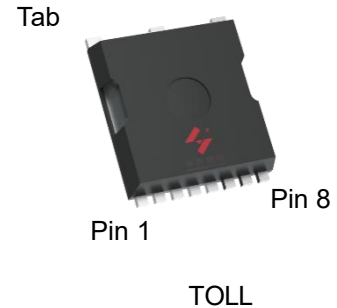


N-Channel Enhancement Mode MOSFET

Feature

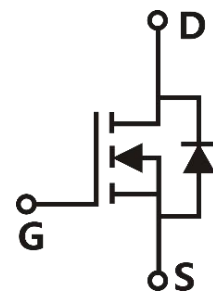
- 150V/205A
 $R_{DS(ON)} = 4.2m\Omega (typ.) @ V_{GS} = 10V$
- 100% Avalanche Tested
- 100% DVDS
- Reliable and Rugged
- Halogen Free and Green Devices Available
(RoHS Compliant)

Pin Description




Applications

- Battery Management System
- Motor Control



Pin 2,3,4,5,6,7,8
Single N-Channel MOSFET

Ordering and Marking Information

| | |
|---|---|
|  <p>TA HYG045N15 XYMXXXXXX</p> | <p>Package Code TA: TOLL</p> <p>Date Code XYMXXXXXX</p> |
|---|---|

Note: HUAYI halogen free products contain molding compounds/die attach materials and 100% matte tin plate Termination finish; which are fully compliant with RoHS. HUAYI halogen free products meet or exceed the halogen free requirements of IPC/JEDEC J-STD-020 for MSL classification at halogen free peak reflow temperature. HUAYI defines "Green" to mean halogen free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

HUAYI reserves the right to make changes, corrections, enhancements, modifications, and improvements to this product and/or to this document at any time without notice.

Absolute Maximum Ratings

| Symbol | Parameter | | Rating | Unit |
|---|--|----------|------------|------|
| Common Ratings (Tc=25°C Unless Otherwise Noted) | | | | |
| V _{DSS} | Drain-Source Voltage | | 150 | V |
| V _{GSS} | Gate-Source Voltage | | ± 20 | V |
| T _J | Junction Temperature Range | | -55 to 175 | °C |
| T _{STG} | Storage Temperature Range | | | °C |
| I _S | Source Current-Continuous(Body Diode) | Tc=25°C | 205 | A |
| Mounted on Large Heat Sink | | | | |
| I _{DM} | Pulsed Drain Current * | Tc=25°C | 715 | A |
| I _D | Continuous Drain Current | Tc=25°C | 205 | A |
| | | Tc=100°C | 145 | A |
| P _D | Maximum Power Dissipation | Tc=25°C | 428.5 | W |
| | | Tc=100°C | 214.2 | W |
| R _{θJC} | Thermal Resistance, Junction-to-Case | | 0.35 | °C/W |
| R _{θJA} | Thermal Resistance, Junction-to-Ambient ** | | 45 | °C/W |
| E _{AS} | Single Pulsed-Avalanche Energy *** | L=0.3mH | 1356.6 | mJ |

Note: * Repetitive rating; pulse width limited by max.junction temperature.

** Surface mounted on 1in2 FR-4 board.

*** Limited by T_{Jmax}, starting T_J=25°C, L = 0.3mH, R_θ= 25Ω, V_{GS} =10V.

Electrical Characteristics(Tc =25°C Unless Otherwise Noted)

| Symbol | Parameter | Test Conditions | HYG045N15NS1 | | | Unit |
|------------------------|----------------------------------|---|--------------|-------|------|------|
| | | | Min | Typ. | Max | |
| Static Characteristics | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _{DS} = 250μA | 150 | - | - | V |
| I _{DSS} | Drain-to-Source Leakage Current | V _{DS} =150V, V _{GS} =0V | - | - | 1 | μA |
| | | T _J =125°C | - | - | 50 | μA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _{DS} =250μA | 2.2 | 3.0 | 3.8 | V |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} = ± 20V, V _{DS} =0V | - | - | ±100 | nA |
| R _{DS(ON)} | Drain-Source On-State Resistance | V _{GS} =10V, I _{DS} =50A | - | 4.2 | 5.2 | mΩ |
| Diode Characteristics | | | | | | |
| V _{SD} | Diode Forward Voltage | I _{SD} =50A, V _{GS} =0V | - | 0.8 | 1.3 | V |
| t _{rr} | Reverse Recovery Time | I _{SD} =50A, dI _{SD} /dt=100A/μs | - | 112.7 | - | ns |
| Q _{rr} | Reverse Recovery Charge | | - | 461.6 | - | nC |

Electrical Characteristics (Cont.) (Tc =25°C Unless Otherwise Noted)

| Symbol | Parameter | Test Conditions | HYG045N15NS1 | | | Unit |
|-----------------------------|------------------------------|---|--------------|------|-----|------|
| | | | Min | Typ. | Max | |
| Dynamic Characteristics | | | | | | |
| R _G | Gate Resistance | V _{GS} =0V,V _{DS} =0V,F=1MHz | - | 2.36 | - | Ω |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =25V, Frequency=1MHz | - | 7438 | - | pF |
| C _{oss} | Output Capacitance | | - | 3792 | - | |
| C _{rss} | Reverse Transfer Capacitance | | - | 60.6 | - | |
| t _{d(ON)} | Turn-on Delay Time | V _{DD} =75V,R _G =2.5Ω, I _{DS} =50A,V _{GS} =10V | - | 32.8 | - | ns |
| T _r | Turn-on Rise Time | | - | 81.9 | - | |
| t _{d(OFF)} | Turn-off Delay Time | | - | 73.7 | - | |
| T _f | Turn-off Fall Time | | - | 80.6 | - | |
| Gate Charge Characteristics | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =10V,V _{DS} =75V, I _{DS} =50A | - | 94.6 | - | nC |
| Q _{gs} | Gate-Source Charge | | - | 39.9 | - | |
| Q _{gd} | Gate-Drain Charge | | - | 8.8 | - | |
| V _{plateau} | Gate plateau voltage | | - | 5.01 | - | V |

Note: *Pulse test, pulse width ≤ 300us, duty cycle ≤ 2%

Typical Operating Characteristics

Figure 1: Power Dissipation

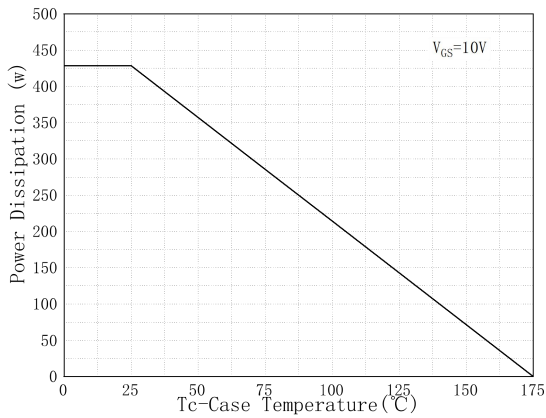


Figure 2: Drain Current

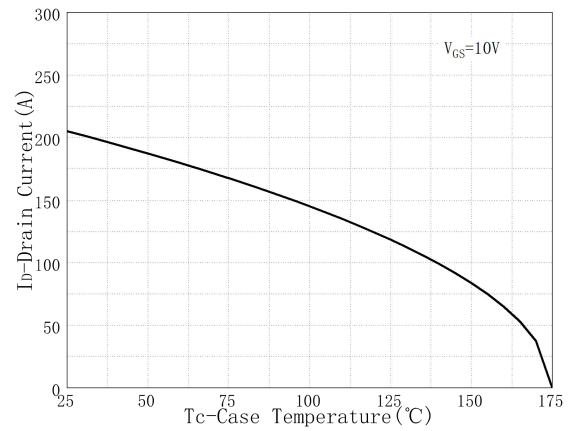


Figure 3: Safe Operation Area

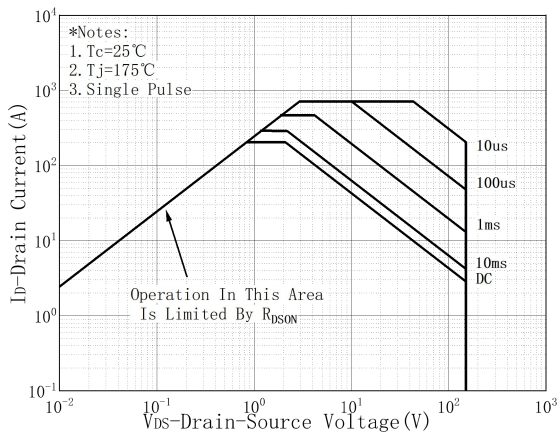


Figure 4: Thermal Transient Impedance

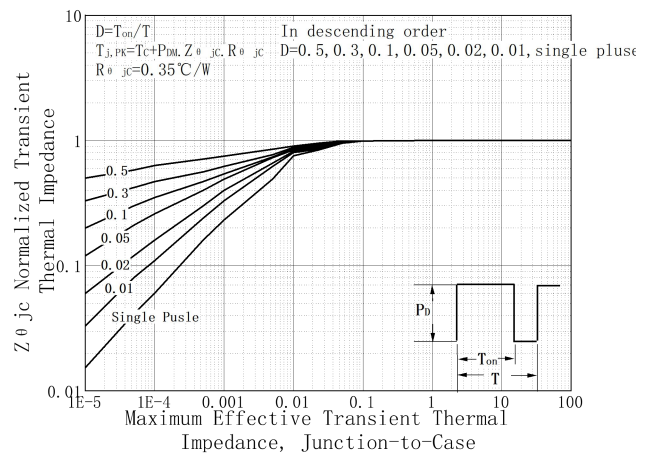


Figure 5: Output Characteristics

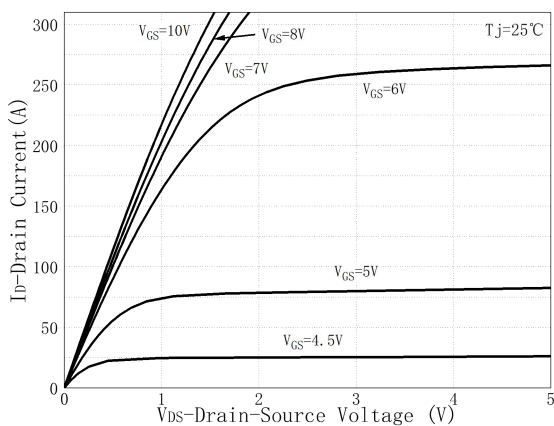
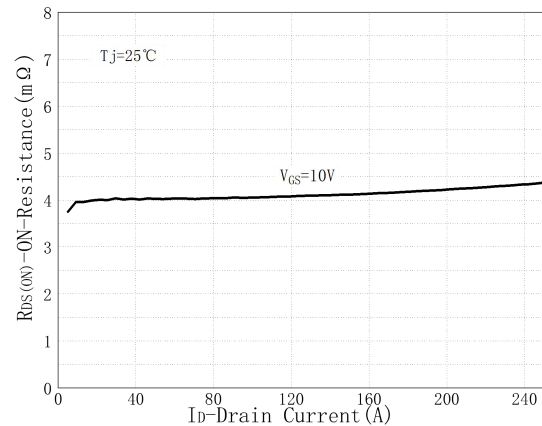


Figure 6: Drain-Source On Resistance



Typical Operating Characteristics(Cont.)

Figure 7: On-Resistance vs. Temperature

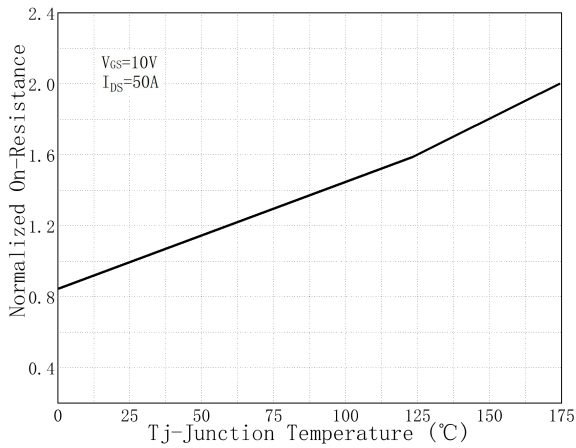


Figure 8: Source-Drain Diode Forward

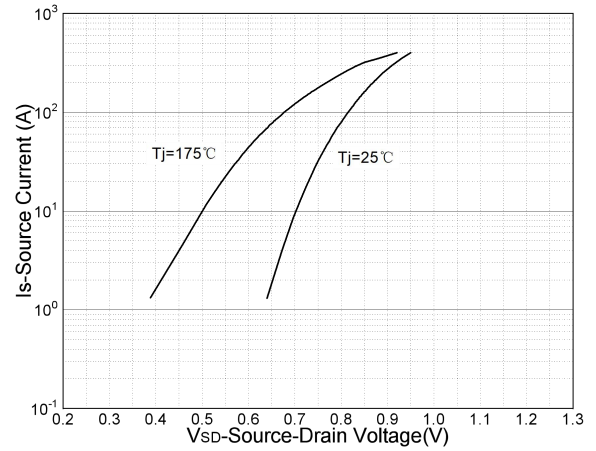


Figure 9: Capacitance Characteristics

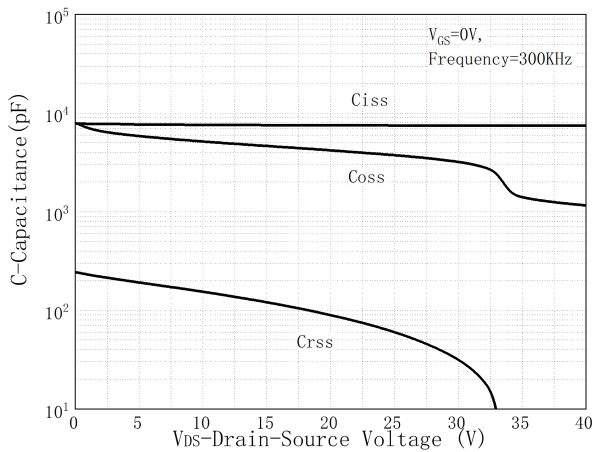
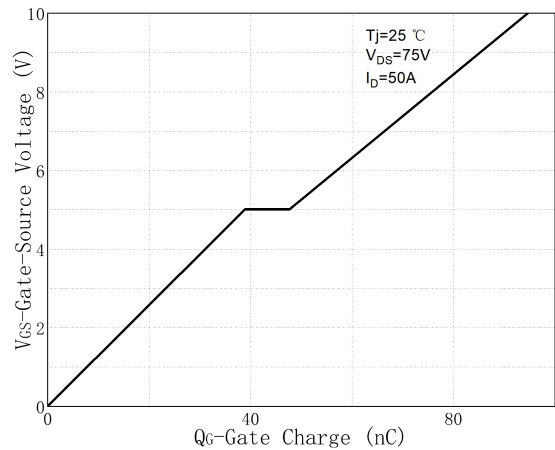
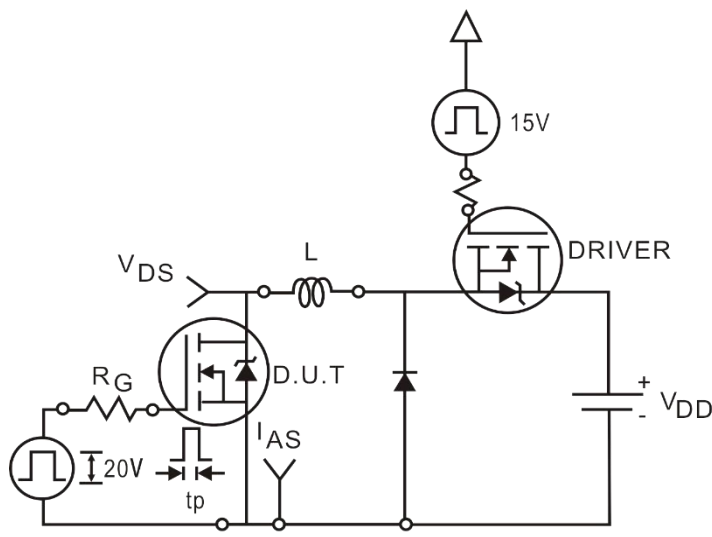


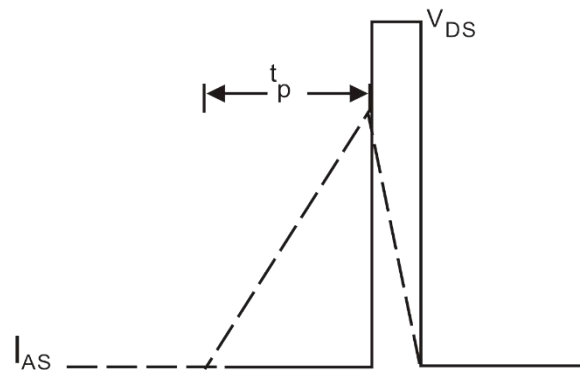
Figure 10: Gate Charge Characteristics



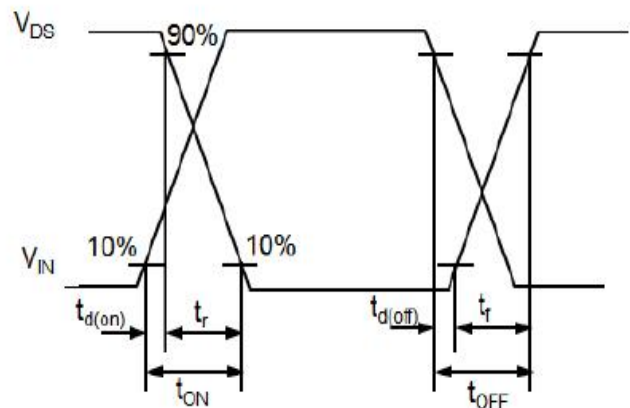
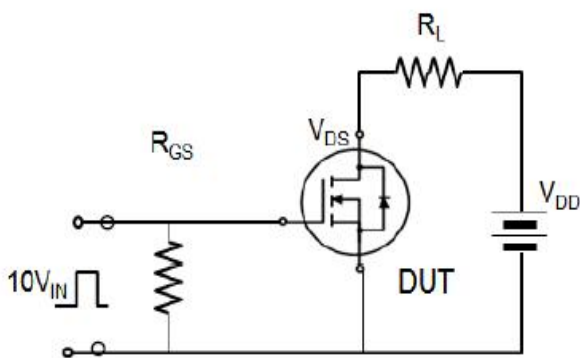
Avalanche Test Circuit



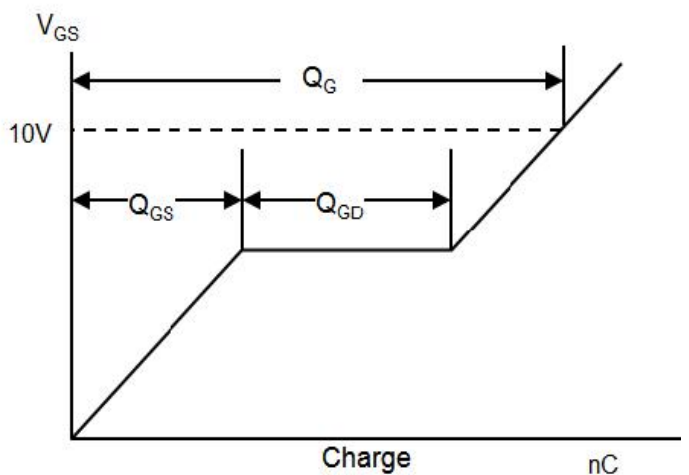
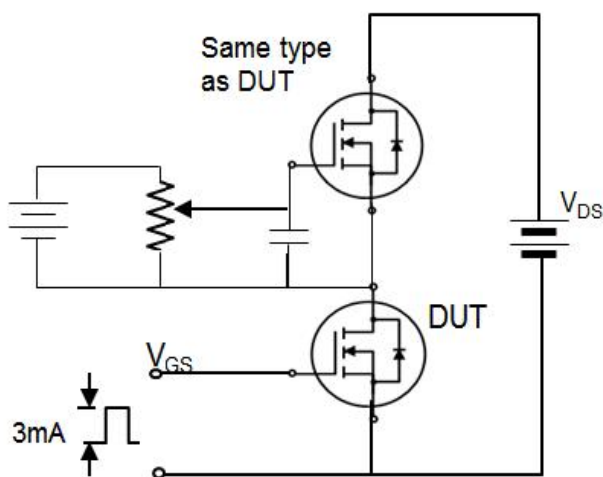
$$E_{AS} = \frac{1}{2} L I_{AS}^2$$



Switching Time Test Circuit



Gate Charge Test Circuit



Package Information

| Package Type | Unit | Quantity |
|--------------|------|----------|
| TOLL | Reel | 1200 |

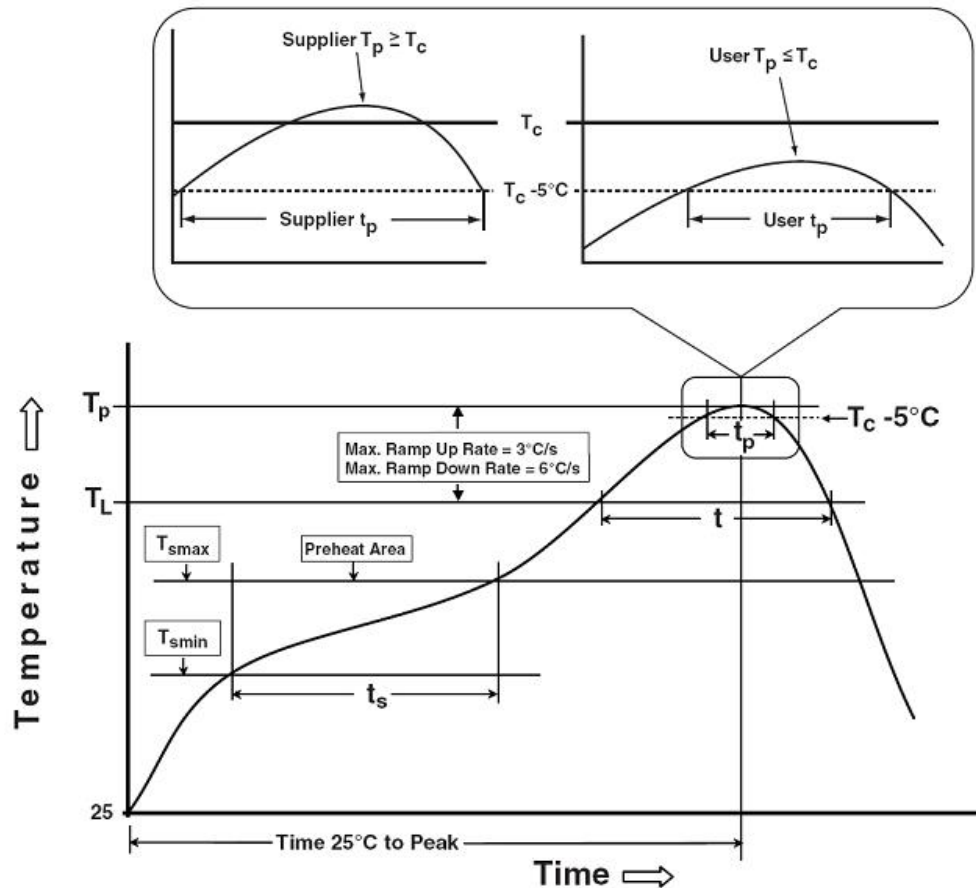
Package Information

Technical drawing of the 100-pin connector showing top, side, and front views with dimensions in mm.

Top View Dimensions:

- Overall width: 10.38 ± 0.2 [D]
- Pin pitch (pins 1-8): 0.6 ± 0.12 [L2]
- Pin pitch (pins 9-16): 0.7 ± 0.2 [L1]
- Pin pitch (pins 17-24): 0.7 ± 0.2 [L1]
- Pin pitch (pins 25-32): 0.7 ± 0.2 [L1]
- Pin pitch (pins 33-40): 0.7 ± 0.2 [L1]
- Pin pitch (pins 41-48): 0.7 ± 0.2 [L1]
- Pin pitch (pins 49-56): 0.7 ± 0.2 [L1]
- Pin pitch (pins 57-64): 0.7 ± 0.2 [L1]
- Pin pitch (pins 65-72): 0.7 ± 0.2 [L1]
- Pin pitch (pins 73-80): 0.7 ± 0.2 [L1]
- Pin pitch (pins 81-88): 0.7 ± 0.2 [L1]
- Pin pitch (pins 89-96): 0.7 ± 0.2 [L1]
- Pin pitch (pins 97-104): 0.7 ± 0.2 [L1]
- Pin pitch (pins 105-112): 0.7 ± 0.2 [L1]
- Pin pitch (pins 113-120): 0.7 ± 0.2 [L1]
- Pin pitch (pins 121-128): 0.7 ± 0.2 [L1]
- Pin pitch (pins 129-136): 0.7 ± 0.2 [L1]
- Pin pitch (pins 137-144): 0.7 ± 0.2 [L1]
- Pin pitch (pins 145-152): 0.7 ± 0.2 [L1]
- Pin pitch (pins 153-160): 0.7 ± 0.2 [L1]
- Pin pitch (pins 161-168): 0.7 ± 0.2 [L1]
- Pin pitch (pins 169-176): 0.7 ± 0.2 [L1]
- Pin pitch (pins 177-184): 0.7 ± 0.2 [L1]
- Pin pitch (pins 185-192): 0.7 ± 0.2 [L1]
- Pin pitch (pins 193-200): 0.7 ± 0.2 [L1]
- Pin pitch (pins 201-208): 0.7 ± 0.2 [L1]
- Pin pitch (pins 209-216): 0.7 ± 0.2 [L1]
- Pin pitch (pins 217-224): 0.7 ± 0.2 [L1]
- Pin pitch (pins 225-232): 0.7 ± 0.2 [L1]
- Pin pitch (pins 233-240): 0.7 ± 0.2 [L1]
- Pin pitch (pins 241-248): 0.7 ± 0.2 [L1]
- Pin pitch (pins 249-256): 0.7 ± 0.2 [L1]
- Pin pitch (pins 257-264): 0.7 ± 0.2 [L1]
- Pin pitch (pins 265-272): 0.7 ± 0.2 [L1]
- Pin pitch (pins 273-280): 0.7 ± 0.2 [L1]
- Pin pitch (pins 281-288): 0.7 ± 0.2 [L1]
- Pin pitch (pins 289-296): 0.7 ± 0.2 [L1]
- Pin pitch (pins 297-304): 0.7 ± 0.2 [L1]
- Pin pitch (pins 305-312): 0.7 ± 0.2 [L1]
- Pin pitch (pins 313-320): 0.7 ± 0.2 [L1]
- Pin pitch (pins 321-328): 0.7 ± 0.2 [L1]
- Pin pitch (pins 329-336): 0.7 ± 0.2 [L1]
- Pin pitch (pins 337-344): 0.7 ± 0.2 [L1]
- Pin pitch (pins 345-352): 0.7 ± 0.2 [L1]
- Pin pitch (pins 353-360): 0.7 ± 0.2 [L1]
- Pin pitch (pins 361-368): 0.7 ± 0.2 [L1]
- Pin pitch (pins 369-376): 0.7 ± 0.2 [L1]
- Pin pitch (pins 377-384): 0.7 ± 0.2 [L1]
- Pin pitch (pins 385-392): 0.7 ± 0.2 [L1]
- Pin pitch (pins 393-400): 0.7 ± 0.2 [L1]
- Pin pitch (pins 401-408): 0.7 ± 0.2 [L1]
- Pin pitch (pins 409-416): 0.7 ± 0.2 [L1]
- Pin pitch (pins 417-424): 0.7 ± 0.2 [L1]
- Pin pitch (pins 425-432): 0.7 ± 0.2 [L1]
- Pin pitch (pins 433-440): 0.7 ± 0.2 [L1]
- Pin pitch (pins 441-448): 0.7 ± 0.2 [L1]
- Pin pitch (pins 449-456): 0.7 ± 0.2 [L1]
- Pin pitch (pins 457-464): 0.7 ± 0.2 [L1]
- Pin pitch (pins 465-472): 0.7 ± 0.2 [L1]
- Pin pitch (pins 473-480): 0.7 ± 0.2 [L1]
- Pin pitch (pins 481-488): 0.7 ± 0.2 [L1]
- Pin pitch (pins 489-496): 0.7 ± 0.2 [L1]
- Pin pitch (pins 497-504): 0.7 ± 0.2 [L1]
- Pin pitch (pins 505-512): 0.7 ± 0.2 [L1]
- Pin pitch (pins 513-520): 0.7 ± 0.2 [L1]
- Pin pitch (pins 521-528): 0.7 ± 0.2 [L1]
- Pin pitch (pins 529-536): 0.7 ± 0.2 [L1]
- Pin pitch (pins 537-544): 0.7 ± 0.2 [L1]
- Pin pitch (pins 545-552): 0.7 ± 0.2 [L1]
- Pin pitch (pins 553-560): 0.7 ± 0.2 [L1]
- Pin pitch (pins 561-568): 0.7 ± 0.2 [L1]
- Pin pitch (pins 569-576): 0.7 ± 0.2 [L1]
- Pin pitch (pins 577-584): 0.7 ± 0.2 [L1]
- Pin pitch (pins 585-592): 0.7 ± 0.2 [L1]
- Pin pitch (pins 593-600): 0.7 ± 0.2 [L1]
- Pin pitch (pins 601-608): 0.7 ± 0.2 [L1]
- Pin pitch (pins 609-616): 0.7 ± 0.2 [L1]
- Pin pitch (pins 617-624): 0.7 ± 0.2 [L1]
- Pin pitch (pins 625-632): 0.7 ± 0.2 [L1]
- Pin pitch (pins 633-640): 0.7 ± 0.2 [L1]
- Pin pitch (pins 641-648): 0.7 ± 0.2 [L1]
- Pin pitch (pins 649-656): 0.7 ± 0.2 [L1]
- Pin pitch (pins 657-664): 0.7 ± 0.2 [L1]
- Pin pitch (pins 665-672): 0.7 ± 0.2 [L1]
- Pin pitch (pins 673-680): 0.7 ± 0.2 [L1]
- Pin pitch (pins 681-688): 0.7 ± 0.2 [L1]
- Pin pitch (pins 689-696): 0.7 ± 0.2 [L1]
- Pin pitch (pins 697-704): 0.7 ± 0.2 [L1]
- Pin pitch (pins 705-712): 0.7 ± 0.2 [L1]
- Pin pitch (pins 713-720): 0.7 ± 0.2 [L1]
- Pin pitch (pins 721-728): 0.7 ± 0.2 [L1]
- Pin pitch (pins 729-736): 0.7 ± 0.2 [L1]
- Pin pitch (pins 737-744): 0.7 ± 0.2 [L1]
- Pin pitch (pins 745-752): 0.7 ± 0.2 [L1]
- Pin pitch (pins 753-760): 0.7 ± 0.2 [L1]
- Pin pitch (pins 761-768): 0.7 ± 0.2 [L1]
- Pin pitch (pins 769-776): 0.7 ± 0.2 [L1]
- Pin pitch (pins 777-784): 0.7 ± 0.2 [L1]
- Pin pitch (pins 785-792): 0.7 ± 0.2 [L1]
- Pin pitch (pins 793-800): 0.7 ± 0.2 [L1]
- Pin pitch (pins 801-808): 0.7 ± 0.2 [L1]
- Pin pitch (pins 809-816): 0.7 ± 0.2 [L1]
- Pin pitch (pins 817-824): 0.7 ± 0.2 [L1]
- Pin pitch (pins 825-832): 0.7 ± 0.2 [L1]
- Pin pitch (pins 833-840): 0.7 ± 0.2 [L1]
- Pin pitch (pins 841-848): 0.7 ± 0.2 [L1]
- Pin pitch (pins 849-856): 0.7 ± 0.2 [L1]
- Pin pitch (pins 857-864): 0.7 ± 0.2 [L1]
- Pin pitch (pins 865-872): 0.7 ± 0.2

Classification Profile



Classification Reflow Profiles

| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|------------------------------------|------------------------------------|
| Preheat & Soak | | |
| Temperature min (T_{smin}) | 100 °C | 150 °C |
| Temperature max (T_{smax}) | 150 °C | 200 °C |
| Time (T_{smin} to T_{smax}) (t_s) | 60-120 seconds | 60-120 seconds |
| Average ramp-up rate (T_{smax} to T_p) | 3 °C/second max. | 3°C/second max. |
| Liquidous temperature (T_L) | 183 °C | 217 °C |
| Time at liquidous (t_L) | 60-150 seconds | 60-150 seconds |
| Peak package body Temperature (T_p)* | See Classification Temp in table 1 | See Classification Temp in table 2 |
| Time (t_p)** within 5°C of the specified classification temperature (T_c) | 20** seconds | 30** seconds |
| Average ramp-down rate (T_p to T_{smax}) | 6 °C/second max. | 6 °C/second max. |
| Time 25°C to peak temperature | 6 minutes max. | 8 minutes max. |
| *Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. | | |
| ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum. | | |

Table 1.SnPb Eutectic Process – Classification Temperatures (Tc)

| Package Thickness | Volume mm ³ <350 | Volume mm ³ ≥350 |
|-------------------|--------------------------------|--------------------------------|
| <2.5 mm | 235 °C | 220 °C |
| ≥2.5 mm | 220 °C | 220 °C |

Table 2.Pb-free Process – Classification Temperatures (Tc)

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

Reliability Test Program

| Test item | Method | Description |
|---------------|---------------|---|
| SOLDERABILITY | JESD-22, B102 | 5 Sec, 245°C |
| HTRB | JESD-22, A108 | 168/500/1000 Hrs, Bias @ 150°C |
| HTGB | JESD-22, A108 | 168 /500/1000 Hrs, V _{gs} 100% @ 150°C |
| PCT | JESD-22, A102 | 96 Hrs, 100%RH, 2atm, 121°C |
| TCT | JESD-22, A104 | 250/500/1000 Cycles, -55°C~150°C |

Customer Service

Worldwide Sales and Service: sales@hymexa.com

Technical Support: Technology@hymexa.com

Huayi Microelectronics Co., Ltd.

No.8928, Shangji Road, Economic and Technological Development Zone, Xi'an, China

TEL: (86-029) 86685706

FAX: (86-029) 86685705

E-mail: sales@hymexa.com

Web net: <http://www.hymexa.com/>