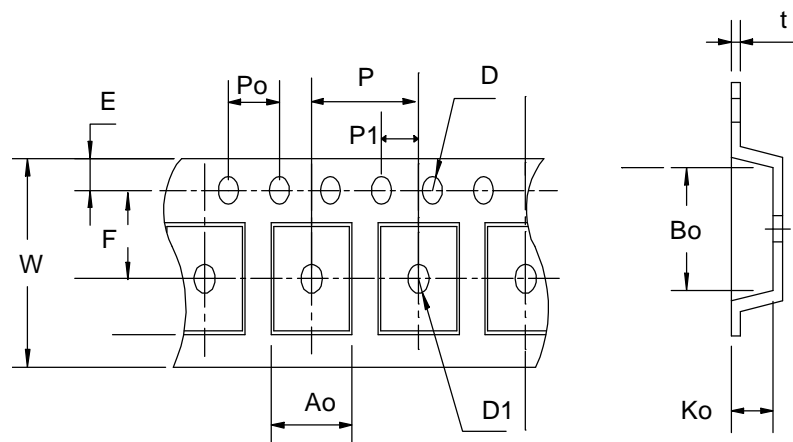
| Package Thickness | Volume mm ³ <350 | Volume mm ³ 350-2000 | Volume mm ³ >2000 |
|-------------------|--------------------------------|------------------------------------|---------------------------------|
| <1.6 mm | 260 +0°C* | 260 +0°C* | 260 +0°C* |
| 1.6 mm – 2.5 mm | 260 +0°C* | 250 +0°C* | 245 +0°C* |
| ≥2.5 mm | 250 +0°C* | 245 +0°C* | 245 +0°C* |

*Tolerance: The device manufacturer/supplier **shall** assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C. For example 260°C+0°C) at the rated MSL level.

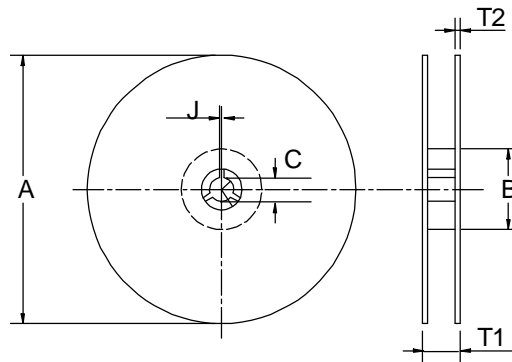
Reliability Test Program

| Test item | Method | Description |
|---------------|---------------------|---------------------------|
| SOLDERABILITY | MIL-STD-883D-2003 | 245°C, 5 SEC |
| HOLT | MIL-STD 883D-1005.7 | 1000 Hrs Bias @ 125°C |
| PCT | JESD-22-B, A102 | 168 Hrs, 100% RH, 121°C |
| TST | MIL-STD 883D-1011.9 | -65°C ~ 150°C, 200 Cycles |

Carrier Tape & Reel Dimensions



Carrier Tape & Reel Dimensions (Cont.)



| Application | A | B | C | J | T1 | T2 | W | P | E |
|-------------|----------|----------|-----------|----------|-------------------|----------|-----------------|----------|-----------|
| TO-252 | 330 ±3 | 100 ±2 | 13 ±0.5 | 2 ±0.5 | 16.4 +0.3 -0.2 | 2.5 ±0.5 | 16+ 0.3 -0.1 | 8 ±0.1 | 1.75 ±0.1 |
| | F | D | D1 | Po | P1 | Ao | Bo | Ko | t |
| | 7.5 ±0.1 | 1.5 +0.1 | 1.5 ±0.25 | 4.0 ±0.1 | 2.0 ±0.1 | 6.8 ±0.1 | 10.4 ±0.1 | 2.5 ±0.1 | 0.3 ±0.05 |

(mm)

Cover Tape Dimensions

| Application | Carrier Width | Cover Tape Width | Devices Per Reel |
|-------------|---------------|------------------|------------------|
| TO-252 | 16 | 13.3 | 2500 |

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