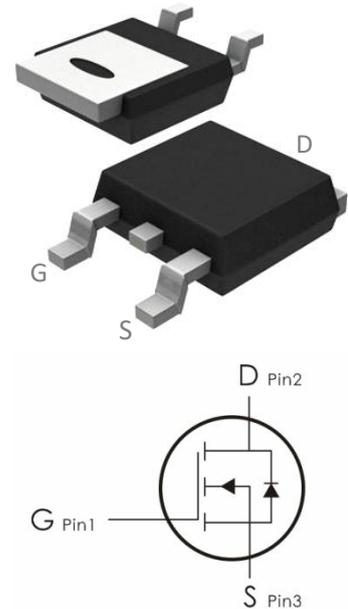


Description:

This N-Channel MOSFET uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge. It can be used in a wide variety of applications.

Features:

- 1) $V_{DS}=60V, I_D=40A, R_{DS(ON)} < 15m\ \Omega @ V_{GS}=10V$ (Typ: $12m\ \Omega$)
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra low $R_{DS(ON)}$.
- 5) Excellent package for good heat dissipation.
- 6) MSL3



Package Marking and Ordering Information:

| Part NO. | Marking | Package | Packing |
|-----------|---------|---------|---------------|
| DE020NG-C | E020N-C | TO- 252 | 2500 pcs/Reel |

Absolute Maximum Ratings: ($T_C=25^\circ C$ unless otherwise noted)

| Symbol | Parameter | Ratings | Units |
|----------------|--|----------|------------|
| V_{DS} | Drain-Source Voltage | 60 | V |
| V_{GS} | Gate-Source Voltage | ± 25 | V |
| I_D | Continuous Drain Current ¹ | 40 | A |
| | Continuous Drain Current- $T_C=100^\circ C$ ¹ | 28 | |
| I_{DM} | Pulsed Drain Current ² | 160 | |
| P_D | Power Dissipation | 48 | W |
| E_{AS} | Single pulse avalanche energy ³ | 59 | mJ |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55-+150 | $^\circ C$ |

Thermal Characteristics:

| Symbol | Parameter | Max | Units |
|-----------------|--------------------------------------|-----|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 2.6 | $^\circ C/W$ |

Electrical Characteristics: ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|--|---------------------------|------|-----------|------------------|
| Off Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\ \mu\text{A}$ | 60 | --- | --- | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{GS}=0V, V_{DS}=60V$ | --- | --- | 1 | μA |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0A$ | --- | --- | ± 100 | nA |
| On Characteristics | | | | | | |
| $V_{GS(th)}$ | Gate-Source Threshold Voltage | $V_{GS}=V_{DS}, I_D=250\ \mu\text{A}$ | 1 | 1.6 | 2.5 | V |
| $R_{DS(on)}$ | Drain-Source On Resistance ⁴ | $V_{GS}=10V, I_D=20A$ | --- | 12 | 15 | $\text{m}\Omega$ |
| | | $V_{GS}=4.5V, I_D=10A$ | --- | 16 | 20 | $\text{m}\Omega$ |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS}=30V, V_{GS}=0V, f=1\text{MHz}$ | --- | 1450 | --- | pF |
| C_{oss} | Output Capacitance | | --- | 102 | -- | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 93 | --- | |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS}=30V, I_D=6A,$ $R_{ENG}=3\ \Omega, V_{GS}=10V$ | --- | 11.8 | --- | ns |
| t_r | Rise Time | | --- | 6.8 | --- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | --- | 21 | --- | ns |
| t_f | Fall Time | | --- | 10 | --- | ns |
| Q_g | Total Gate Charge | | $V_{GS}=10V, V_{DS}=30V,$ | --- | 27 | --- |
| Q_{gs} | Gate-Source Charge | $I_D=6A$ | --- | 5.15 | --- | nC |
| Q_{gd} | Gate-Drain "Miller" Charge | | --- | 9 | --- | nC |
| Drain-Source Diode Characteristics | | | | | | |
| V_{SD} | Diode Forward Voltage | $V_{GS}=0V, I_{SD}=6A$ | --- | --- | 1.2 | V |
| I_S | Continuous Drain Current | $V_D=V_G=0V$ | --- | --- | 40 | A |
| I_{SM} | Pulsed Drain Current | | --- | --- | 160 | A |
| T_{rr} | Reverse Recovery Time | $I_F=19A, T_J=25^{\circ}\text{C}$ | --- | 25.8 | --- | ns |
| Q_{rr} | Reverse Recovery Charge | $dI/dt=100A/\mu\text{s}$ | --- | 19.6 | --- | nC |

Notes:

1. Computed continuous current assumes the condition of $T_{j,Max}$ while the actual continuous current depends on the thermal & electro-mechanical application board design
2. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
3. EAS condition : $T_J=25^{\circ}C, V_{DD}=30V, V_G=10V, L=0.5mH$
4. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

Test Circuit & Waveform

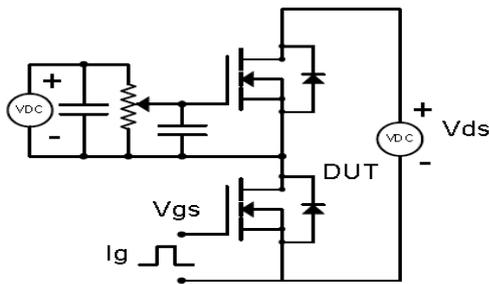


Figure 1 Gate Charge Test Circuit & Waveform

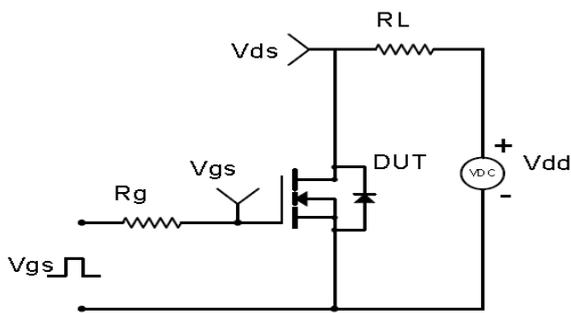
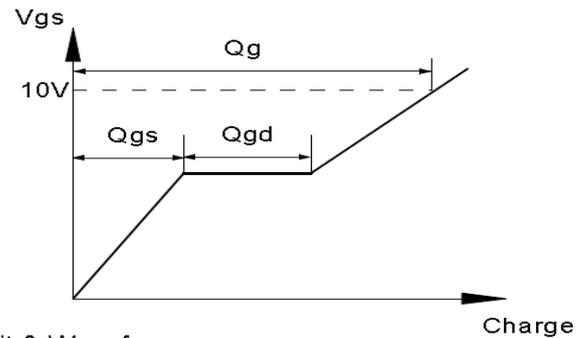


Figure 2 Resistive Switching Test Circuit & Waveforms

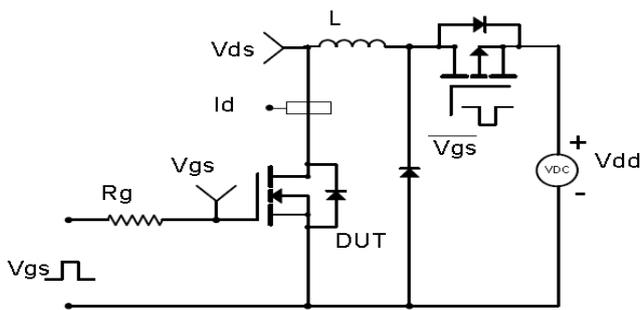
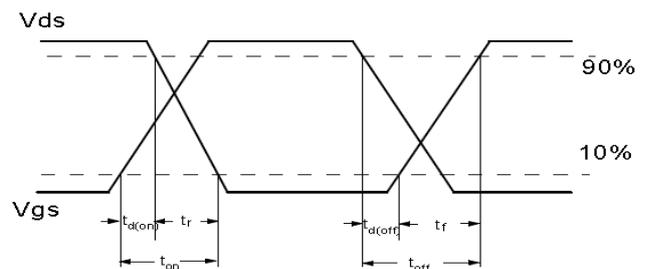


Figure 3 Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

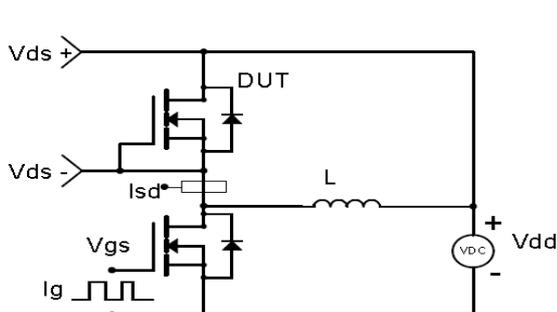
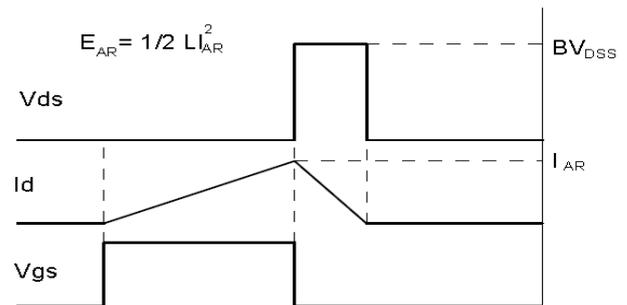
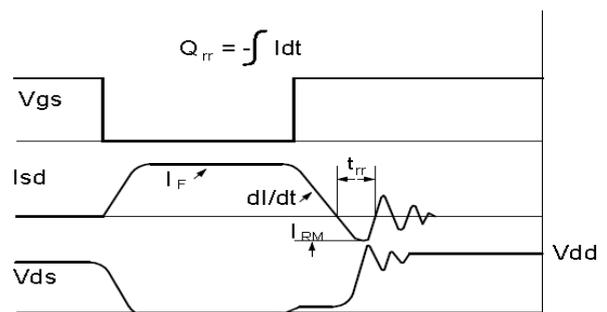


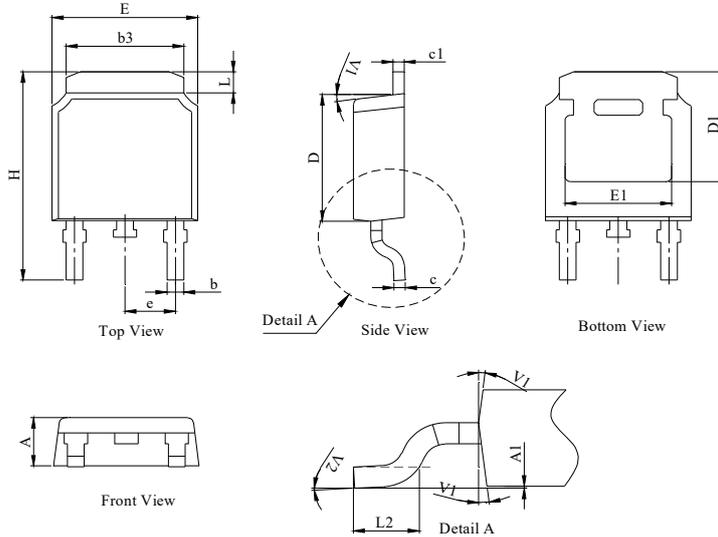
Figure 4 Diode Recovery Test Circuit & Waveforms



TO-252 Package Information

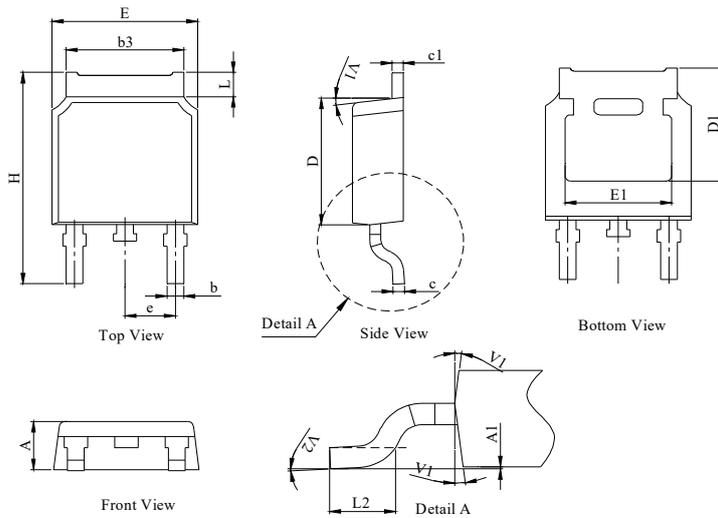
Package Outline Type-A

UNIT: mm



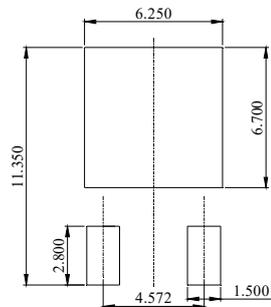
| DIM. | MILLIMETER | | |
|------|------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 2.18 | 2.30 | 2.39 |
| A1 | 0 | -- | 0.13 |
| b | 0.64 | 0.76 | 0.89 |
| c | 0.40 | 0.50 | 0.61 |
| c1 | 0.46 | 0.50 | 0.58 |
| D | 5.97 | 6.10 | 6.23 |
| D1 | 5.05 | -- | -- |
| E | 6.35 | 6.60 | 6.73 |
| E1 | 4.32 | -- | -- |
| b3 | 5.21 | 5.38 | 5.55 |
| e | 2.29 BSC | | |
| H | 9.40 | 10.00 | 10.40 |
| L | 0.89 | -- | 1.27 |
| L2 | 1.40 | -- | 1.78 |
| V1 | 7° REF | | |
| V2 | 0° | -- | 6° |

Package Outline Type-B



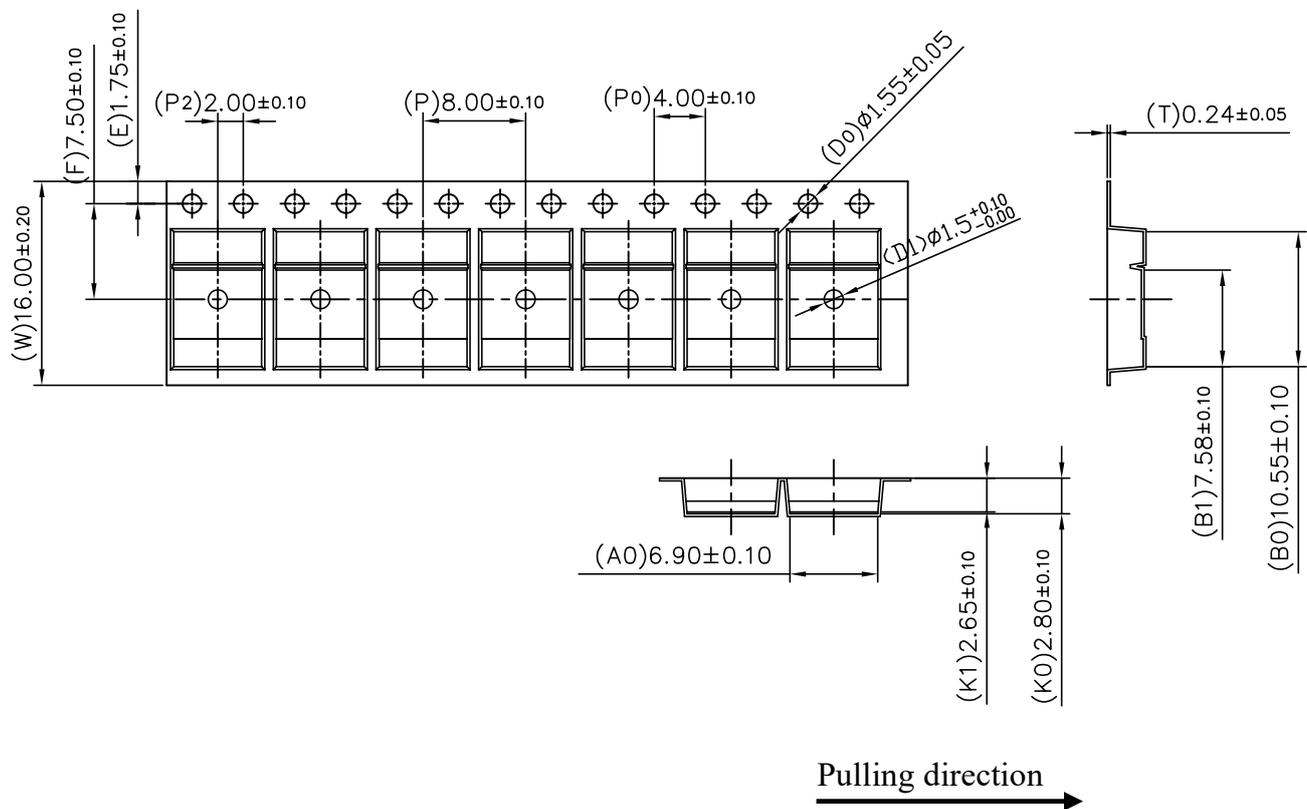
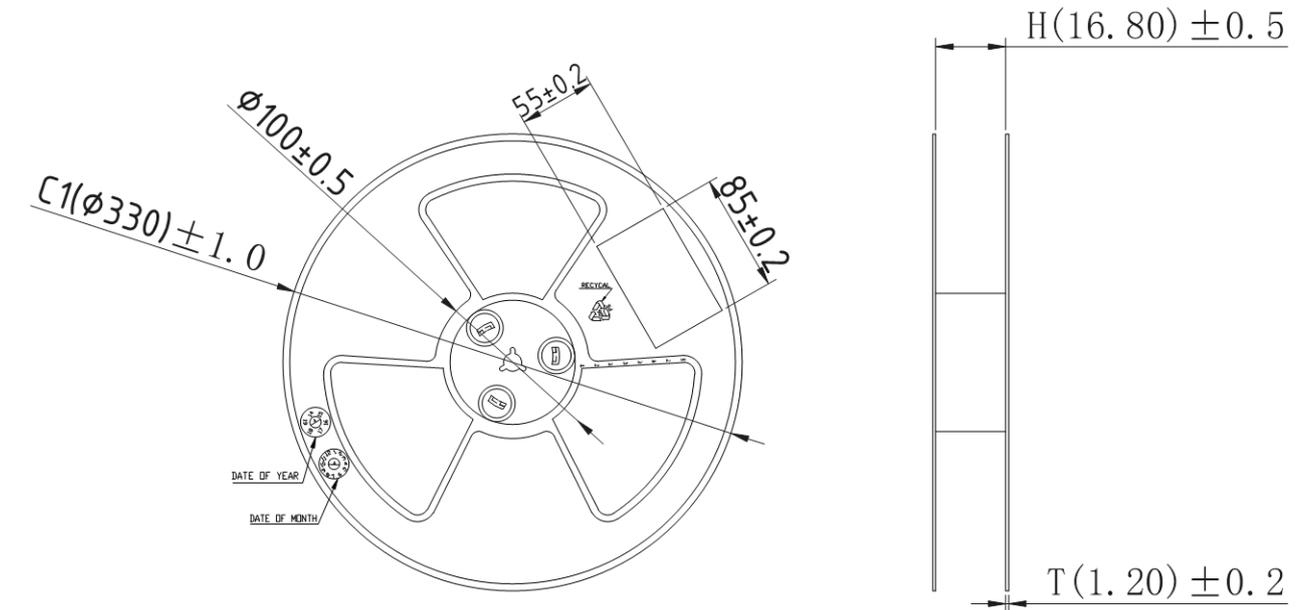
| DIM. | MILLIMETER | | |
|------|------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 2.10 | 2.30 | 2.40 |
| A1 | 0 | -- | 0.13 |
| b | 0.66 | 0.76 | 0.86 |
| b3 | 5.21 | 5.38 | 5.55 |
| c | 0.40 | 0.50 | 0.60 |
| c1 | 0.44 | 0.50 | 0.58 |
| D | 5.90 | 6.10 | 6.30 |
| D1 | 5.30REF | | |
| E | 6.40 | 6.60 | 6.80 |
| E1 | 4.63 | - | - |
| e | 2.29 BSC | | |
| H | 9.50 | 10.00 | 10.70 |
| L | 1.09 | -- | 1.21 |
| L2 | 1.35 | -- | 1.65 |
| V1 | 7° REF | | |
| V2 | 0° | -- | 6° |

Recommended Soldering Footprint



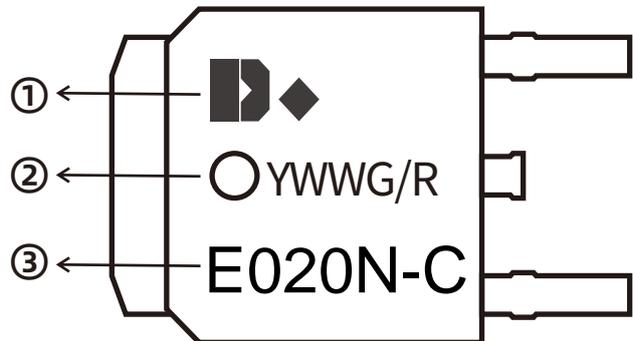
Tape & Reel Information

Dimensions in mm



Marking Information:

- ①. Doingter LOGO
- ②. Date Code(YWWG / R)
 Y : Year Code , last digit of the year
 WW : Week Code(01-53)
 G/R : G(Green) /R(Lead Free)
- ③. Part NO.



Previous Version

| Version | Date | Subjects (major changes since last revision) |
|---------|------------|--|
| 1.1 | 2025-05-02 | Release of final version |

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