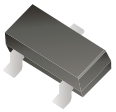
# MOSFET

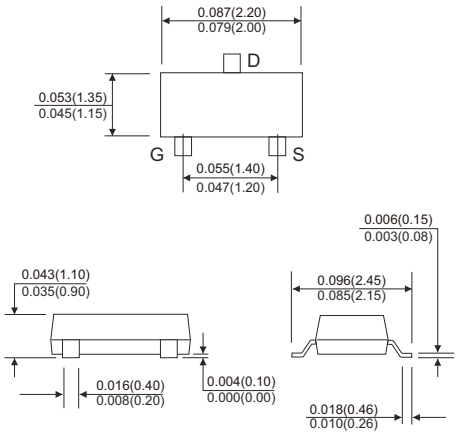
# CMSP1013V3-HF

## P-Channel
## RoHS Device
## Halogen Free



| $V_{(BR)DSS}$ | $R_{DS(on)}$ Typ | $I_D$ |
|---|---|---|
| -20V | 0.64Ω @ -4.5V | -540mA |
| | 1.1Ω @ -2.5V | |
| | 1.9Ω @ -1.8V | |

**SOT-323**



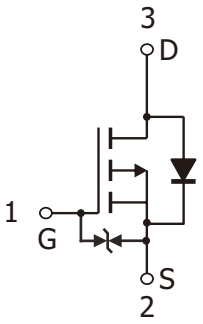

Dimensions in inches and (millimeter)

## Features

- Very low level gate drive requirements allowing direct operation in 3V circuits. $V_{GS(th)}$ < 1.2V.
- Compact industrtial standard SOT-323 surface mount package.
- ESD protected gate.
- Pb-free lead plating and halogen-free package.

## Circuit Diagram

1 G : Gate
2 S : Source
3 D : Drain




## Mechanical data

- Case: SOT-323, molded plastic.
- Mounting position: Any.

## Maximum Ratings (at $T_A$=25°C unless otherwise noted)

| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | -20 | V |
| Gate-source voltage | $V_{GS}$ | ±10 | V |
| Continuous drain current @ $T_A$=25°C, $V_{GS}$=4.5V | $I_D$ | -0.54 | A |
| Pulsed drain current (Note 1) | $I_{DM}$ | -1.5 | |
| Maximum power dissipation @ $T_A$=25°C (Note 2) | $P_D$ | 350 | mW |
| Thermal resistance, junction-to-ambient | $R_{thja}$ | 357 | °C/W |
| Operating junction and storage temperature | $T_j$, $T_{STG}$ | -55 ~ +150 | °C |

Notes: 1. Pulse width ≤ 10μs, duty cycle ≤ 2%.
2. Surface mounted on 1 in² copper pad of FR-4 board, t ≤ 5s.

## Electrical Characteristics (at TA=25°C unless otherwise noted)

| Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|
| **Static** | | | | | |
| $BV_{DSS}$ | -20 | | | V | $V_{GS}$ = 0V, $I_D$ = -250μA |
| $V_{GS(th)}$ | -0.5 | -0.8 | -1.2 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA |
| $G_{FS}$ | | 0.5 | | S | $V_{DS}$ = -10V, $I_D$ = -200mA |
| $I_{GSS}$ | | | ±10 | μA | $V_{GS}$ = ±10V, $V_{DS}$ = 0V |
| $I_{DSS}$ | | | -1 | | $V_{DS}$ = -20V, $V_{GS}$ = 0V |
| | | | -10 | | $V_{DS}$ = -20V, $V_{GS}$ = 0V, $T_J$ = 55°C |
| *$R_{DS(on)}$ | | 0.64 | 0.9 | Ω | $V_{GS}$ = -4.5V, $I_D$ = -430mA |
| | | 0.68 | 0.9 | | $V_{GS}$ = -4V, $I_D$ = -300mA |
| | | 1.1 | 1.4 | | $V_{GS}$ = -2.5V, $I_D$ = -300mA |
| | | 1.9 | 2.7 | | $V_{GS}$ = -1.8V, $I_D$ = -150mA |
| **Dynamic** | | | | | |
| $C_{iss}$ | | 59 | | pF | $V_{DS}$ = -10V, $V_{GS}$ = 0V, f = 1MHz |
| $C_{oss}$ | | 21 | | | |
| $C_{rss}$ | | 15 | | | |
| *$t_{d(ON)}$ | | 5 | | ns | $V_{DS}$ = -6V, $I_D$ = -500mA, $V_{GS}$ = -4.5V, $R_G$ = 50Ω |
| *$t_r$ | | 6 | | | |
| *$t_{d(OFF)}$ | | 42 | | | |
| *$t_f$ | | 14 | | | |
| *$Q_g$ | | 1.2 | | nC | $V_{DS}$ = -5V, $I_D$ = -250mA, $V_{GS}$ = -4.5V |
| *$Q_{gs}$ | | 0.38 | | | |
| *$Q_{gd}$ | | 0.23 | | | |
| **Source-Drain Diode** | | | | | |
| *$I_S$ | | | -0.54 | A | |
| *$I_{SM}$ | | | -1.5 | | |
| *$V_{SD}$ | | -0.77 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -100mA |

* Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 2%.

## Typical Characteristic (CMSP1013V3-HF)

Fig.1 - Typical Output Characteristics

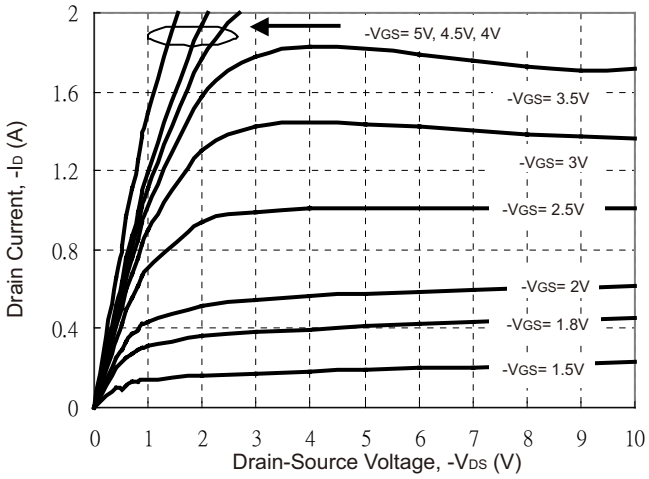



Fig.2 - Breakdown Voltage vs Ambient Temperature

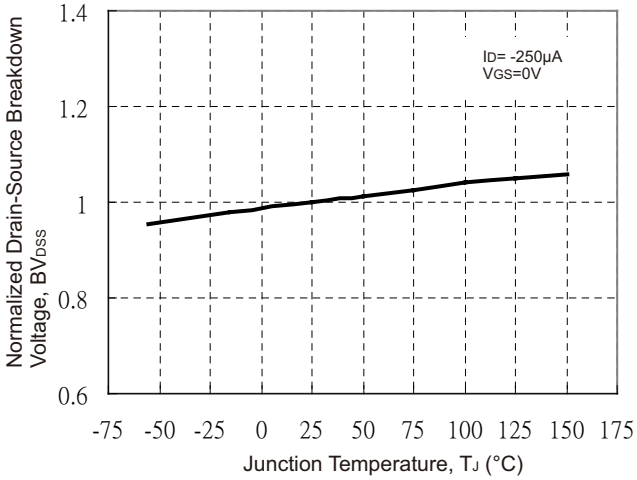



Fig.3 - Static Drain-Source On-State Resistance vs Drain Current

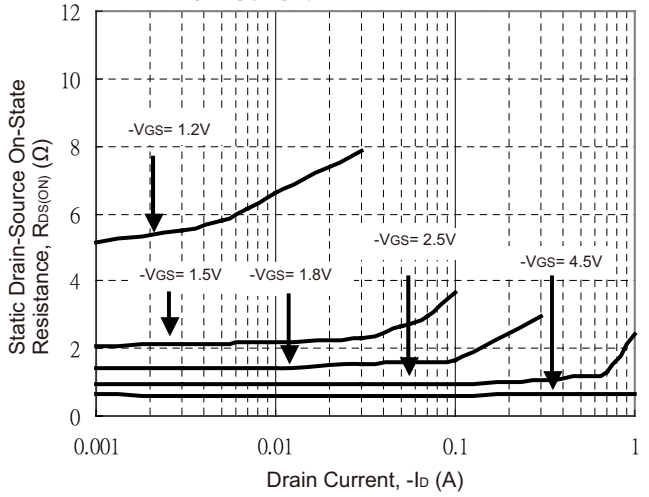



Fig.4 - Reverse Drain Current vs Source-Drain Voltage

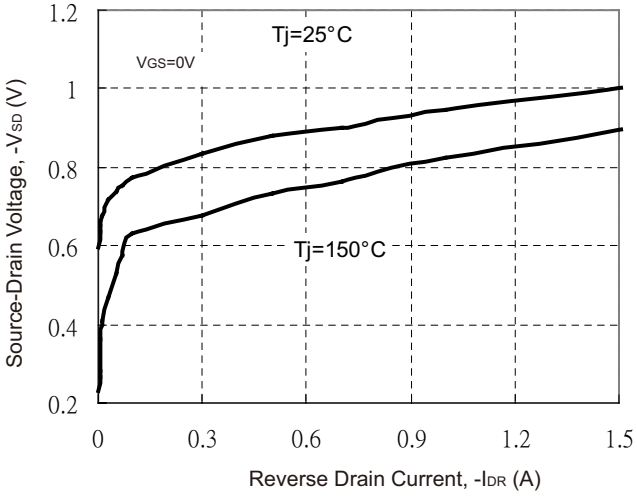



Fig.5 - Static Drain-Source On-State Resistance vs Gate-Source Voltage

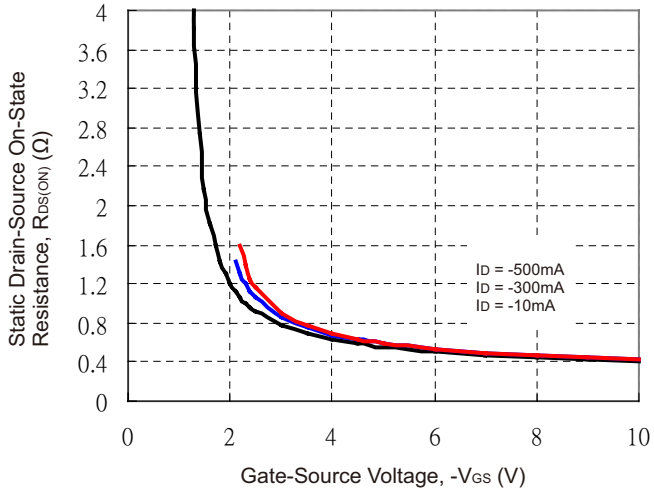
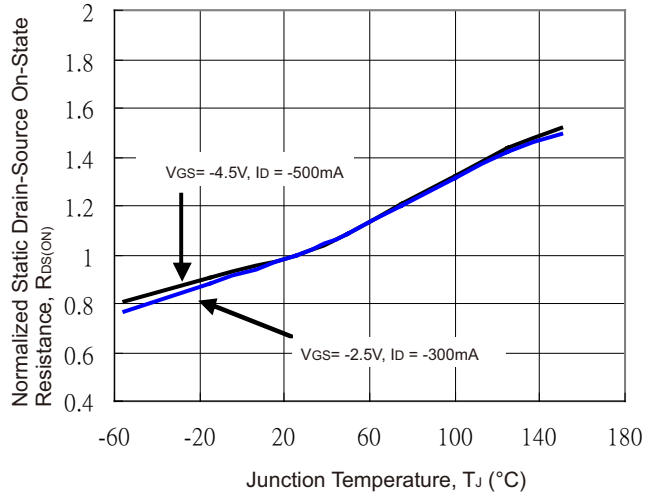



Fig.6 - Drain-Source On-State Resistance vs Junction Temperature



## Typical Characteristic (CMSP1013V3-HF)

Fig.7 - Capacitance vs Drain-to-Source Voltage

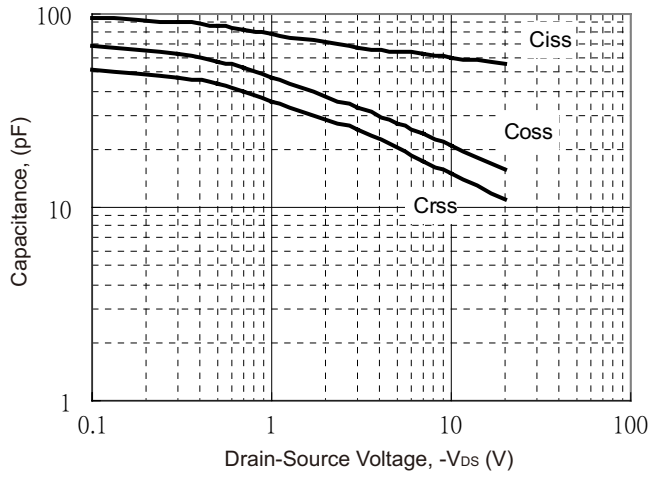



Fig.8 - Threshold Voltage vs Junction Temperature

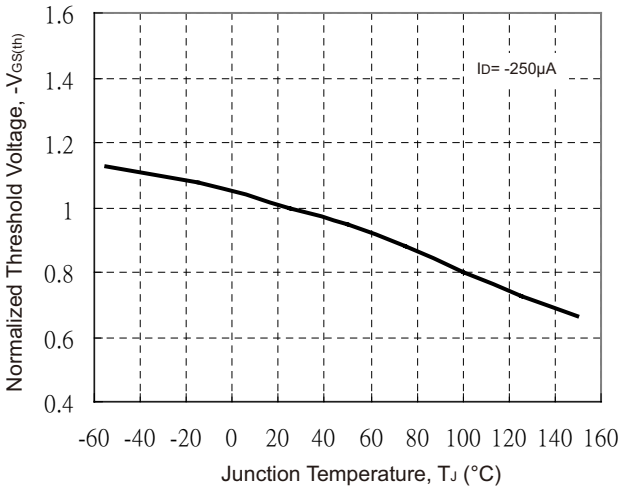



Fig.9 - Single Pulse Power Rating, Junction to Ambient

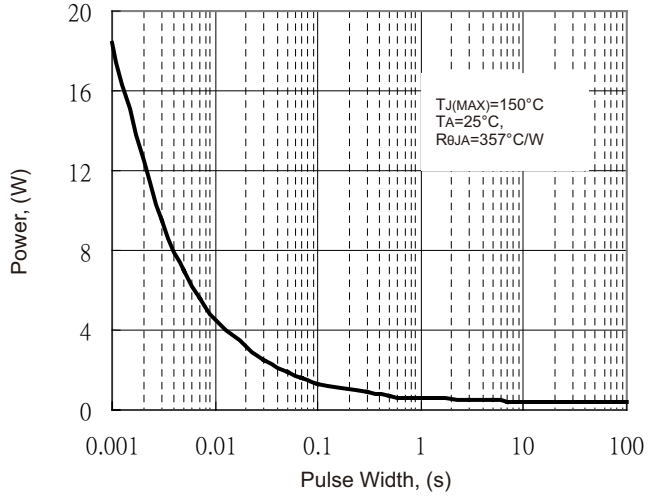



Fig.10 - Gate Charge Characteristics

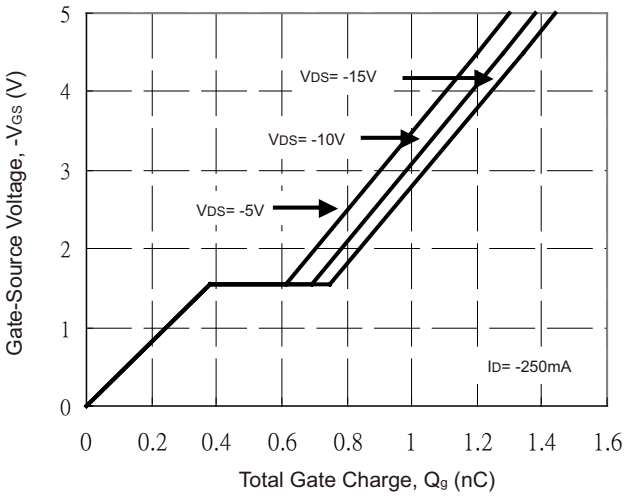



Fig.11 - Maximum Safe Operating Area

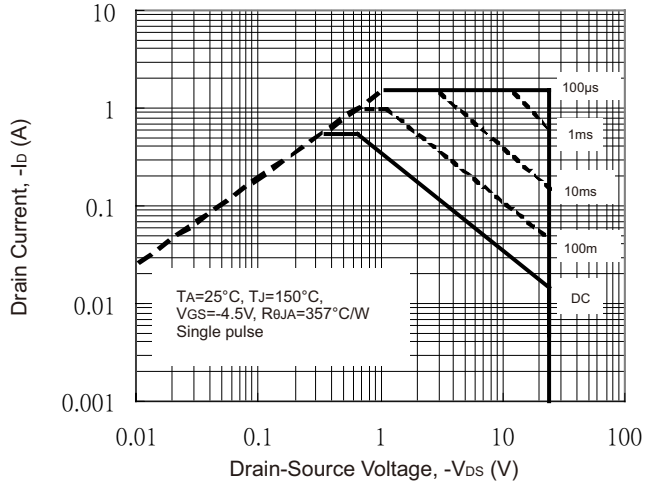
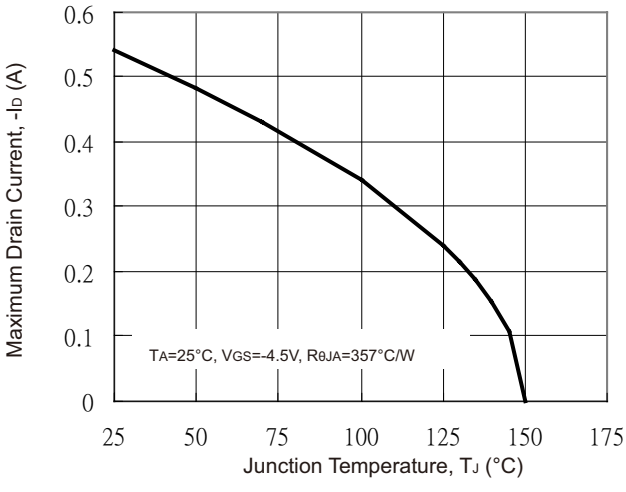



Fig.12 - Maximum Drain Current vs Junction Temperature



## Typical Characteristic (CMSP1013V3-HF)

Fig.13 - Typical Transfer Characteristics

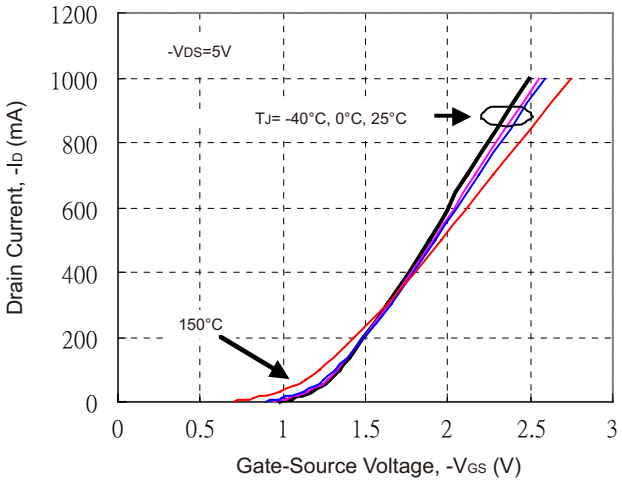



Fig.14 - Power Derating Curve

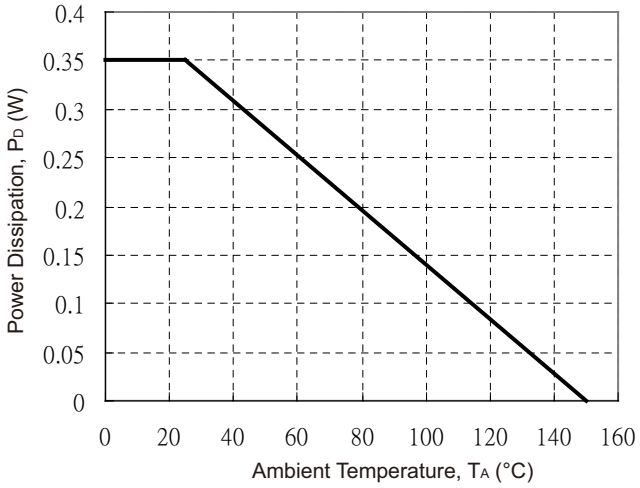
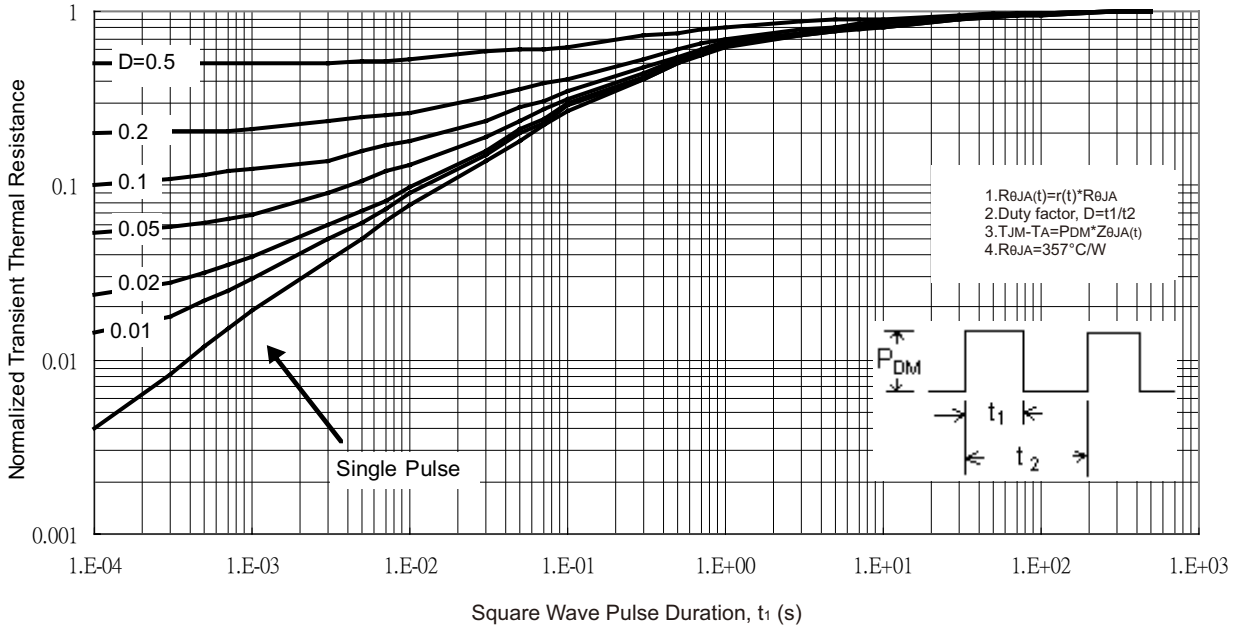
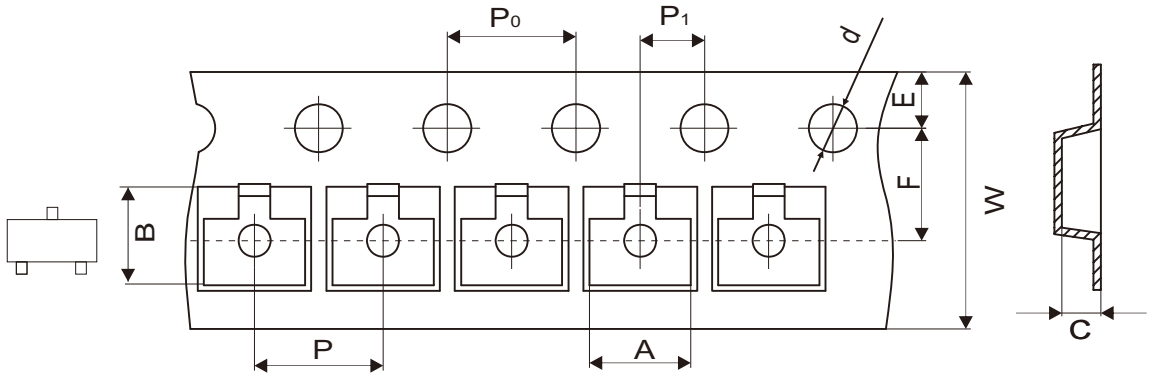
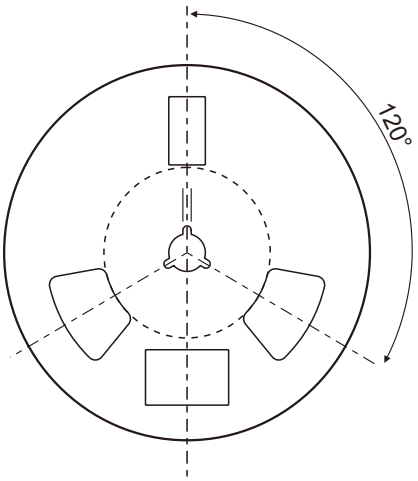


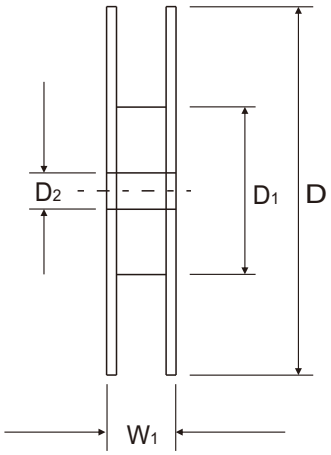

Fig.15 - Transient Thermal Response Curves

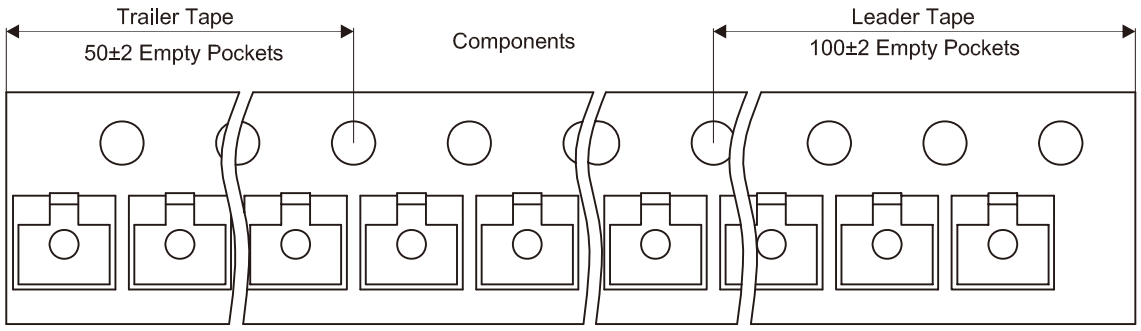


# Reel Taping Specification



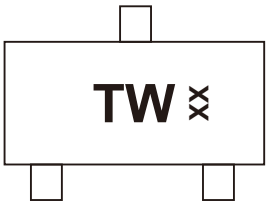




| | SYMBOL | A | B | C | d | D | D1 | D2 |
|---|---|---|---|---|---|---|---|---|
| SOT-323 | (mm) | 2.25 ± 0.05 | 2.55 ± 0.05 | 1.19 ± 0.05 | 1.55 ± 0.10 | 178.00 ± 2.00 | 54.40 ± 1.00 | 13.00 ± 1.00 |
| | (inch) | 0.089 ± 0.002 | 0.100 ± 0.002 | 0.047 ± 0.002 | 0.061 ± 0.004 | 7.008 ± 0.079 | 2.142 ± 0.039 | 0.512 ± 0.039 |

| | SYMBOL | E | F | P | P0 | P1 | W | W1 |
|---|---|---|---|---|---|---|---|---|
| SOT-323 | (mm) | 1.75 ± 0.10 | 3.50 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.10 | 8.00 + 0.30/-0.10 | 12.30 ± 1.00 |
| | (inch) | 0.069 ± 0.004 | 0.138 ± 0.004 | 0.157 ± 0.004 | 0.157 ± 0.004 | 0.079 ± 0.004 | 0.315 + 0.012/-0.004 | 0.484 ± 0.039 |

## Marking Code

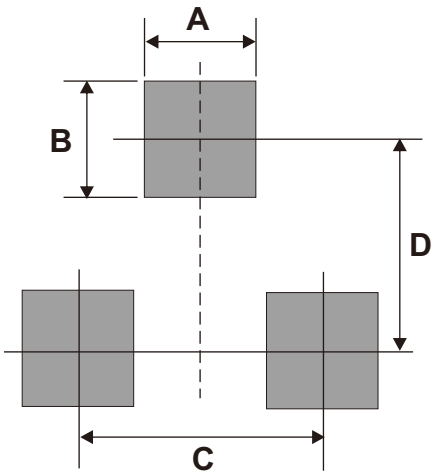
| Part Number | Marking Code |
|---|---|
| CMSP1013V3-HF | TW |




XX = Control code

## Suggested P.C.B. PAD Layout

| SIZE | SOT-323 | |
|---|---|---|
| | (mm) | (inch) |
| A | 0.50 | 0.020 |
| B | 0.80 | 0.031 |
| C | 1.30 | 0.012 |
| D | 2.20 | 0.087 |




## Standard Packaging

| Case Type | REEL PACK | |
|---|---|---|
| | REEL ( pcs ) | Reel Size (inch) |
| SOT-323 | 3,000 | 7 |