

N-Ch 60V Fast Switching MOSFETs

- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Product Summary

| BVDSS | R _{DS(on)} | I _D |
|-------|---------------------|----------------|
| 60V | 6.8mΩ | 65A |

Description

The SM2610E is the high cell density trenched N-ch MOSFETs, which provide excellent R_{DS(on)} and gate charge for most of the synchronous buck converter applications.

The SM2610E meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO252 Pin Configuration

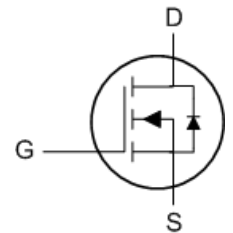
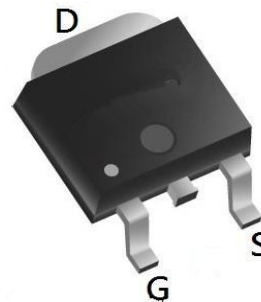


Table 1. Absolute Maximum Ratings (TA=25°C)

| Symbol | Parameter | Value | Unit |
|-----------------------------------|--------------------------------------------------------------|------------|------|
| V _{DS} | Drain-Source Voltage (V _{GS} =0V) | 64 | V |
| V _{GS} | Gate-Source Voltage (V _{DS} =0V) | ±20 | V |
| I _{D(DC)} | Drain Current (DC) at T _c =25°C | 65 | A |
| I _{D(DC)} | Drain Current (DC) at T _c =100°C | 45 | A |
| I _{DM (pluse)} | Drain Current-Continuous@ Current-Pulsed ^(Note 1) | 260 | A |
| dv/dt | Peak Diode Recovery Voltage | 8 | V/ns |
| P _D | Maximum Power Dissipation(T _c =25°C) | 75 | W |
| | Derating Factor | 0.5 | W/°C |
| E _{AS} | Single Pulse Avalanche Energy ^(Note 2) | 300 | mJ |
| T _J , T _{STG} | Operating Junction and Storage Temperature Range | -55 To 175 | °C |

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.EAS condition:T_J=25°C,V_{DD}=33V,V_G=10V

Table 2. Thermal Characteristic

| Symbol | Parameter | Value | Max | Unit |
|-----------------|--------------------------------------|-------|-----|---------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | --- | 2.0 | $^{\circ}C/W$ |

Table 3. Electrical Characteristics (TA=25 $^{\circ}C$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------|-----|------|-----------|------------|
| On/Off States | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 64 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current(Tc=25 $^{\circ}C$) | $V_{DS}=64V, V_{GS}=0V$ | | | 1 | μA |
| I_{DSS} | Zero Gate Voltage Drain Current(Tc=125 $^{\circ}C$) | $V_{DS}=64V, V_{GS}=0V$ | | | 10 | μA |
| I_{GSS} | Gate-Body Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2 | | 4 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance | $V_{GS}=10V, I_D=40A$ | | 6.8 | 8.2 | m Ω |
| Dynamic Characteristics | | | | | | |
| g_{FS} | Forward Transconductance | $V_{DS}=10V, I_D=15A$ | 15 | | | S |
| C_{iss} | Input Capacitance | $V_{DS}=25V, V_{GS}=0V,$ $f=1.0MHz$ | | 2873 | | pF |
| C_{oss} | Output Capacitance | | | 252 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 205 | | pF |
| Q_g | Total Gate Charge | $V_{DS}=50V, I_D=40A,$ $V_{GS}=10V$ | | 56 | | nC |
| Q_{gs} | Gate-Source Charge | | | 10 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 16 | | nC |
| Switching Times | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}=30V, I_D=2A, R_L=15\Omega$ $V_{GS}=10V, R_G=2.5\Omega$ | | 14.5 | | nS |
| t_r | Turn-on Rise Time | | | 24 | | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 45 | | nS |
| t_f | Turn-Off Fall Time | | | 22 | | nS |
| Source-Drain Diode Characteristics | | | | | | |
| I_{SD} | Source-Drain Current(Body Diode) | | | 65 | | A |
| I_{SDM} | Pulsed Source-Drain Current(Body Diode) | | | 260 | | A |
| V_{SD} | Forward On Voltage ^(Note 1) | $T_J=25^{\circ}C, I_{SD}=40A, V_{GS}=0V$ | | 0.89 | 0.99 | V |
| t_{rr} | Reverse Recovery Time ^(Note 1) | $T_J=25^{\circ}C, I_F=75A$ $di/dt=100A/\mu s$ | | 22 | | nS |
| Q_{rr} | Reverse Recovery Charge ^(Note 1) | | | 27 | | nC |
| t_{on} | Forward Turn-on Time | Intrinsic turn-on time is negligible(turn-on is dominated by L_S+L_D) | | | | |

Notes 1. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 1.5\%$, $R_G=25\Omega$, Starting $T_J=25^{\circ}C$

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

Figure1. Output Characteristics

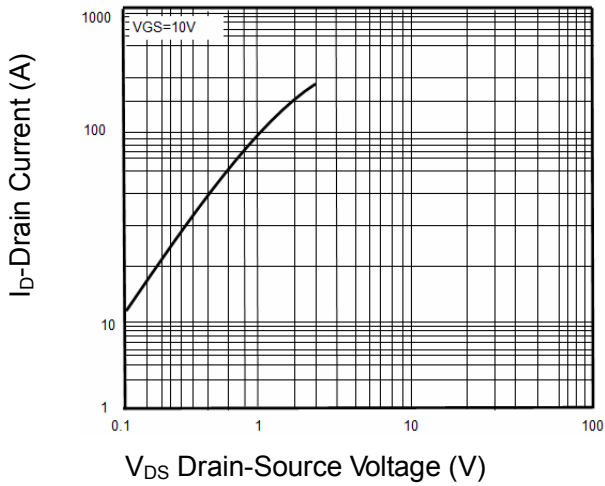


Figure2. Transfer Characteristics

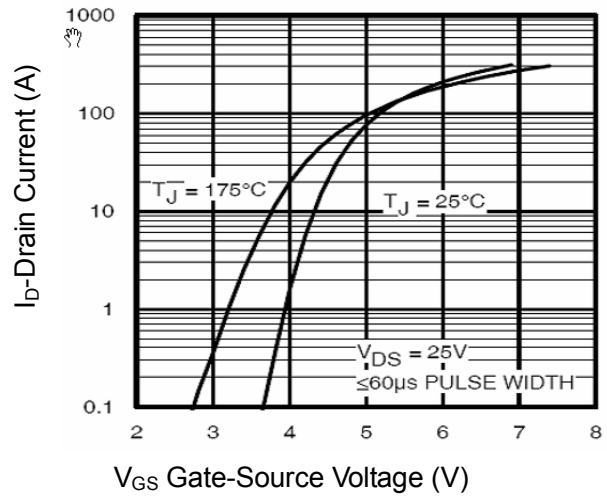


Figure3. BV_{DSS} vs Junction Temperature

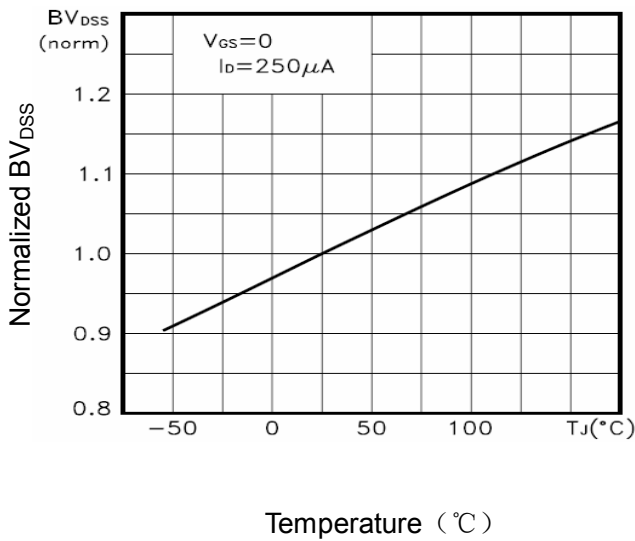


Figure4. ID vs Junction Temperature

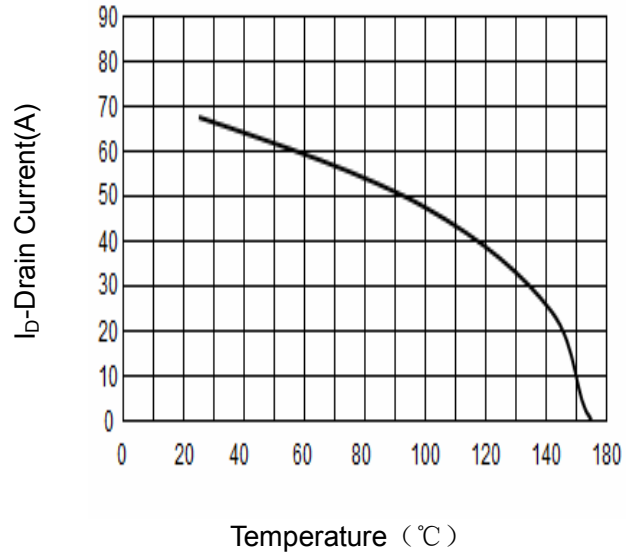


Figure5. VGS(th) vs Junction Temperature

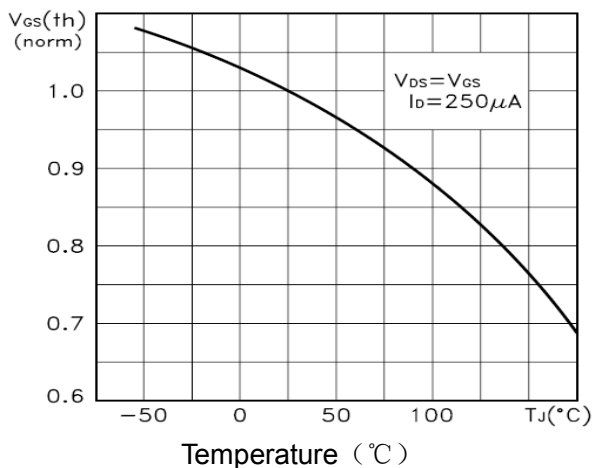


Figure6. R_{ds(on)} Vs Junction Temperature

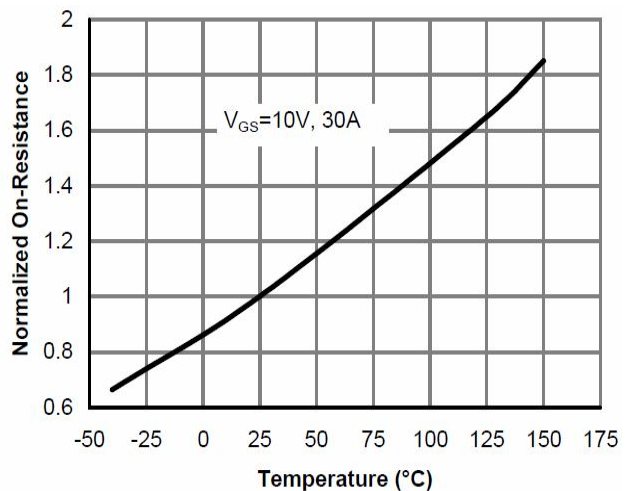


Figure7. Gate Charge

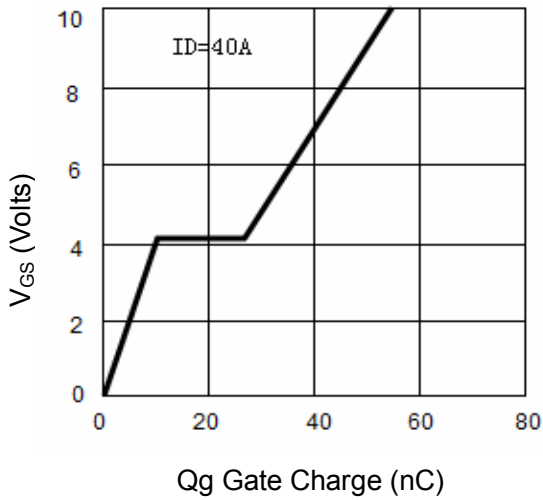


Figure8. Capacitance vs Vds

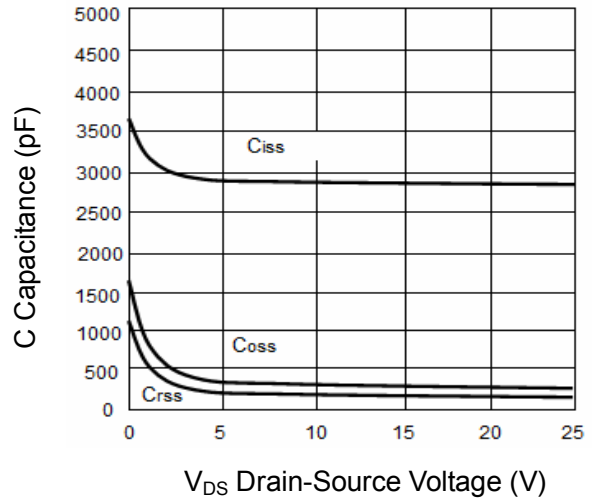


Figure9. Source- Drain Diode Forward

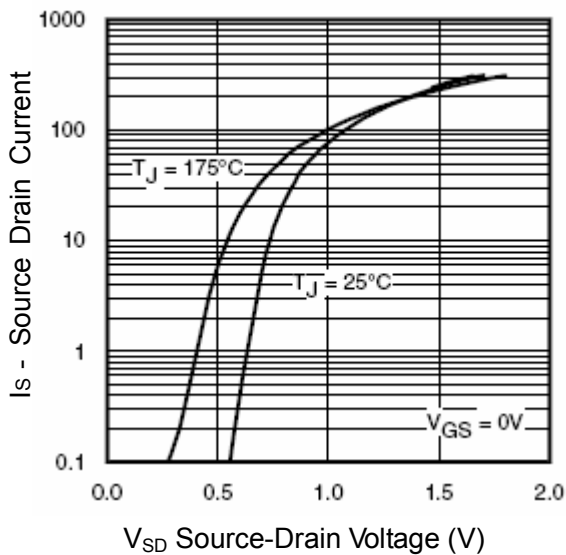


Figure10. Safe Operation Area

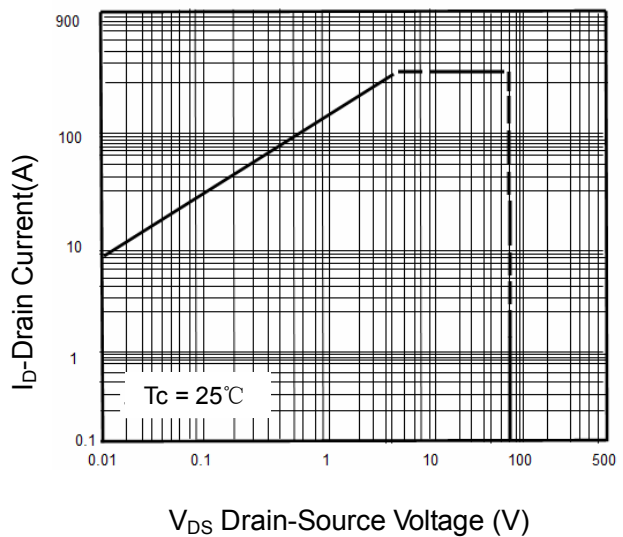
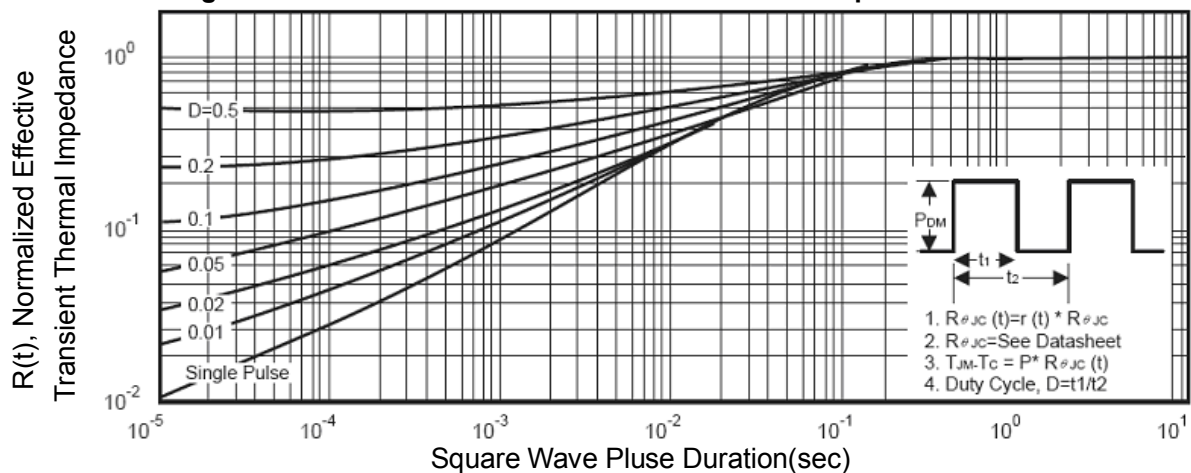
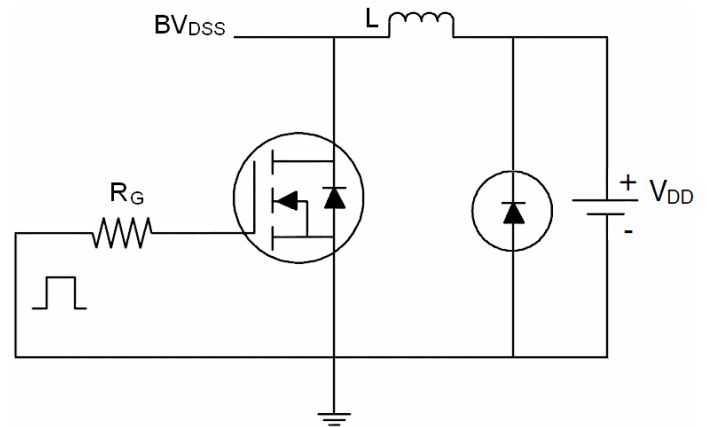
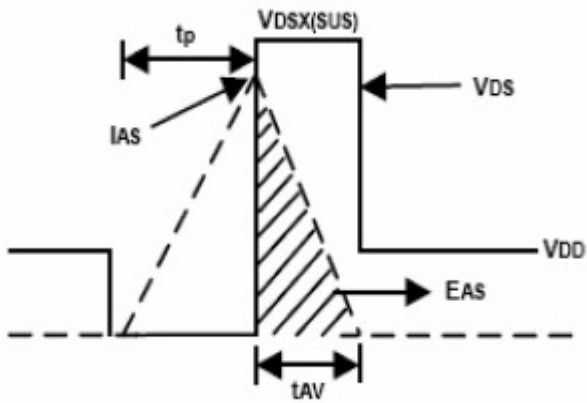


Figure11. Normalized Maximum Transient Thermal Impedance

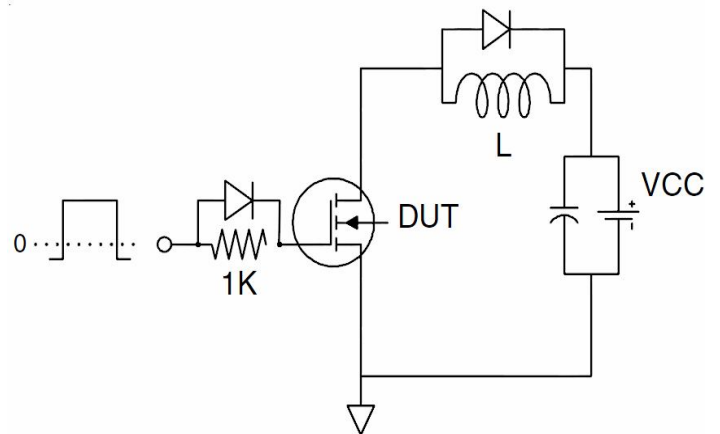
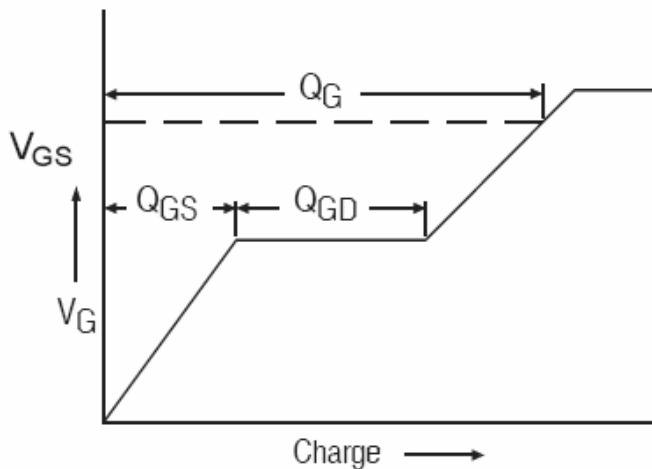


Test Circuit

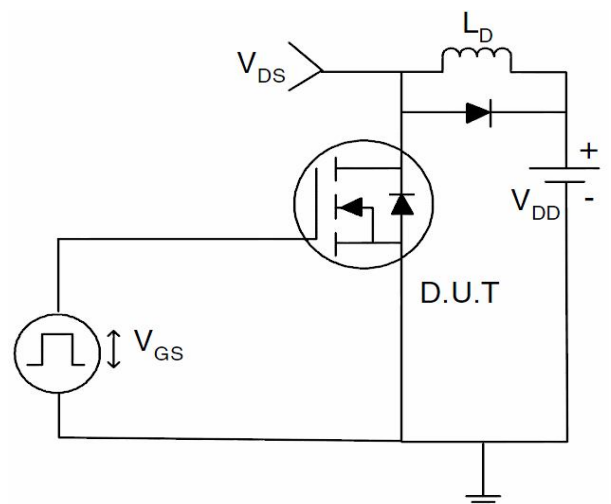
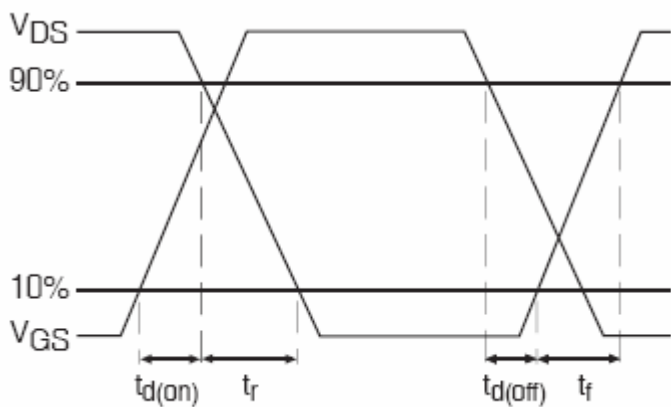
1) E_{AS} Test Circuits



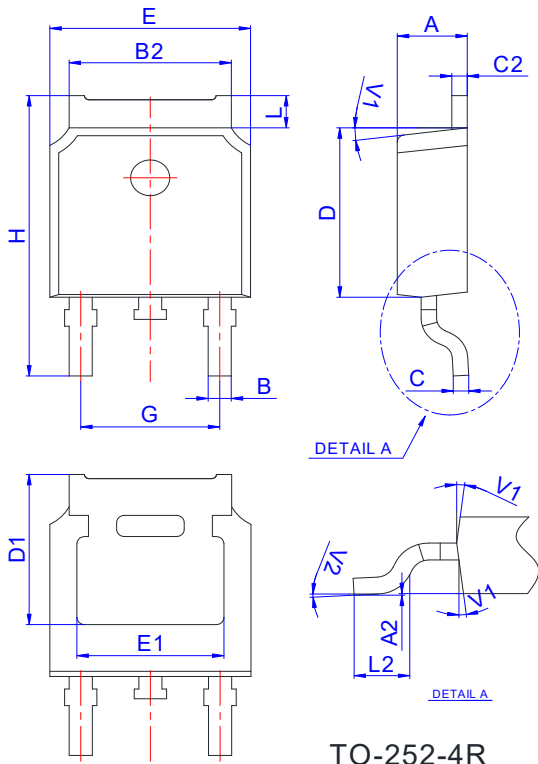
2) Gate Charge Test Circuit:



3) Switch Time Test Circuit:

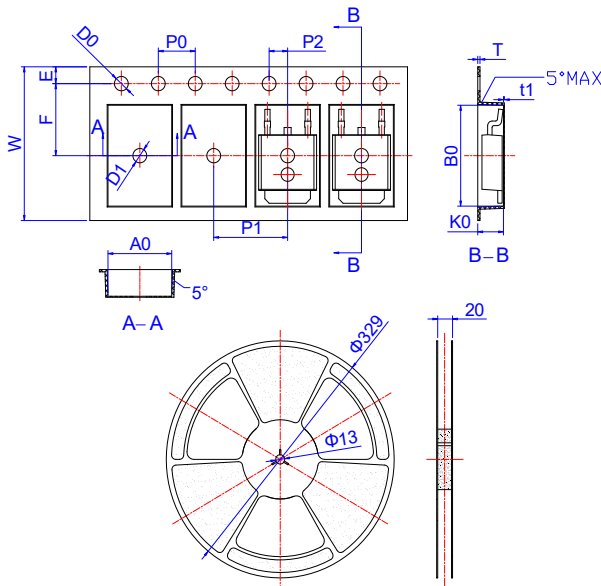


Package Mechanical Data-TO-252-4R



| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|----------|------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | | 2.50 | 0.083 | | 0.098 |
| A2 | 0 | | 0.10 | 0 | | 0.004 |
| B | 0.66 | | 0.86 | 0.026 | | 0.034 |
| B2 | 5.18 | | 5.48 | 0.202 | | 0.216 |
| C | 0.40 | | 0.60 | 0.016 | | 0.024 |
| C2 | 0.44 | | 0.58 | 0.017 | | 0.023 |
| D | 5.90 | | 6.30 | 0.232 | | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.40 | | 6.80 | 0.252 | | 0.268 |
| E1 | 4.63 | | | 0.182 | | |
| G | 4.47 | | 4.67 | 0.176 | | 0.184 |
| H | 9.50 | | 10.70 | 0.374 | | 0.421 |
| L | 1.09 | | 1.21 | 0.043 | | 0.048 |
| L2 | 1.35 | | 1.65 | 0.053 | | 0.065 |
| V1 | | 7° | | | 7° | |
| V2 | 0° | | 6° | 0° | | 6° |

Reel Specification-TO-252-4R



| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| W | 15.90 | 16.00 | 16.10 | 0.626 | 0.630 | 0.634 |
| E | 1.65 | 1.75 | 1.85 | 0.065 | 0.069 | 0.073 |
| F | 7.40 | 7.50 | 7.60 | 0.291 | 0.295 | 0.299 |
| D0 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| D1 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| P0 | 3.90 | 4.00 | 4.10 | 0.154 | 0.157 | 0.161 |
| P1 | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| P2 | 1.90 | 2.00 | 2.10 | 0.075 | 0.079 | 0.083 |
| A0 | 6.85 | 6.90 | 7.00 | 0.270 | 0.271 | 0.276 |
| B0 | 10.45 | 10.50 | 10.60 | 0.411 | 0.413 | 0.417 |
| K0 | 2.68 | 2.78 | 2.88 | 0.105 | 0.109 | 0.113 |
| T | 0.24 | | 0.27 | 0.009 | | 0.011 |
| t1 | 0.10 | | | 0.004 | | |
| 10P0 | 39.80 | 40.00 | 40.20 | 1.567 | 1.575 | 1.583 |

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