

## Product Summary

| Part #      | $V_{DS}$ | $R_{DS(on).typ}$<br>(@ $V_{GS}=-10V$ ) | $R_{DS(on).typ}$<br>(@ $V_{GS}=-4.5V$ ) | $I_D$ |
|-------------|----------|----------------------------------------|-----------------------------------------|-------|
| DP054P03DTL | -30V     | 4.3mΩ                                  | 6.2mΩ                                   | -95A  |

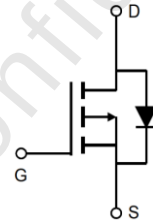
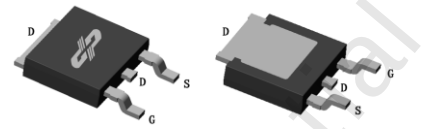
## Features

- Uses advanced MOSFET-DPMOS technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Qualified according to JEDEC criteria

## Applications

- Battery management
- Power Management Switches

TO-252



100% Avalanche Tested

100% Rg Tested

## Package Marking and Ordering Information

| Part #      | Marking   | Package | Packing   |
|-------------|-----------|---------|-----------|
| DP054P03DTL | 054P03DTL | TO-252  | Tape&Reel |



## Absolute Maximum Ratings

| Parameter                                                                    | Symbol                | Value      | Unit       |
|------------------------------------------------------------------------------|-----------------------|------------|------------|
| Drain-source voltage                                                         | $V_{DS}$              | -30        | V          |
| Continuous drain current                                                     | $I_D$                 | -95        | A          |
| $T_C = 25^\circ C$                                                           |                       | -60        |            |
| $T_C = 100^\circ C$                                                          |                       |            |            |
| Pulsed drain current ( $T_C = 25^\circ C$ , $t_p$ limited by $T_{jmax}$ )    | $I_{D \text{ pulse}}$ | -380       | A          |
| Avalanche energy, single pulse ( $L=0.5mH$ , $R_g=25\Omega$ ) <sup>[1]</sup> | $E_{AS}$              | 210        | mJ         |
| Gate-Source voltage                                                          | $V_{GS}$              | $\pm 20$   | V          |
| Power dissipation ( $T_C = 25^\circ C$ )                                     | $P_{tot}$             | 74         | W          |
| Operating junction and storage temperature                                   | $T_j, T_{stg}$        | -55...+150 | $^\circ C$ |

[1].EAS is tested at starting  $T_j = 25^\circ C$ ,  $V_{GS} = -10V$ .

**Thermal Resistance**

| Parameter                                              | Symbol     | Max | Unit |
|--------------------------------------------------------|------------|-----|------|
| Thermal resistance, junction – case.                   | $R_{thJC}$ | 1.7 | °C/W |
| Thermal resistance, junction – ambient(min. footprint) | $R_{thJA}$ | 52  |      |

**Electrical Characteristic** (at  $T_j = 25^\circ\text{C}$ , unless otherwise specified)

| Parameter | Symbol | Value |      |      | Unit | Test Condition |
|-----------|--------|-------|------|------|------|----------------|
|           |        | min.  | typ. | max. |      |                |

**Static Characteristic**

|                                  |              |     |            |            |         |                                                                               |
|----------------------------------|--------------|-----|------------|------------|---------|-------------------------------------------------------------------------------|
| Drain-source breakdown voltage   | $BV_{DSS}$   | -30 | -          | -          | V       | $V_{GS}=0V, I_D=-250\mu A$                                                    |
| Gate threshold voltage           | $V_{GS(th)}$ | -1  | -1.6       | -2.5       | V       | $V_{DS}=V_{GS}, I_D=-250\mu A$                                                |
| Zero gate voltage drain current  | $I_{DSS}$    | -   | -          | -1<br>-100 | $\mu A$ | $V_{DS}=-30V, V_{GS}=0V$<br>$T_j=25^\circ\text{C}$<br>$T_j=100^\circ\text{C}$ |
| Gate-source leakage current      | $I_{GSS}$    | -   | $\pm 10$   | $\pm 100$  | nA      | $V_{GS}=\pm 20V, V_{DS}=0V$                                                   |
| Drain-source on-state resistance | $R_{DS(on)}$ | -   | 4.3<br>6.2 | 5.4<br>8.4 | mΩ      | $V_{GS}=-10V, I_D=-30A$<br>$V_{GS}=-4.5V, I_D=-20A$                           |
| Gate resistance                  | $R_g$        | -   | 2.3        | -          | Ω       | $V_{GS}=0V, V_{DS}=0V,$<br>$f=1\text{MHz}$                                    |
| Transconductance <sup>[2]</sup>  | $g_{fs}$     | -   | 65         | -          | S       | $V_{DS}=-5V, I_D=-10A$                                                        |

**Dynamic Characteristic<sup>[2]</sup>**

|                              |              |   |      |   |    |                                                          |
|------------------------------|--------------|---|------|---|----|----------------------------------------------------------|
| Input Capacitance            | $C_{iss}$    | - | 5750 | - | pF | $V_{GS}=0V, V_{DS}=-15V,$<br>$f=1\text{MHz}$             |
| Output Capacitance           | $C_{oss}$    | - | 730  | - |    |                                                          |
| Reverse Transfer Capacitance | $C_{rss}$    | - | 610  | - |    |                                                          |
| Gate Total Charge (-10V)     | $Q_g$        | - | 30   | - | nC | $V_{GS}=-10V, V_{DS}=-15V,$<br>$I_D=-30A, f=1\text{MHz}$ |
| Gate Total Charge (-4.5V)    | $Q_g$        | - | 16   | - |    |                                                          |
| Gate-Source charge           | $Q_{gs}$     | - | 6    | - |    |                                                          |
| Gate-Drain charge            | $Q_{gd}$     | - | 8    | - |    |                                                          |
| Turn-on delay time           | $t_{d(on)}$  | - | 11   | - | ns | $V_{GS}=-10V, V_{DD}=-15V,$<br>$R_{G\_ext}=2.7\Omega$    |
| Rise time                    | $t_r$        | - | 13   | - |    |                                                          |
| Turn-off delay time          | $t_{d(off)}$ | - | 52   | - |    |                                                          |
| Fall time                    | $t_f$        | - | 21   | - |    |                                                          |

**Body Diode Characteristic**

| Parameter                                         | Symbol         | Value |      |      | Unit | Test Condition               |
|---------------------------------------------------|----------------|-------|------|------|------|------------------------------|
|                                                   |                | min.  | typ. | max. |      |                              |
| Body Diode Forward Voltage                        | $V_{SD}$       | -     | -0.8 | -1.2 | V    | $V_{GS}=0V, I_{SD}=-20A$     |
| Diode continuous forward current                  | $I_s$          | -     | -    | -95  | A    | TC = 25°C                    |
| Diode pluse current                               | $I_{s\ pluse}$ | -     | -    | -380 | A    | TC = 25°C                    |
| Body Diode Reverse Recovery Time <sup>[2]</sup>   | $t_{rr}$       | -     | 35   | -    | ns   | $I_F=-30A, di/dt=100A/\mu s$ |
| Body Diode Reverse Recovery Charge <sup>[2]</sup> | $Q_{rr}$       | -     | 75   | -    | nC   |                              |

[2]. Defined by design. Not subject to production test

## Typical Performance Characteristics

Fig 1: Output Characteristics

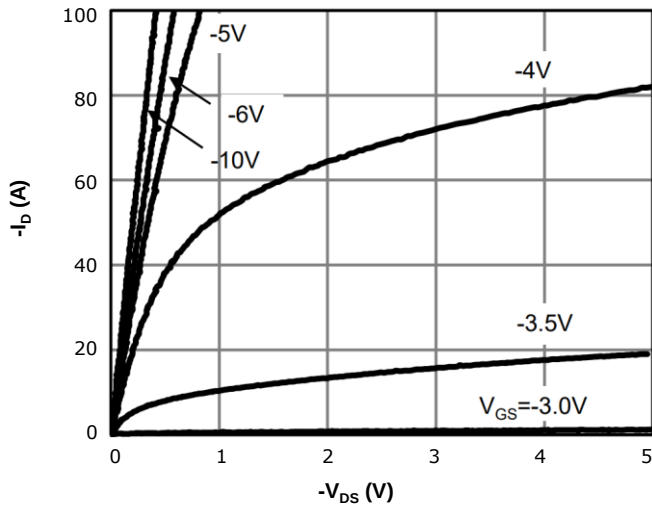


Fig 2: Transfer Characteristics

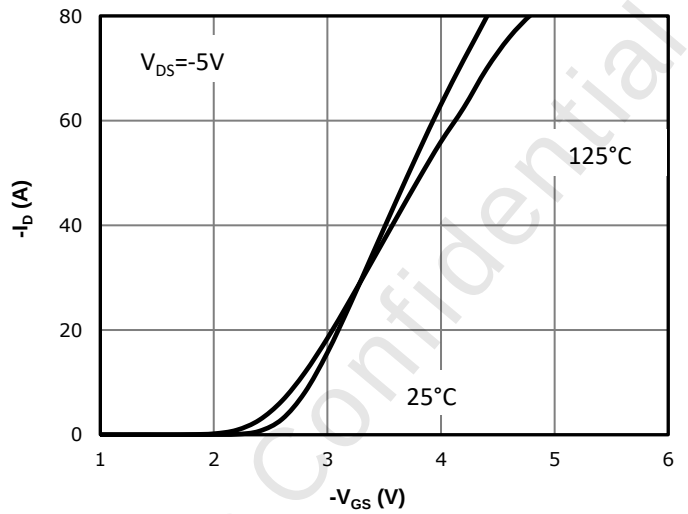


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

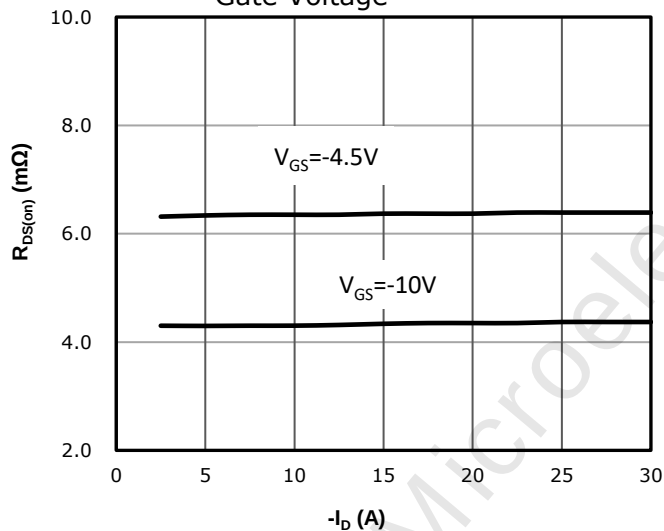


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

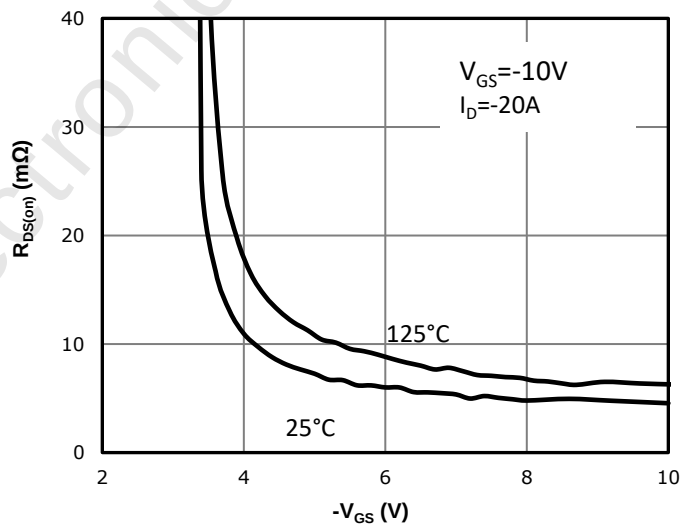


Fig 5:  $R_{DS(on)}$  vs. Temperature

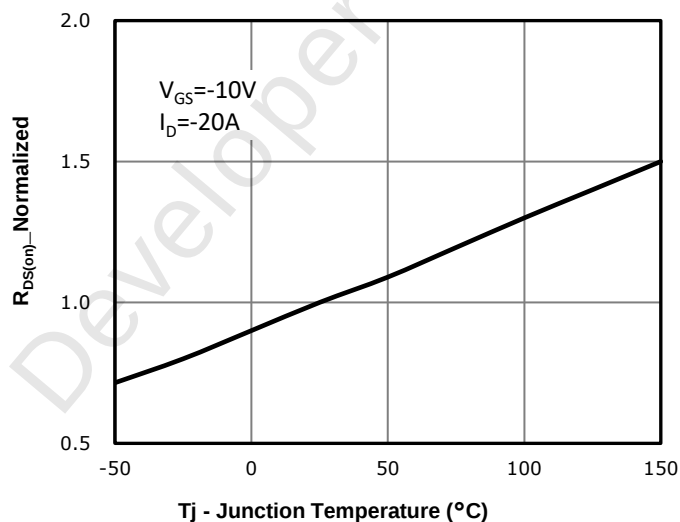


Fig 6: Capacitance Characteristics

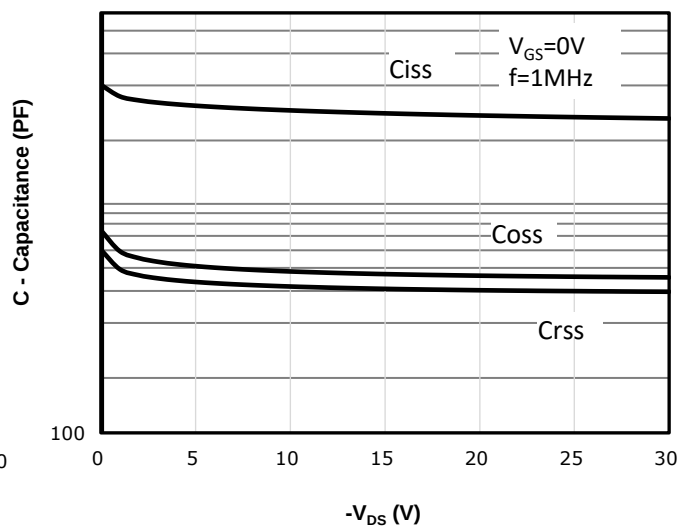


Fig 7: Gate Charge Characteristics

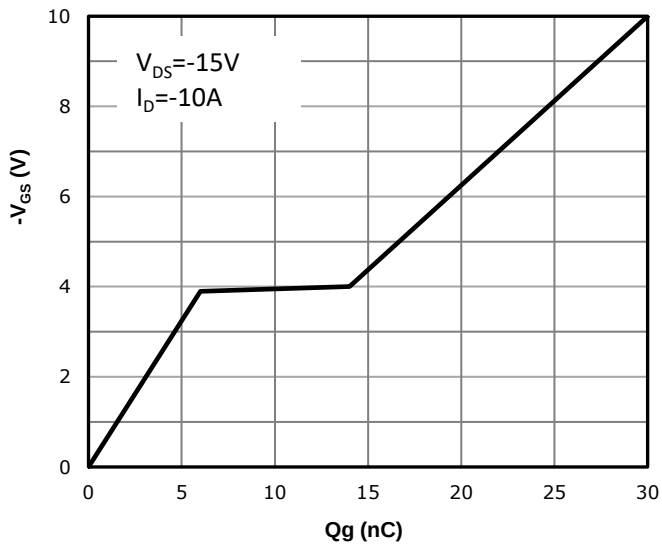


Fig 8: Body-diode Forward Characteristics

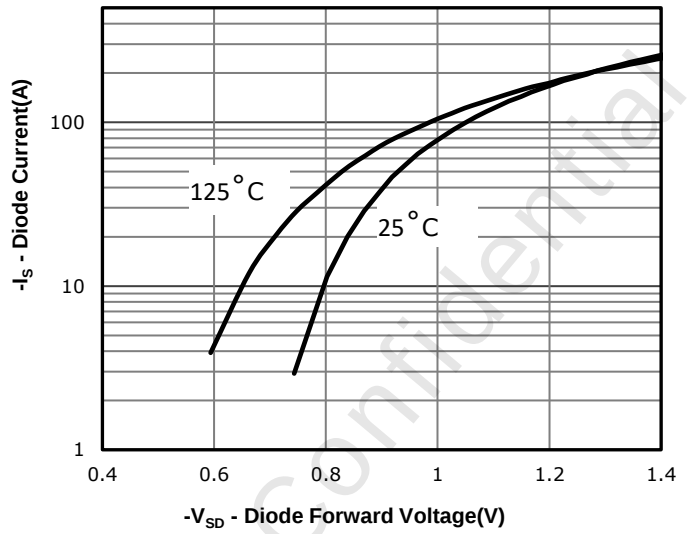


Fig 9: Power Dissipation

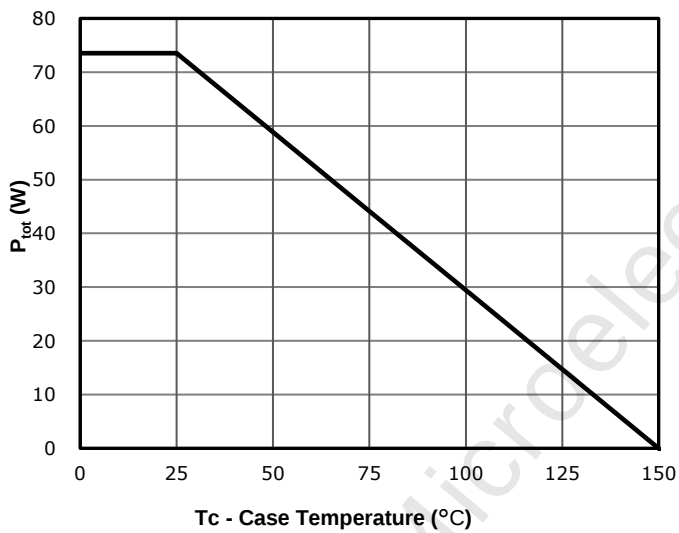


Fig 10: Drain Current Derating

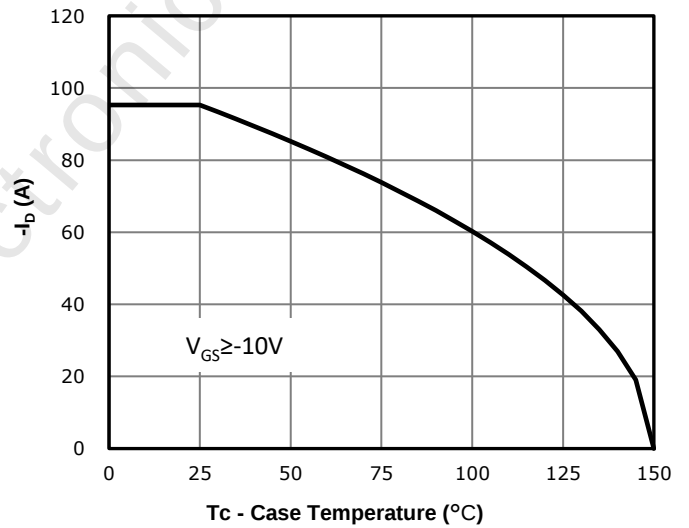


Fig 11: Safe Operating Area

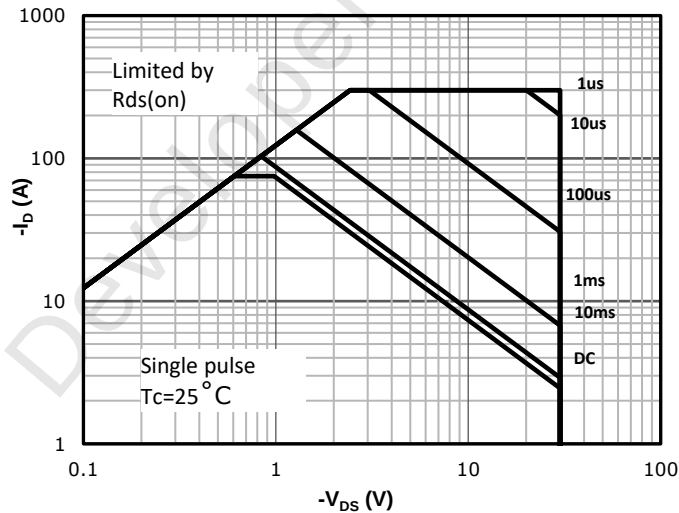
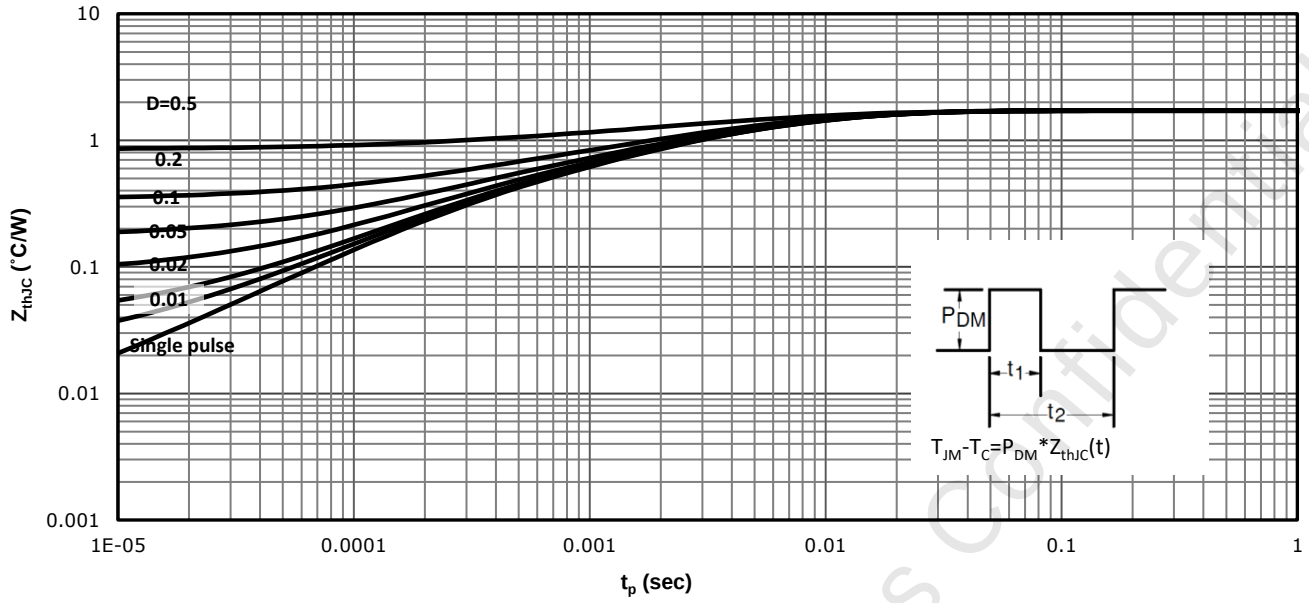
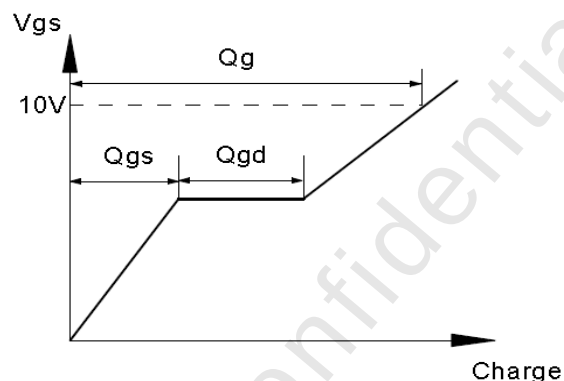
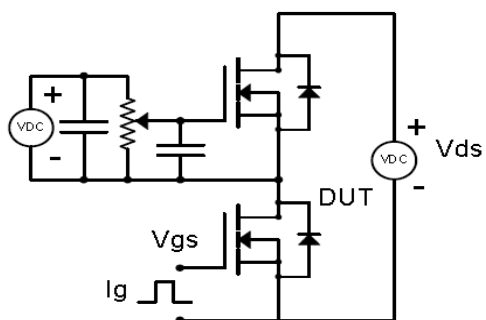


Fig 12: Max. Transient Thermal Impedance

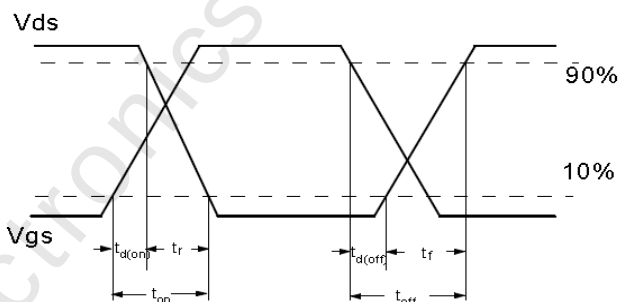
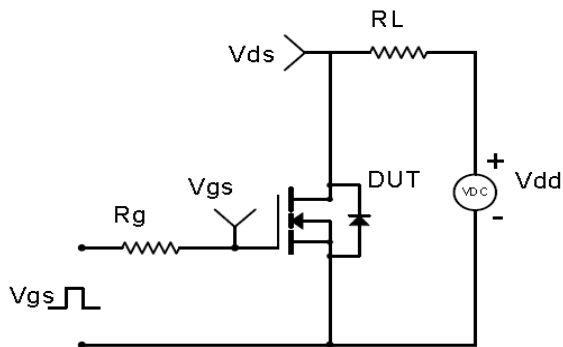


## Test Circuit & Waveform

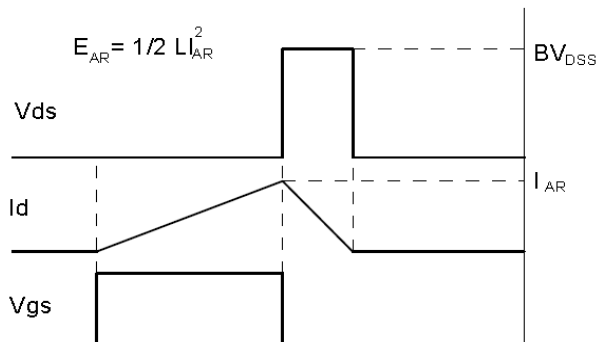
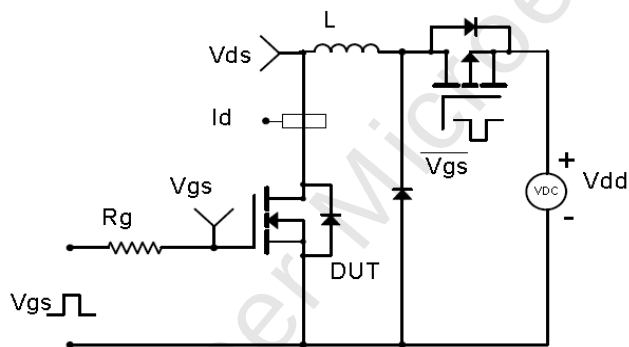
Gate Charge Test Circuit & Waveform



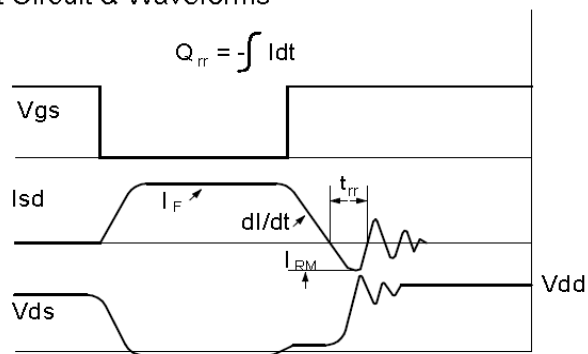
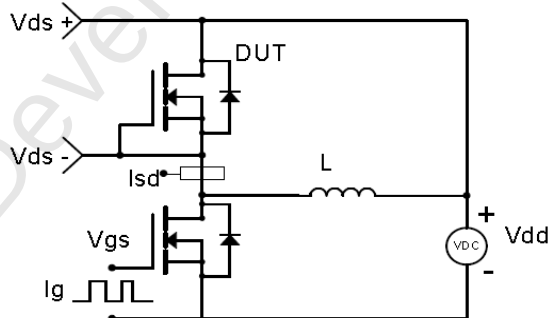
Resistive Switching Test Circuit & Waveforms



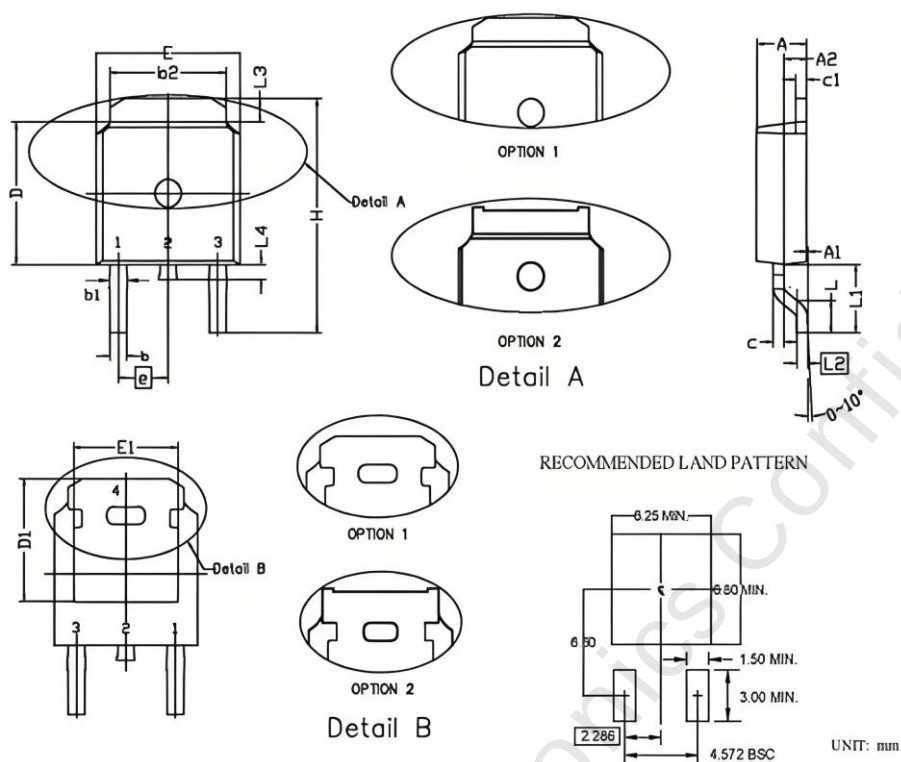
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

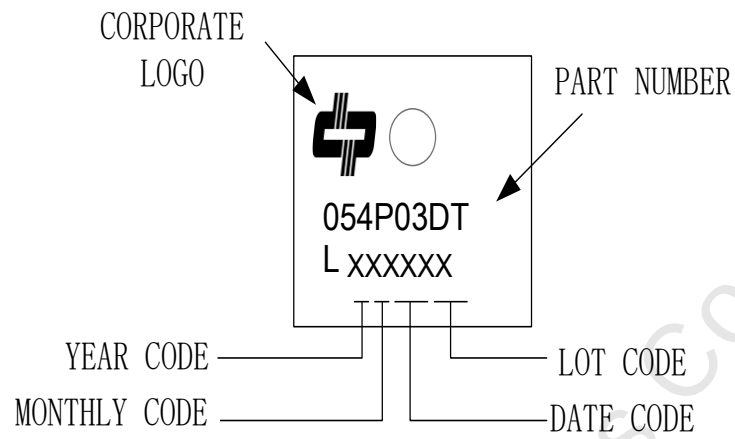


**Package Outline: TO-252**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 2.15                      | 2.45  | 0.085                | 0.096 |
| A1     | 0.00                      | 0.15  | 0.000                | 0.006 |
| A2     | 0.76                      | 1.36  | 0.030                | 0.054 |
| b      | 0.60                      | 0.91  | 0.024                | 0.036 |
| b1     | 0.65                      | 1.15  | 0.026                | 0.045 |
| b2     | 5.00                      | 5.64  | 0.197                | 0.222 |
| c      | 0.45                      | 0.61  | 0.018                | 0.024 |
| c1     | 0.36                      | 0.66  | 0.014                | 0.026 |
| D      | 5.80                      | 6.30  | 0.228                | 0.248 |
| D1     | 5.00                      | 6.00  | 0.197                | 0.236 |
| e      | 2.29 BSC.                 |       | 0.090 BSC.           |       |
| E      | 6.30                      | 6.90  | 0.248                | 0.272 |
| E1     | 4.55                      | 5.30  | 0.179                | 0.209 |
| H      | 9.40                      | 10.48 | 0.370                | 0.413 |
| L      | 1.18                      | 1.70  | 0.046                | 0.067 |
| L1     | 2.92 REF                  |       | 0.115 REF            |       |
| L2     | 0.36                      | 0.66  | 0.014                | 0.026 |
| L3     | 0.72                      | 1.35  | 0.028                | 0.053 |
| L4     | 0.60                      | 1.20  | 0.024                | 0.047 |

## Part Marking Information



## Revision History

| Revision | Major changes              |
|----------|----------------------------|
| 1.0      | Release for formal version |

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