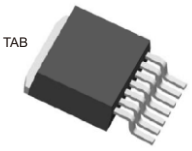
# CSMD27OT080-HF

## N-Channel
## RoHS Device
## Halogen Free

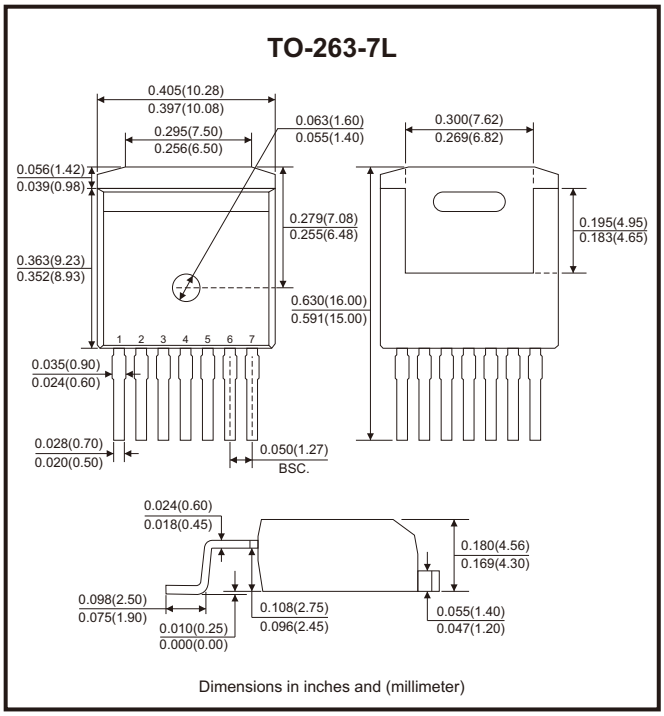



## Features

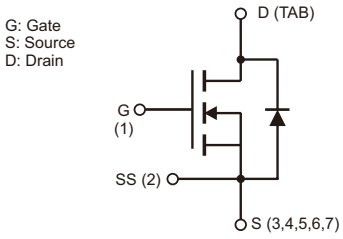
- Low on-resistance and high current density.
- Low capacitance for high frequency operation.
- Ultra high avalanche ruggedness.
- Positive temperature coefficient device.
- Low impedance kelvin source pin-out.

## Mechanical data

- Case: TO-263-7L, molded plastic.
- Terminals: Solderable per MIL-STD-750, method 2026.
- Mounting position: Any.




## Circuit Diagram




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

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-source voltage | $V_{GS}$ = 0V, $I_{DS}$ = 100μA | $V_{DS, max}$ | 1200 | V |
| Continuous drain current | $V_{GS}$ = 20V, $T_C$ = 25°C | $I_D$ | 33 | A |
| | $V_{GS}$ = 20V, $T_C$ = 110°C | $I_D$ | 24 | |
| Pulse drain current | $t_{PW}$ limitation per Fig.15 | $I_{D, pulse}$ | 81 | |
| Power dissipation | $T_C$ = 25°C | $P_D$ | 224 | W |
| Recommend gate source voltage | Static, recommended DC operating values | $V_{GS, op}$ | -5 to 20 | V |
| Maximum gate source voltage | Transient operating limit (AC f > 1Hz, duty cycle < 1%) | $V_{GS, max}$ | -10 to 25 | |
| Operating junction and storage temperature range | | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| Soldering temperature | | $T_L$ | 260 | |
| Mounting torque | M3 or 6-32 screw | $M_D$ | 1 | Nm |

## Thermal Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Thermal resistance junction to case | $R_{\theta JC}$ | | 0.7 | | °C/W |

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

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$ = 0V, $I_{DS}$ = 100μA | 1200 | | | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ = 10V, $I_{DS}$ = 20mA | 1.5 | 3 | 4.5 | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ = 1200V, $V_{GS}$ = 0V | | 1 | 50 | μA |
| | | $V_{DS}$ = 1200V, $V_{GS}$ = 0V, $T_J$ = 175°C | | 10 | | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$ = 20V, $V_{DS}$ = 0V | | | 250 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$ = 20V, $I_{DS}$ = 15A | | 80 | 110 | mΩ |
| | | $V_{GS}$ = 20V, $I_{DS}$ = 15A, $T_J$ = 175°C | | 134 | | |
| Transconductance | $g_{fs}$ | $V_{DS}$ = 9.8V, $I_{DS}$ = 15A | | 6.5 | | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 800V, f = 1MHz, $V_{AC}$ = 25mV | | 2644 | | pF |
| Output capacitance | $C_{oss}$ | | | 85 | | |
| Reverse transfer capacitance | $C_{rss}$ | | | 8 | | |
| Effective output capacitance, energy related | $C_{o(er)}$ | $V_{GS}$ = 0V, $V_{DS}$ = 0 to 800V | | 202 | | |
| Effective output capacitance, time related | $C_{o(tr)}$ | $I_D$ = const., $V_{GS}$ = 0V, $V_{DS}$ = 0 to 800V | | 146 | | |
| Turn on delay time | $t_{d(on)}$ | $V_{DS}$ = 800V, $V_{GS}$ = -5/+20V, $I_D$ = 20A, $R_L$ = 40Ω, $R_{G(ext)}$ = 2.7Ω | | 28 | | ns |
| Rise time | $t_r$ | | | 64 | | |
| Turn off delay time | $t_{d(off)}$ | | | 60 | | |
| Fall time | $t_f$ | | | 26.4 | | |
| Coss stored energy | $E_{oss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 800V, f = 1MHz, $V_{AC}$ = 25mV | | 33 | | μJ |
| Turn-on switching energy | $E_{on}$ | $V_{DS}$ = 800V, $V_{GS}$ = -5/+20V, $I_D$ = 20A, $R_{G(ext)}$ = 2.7Ω | | 148 | | |
| Turn-off switching energy | $E_{off}$ | | | 21.2 | | |
| Internal gate resistance | $R_{G(int.)}$ | f = 1MHz, $V_{AC}$ = 25mV | | 0.75 | | Ω |
| **Built-in SiC Diode Characteristics** | | | | | | |
| Inverse diode forward voltage | $V_{SD}$ | $V_{GS}$ = 0V, $I_{SD}$ = 5A | | 3 | | V |
| Continuous diode forward current | $I_S$ | $V_{GS}$ = 0V, $T_C$ = 25°C | | 36 | | A |
| Reverse recovery time | $t_{rr}$ | $V_{GS}$ = 0V, $I_{SD}$ = 20A, $V_{DS}$ = 400V, $di/dt$ = 300A/μs | | 50 | | ns |
| Reverse recovery charge | $Q_{rr}$ | | | 81 | | nC |
| Peak reverse recovery current | $I_{rrm}$ | | | 3.2 | | A |

## Gate Charge Characteristics (at $T_C$=25°C unless otherwise noted)

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Gate-source charge | $Q_{GS}$ | $V_{DS}$ = 800V, $V_{GS}$ = -5/+20V, $I_D$ = 20A | 57 | nC |
| Gate-drain charge | $Q_{GD}$ | | 23 | |
| Total gate charge | $Q_G$ | | 131 | |
| Gate plateau voltage | $V_{pl}$ | | 9.9 | V |

## Typical Rating and Characteristic Curves (CSMD27OT080-HF)

Fig.1 - Forward Output Characteristics at $T_J$=25°C

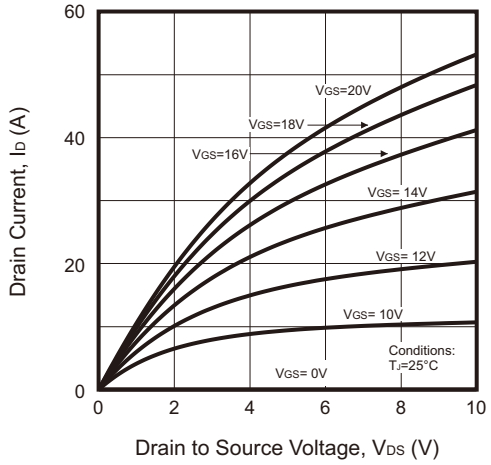



Fig.2 - Forward Output Characteristics at $T_J$=175°C

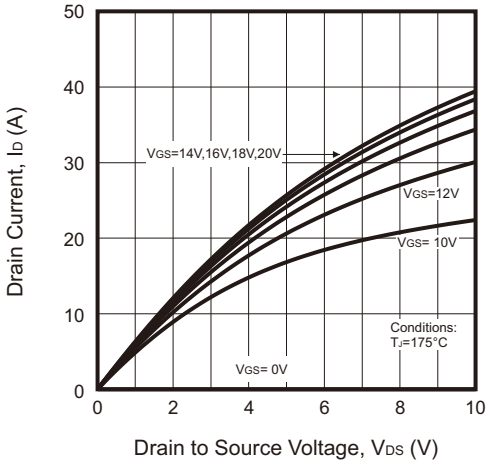



Fig.3 - On-Resistance vs. Drain Current for Various $T_J$

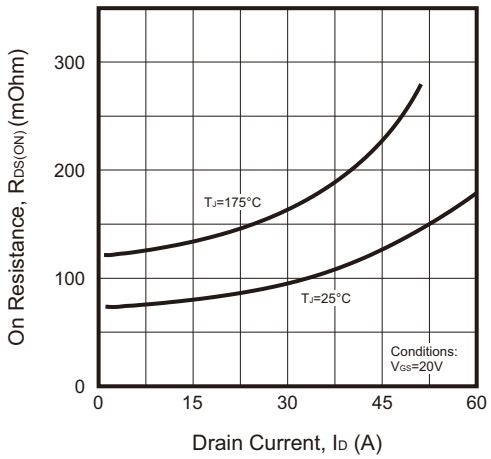



Fig.4 - Transfer Characteristics for for Various $T_J$

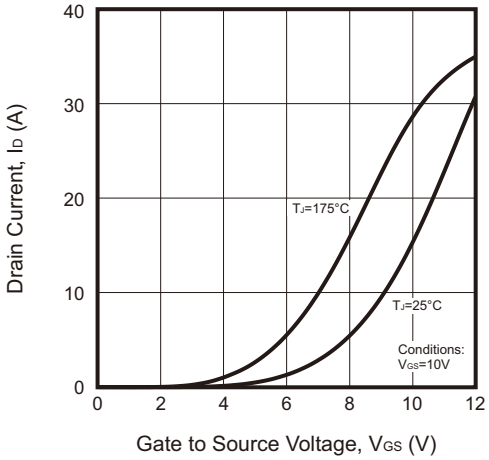



Fig.5 - On-Resistance vs. Gate Voltage for Various $T_J$

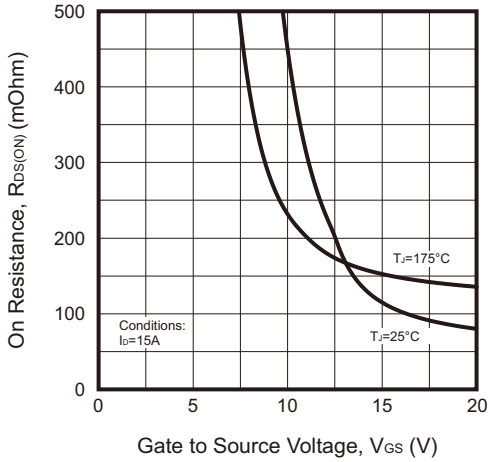
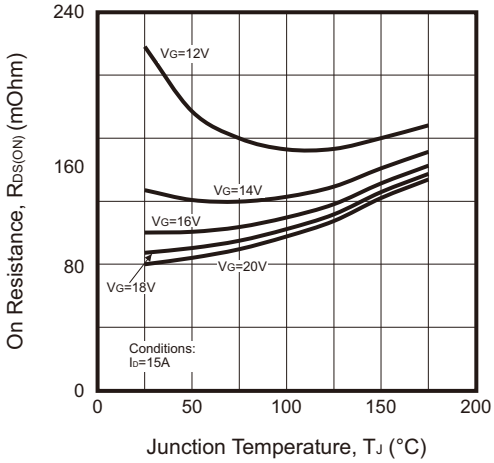



Fig.6 - On-Resistance vs. Temperature for Various Gate Voltage



## Typical Rating and Characteristic Curves (CSMD27OT080-HF)

Fig.7 - Normalized On-Resistance vs. Temperature

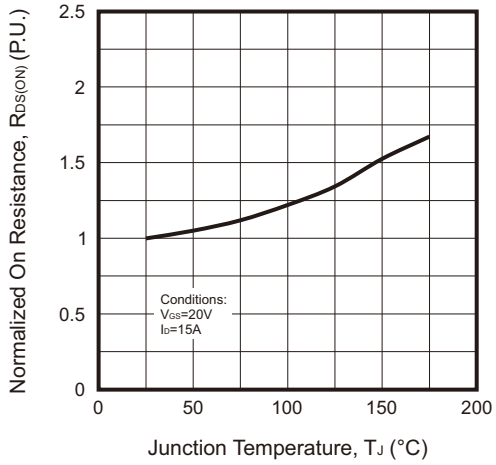



Fig.8 - Reverse Output Characteristics at $T_J$=25°C

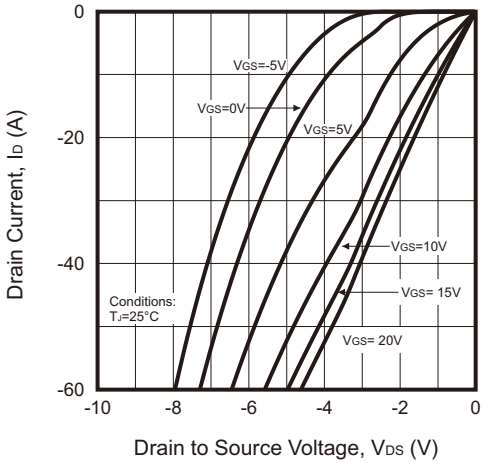



Fig.9 - Reverse Output Characteristics at $T_J$=175°C

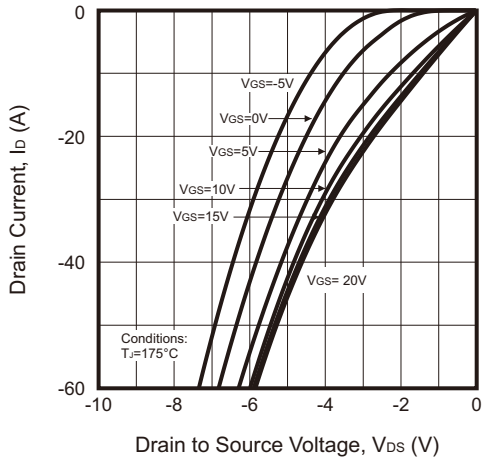



Fig.10 - Capacitance vs. Drain to Source Voltage

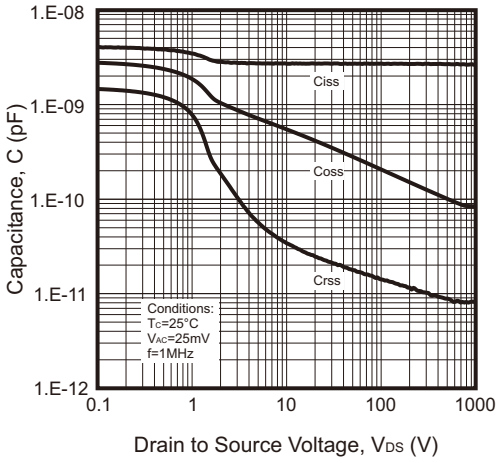



Fig.11 - Threshold Voltage vs. Temperature

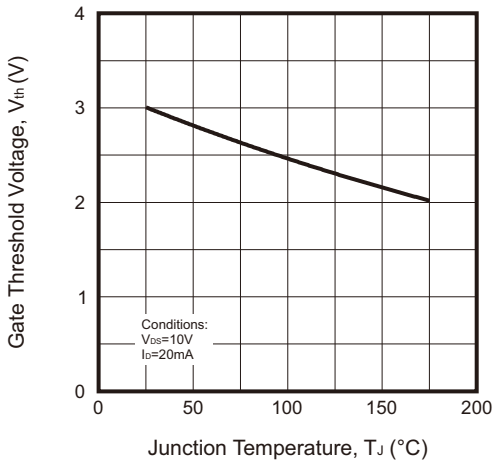
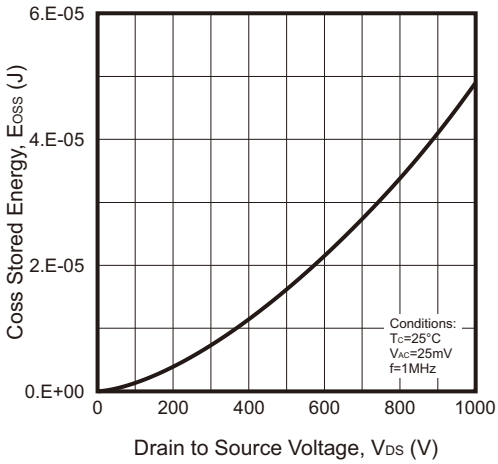



Fig.12 - Output Capacitor Stored Energy



## Typical Rating and Characteristic Curves (CSMD27OT080-HF)

Fig.13 - Max. Power Dissipation Derating vs. Case Temperature

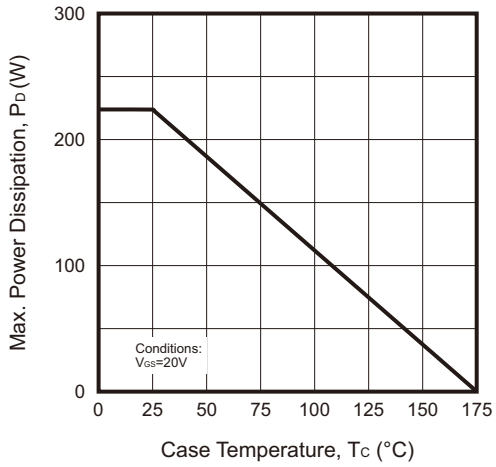



Fig.14 - Drain Current Derating vs. Case Temperature

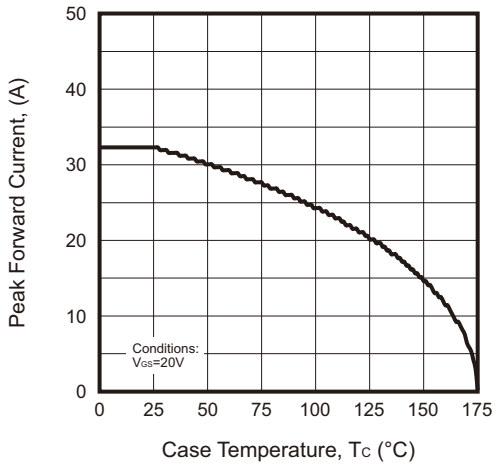



Fig.15 - Safe Operating Area

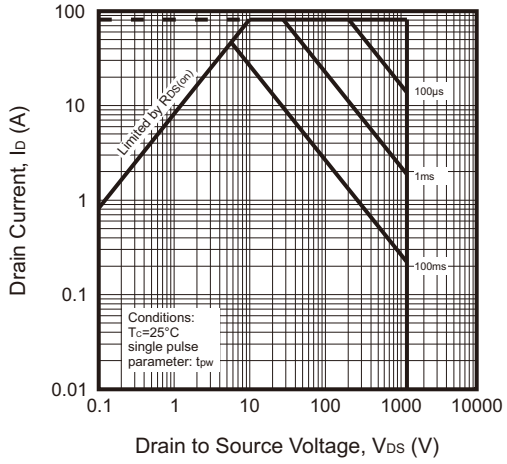



Fig.16 - Gate Charge Characteristics

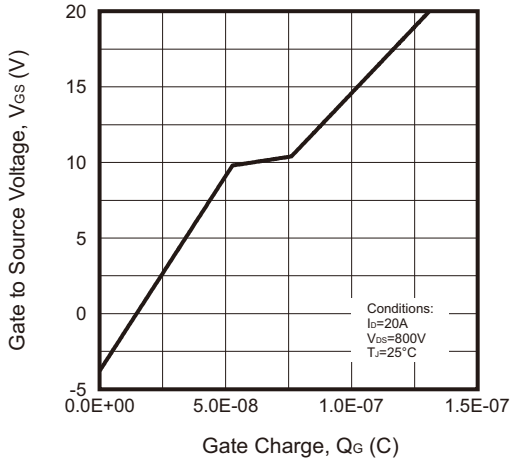



Fig.17 - Clamped Inductive Switching Energy vs. Drain Current

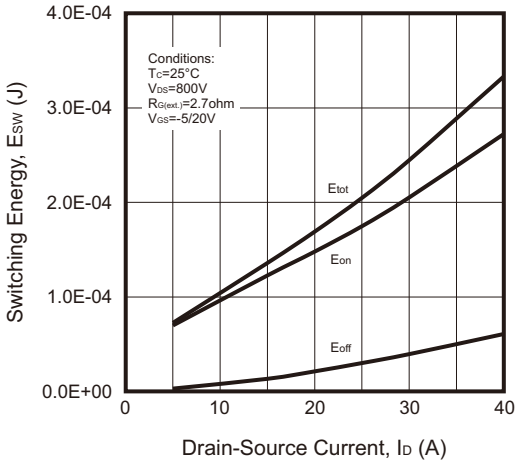
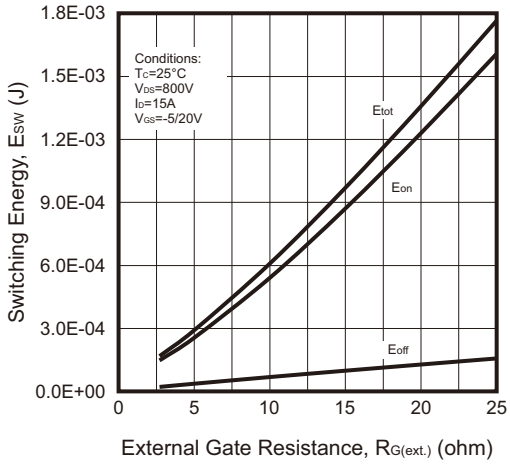
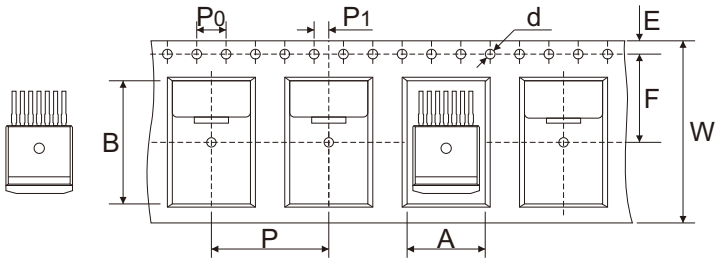
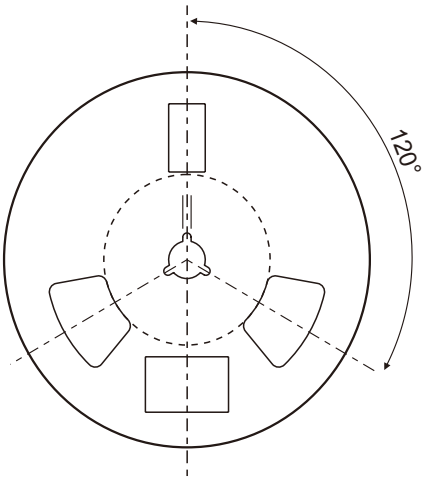


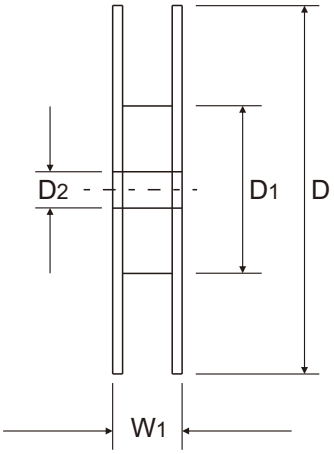

Fig.18 - Clamped Inductive Switching Energy vs. External Gate Resistor ($R_{G(ext.)}$)

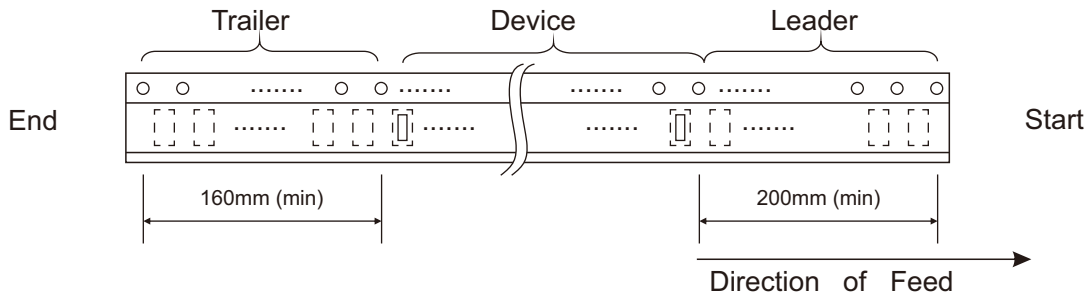


## Reel Taping Specification



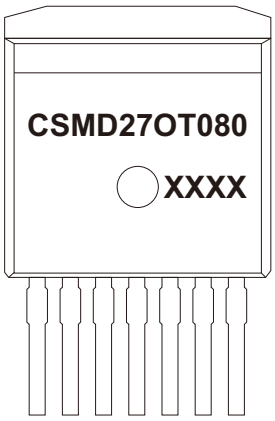




| | SYMBOL | A | B | C | d | D | $D_1$ | $D_2$ |
|---|---|---|---|---|---|---|---|---|
| TO-263 -7L | (mm) | 10.80 ± 0.10 | 16.30 ± 0.10 | 5.26 ± 0.10 | 1.55 ± 0.05 | 330.00 ± 2.00 | 100.00 ± 0.50 | 13.00 + 0.50 − 0.20 |
| | (inch) | 0.425 ± 0.004 | 0.642 ± 0.004 | 0.207 ± 0.004 | 0.061 ± 0.002 | 12.992 ± 0.079 | 3.937 ± 0.020 | 0.512 + 0.020 − 0.008 |

| | SYMBOL | E | F | P | $P_0$ | $P_1$ | T | W | $W_1$ |
|---|---|---|---|---|---|---|---|---|---|
| TO-263 -7L | (mm) | 1.75 ± 0.10 | 11.50 ± 0.10 | 16.00 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.10 | 0.35 ± 0.05 | 24.00 ± 0.30 | 30.40 Max |
| | (inch) | 0.069 ± 0.004 | 0.453 ± 0.004 | 0.630 ± 0.004 | 0.157 ± 0.004 | 0.079 ± 0.004 | 0.014 ± 0.002 | 0.945 ± 0.012 | 1.197 Max |

## Marking Code

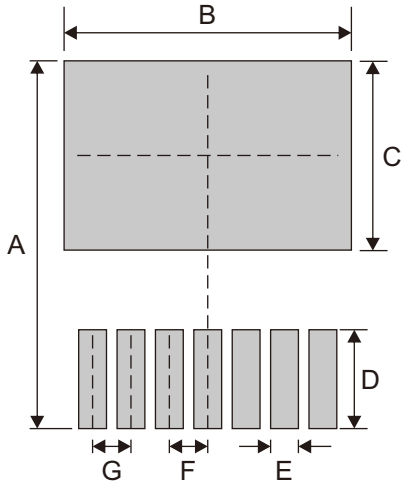
| Part Number | Marking Code |
|---|---|
| CSMD27OT080-HF | CSMD27OT080 |




XXXX = Control code

## Suggested P.C.B. PAD Layout

| SIZE | TO-263-7L | |
|---|---|---|
| | (mm) | (inch) |
| A | 16.30 | 0.642 |
| B | 11.00 | 0.433 |
| C | 8.40 | 0.331 |
| D | 3.40 | 0.134 |
| E | 0.90 | 0.035 |
| F | 1.27 | 0.050 |
| G | 1.27 | 0.050 |




## Standard Packaging

| Case Type | REEL PACK | |
|---|---|---|
| | REEL (pcs) | Reel Size (inch) |
| TO-263-7L | 800 | 13 |