# MSR1560

## SWITCHMODE™ Soft Recovery Power Rectifier

Designed for boost converter or hard–switched converter applications, especially for Power Factor Correction application. It could also be used as a free wheeling diode in variable speed motor control applications and switching mode power supplies. These state–of–the–art devices have the following features:

- Soft Recovery with Low Reverse Recovery Charge ($Q_{RR}$) and Peak Reverse Recovery Current ($I_{RRM}$)
- 150°C Operating Junction Temperature
- Popular TO–220 Package
- Epoxy meets UL94, $V_O$ @ 1/8″
- Low Forward Voltage
- Low Leakage Current
- High Temperature Glass Passivated Junction

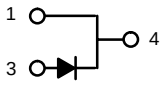
**Mechanical Characteristics:**

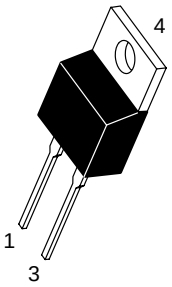
- Case: Molded Epoxy
- Weight: 1.9 Grams (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- Shipped in 50 Units per Plastic Tube
- Marking: MSR1560

ON Semiconductor

http://onsemi.com

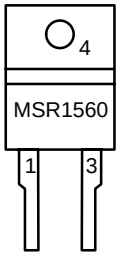
**SOFT RECOVERY POWER RECTIFIER 15 AMPERES 600 VOLTS**




**CASE 221B TO–220 PLASTIC**

**MARKING DIAGRAM**




**ORDERING INFORMATION**

| Device | Package | Shipping |
|---|---|---|
| MSR1560 | TO–220 | 50 Units/Rail |

## MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 600 | V |
| Average Rectified Forward Current (At Rated $V_R$, $T_C$ = 125°C) | $I_O$ | 15 | A |
| Peak Repetitive Forward Current (At Rated $V_R$, Square Wave, 20 kHz, $T_C$ = 125°C) | $I_{FRM}$ | 30 | A |
| Non–Repetitive Peak Surge Current<br>(Surge applied at rated load conditions, halfwave, single phase, 60 Hz) | $I_{FSM}$ | 100 | A |
| Storage / Operating Case Temperature | $T_{stg}$, $T_C$ | – 65 to 150 | °C |
| Operating Junction Temperature | $T_J$ | – 65 to 150 | °C |

## THERMAL CHARACTERISTICS

| | | | |
|---|---|---|---|
| Thermal Resistance — Junction–to–Case<br>Thermal Resistance — Junction–to–Ambient | $R_{\theta JC}$<br>$R_{\theta JA}$ | 1.6<br>72.8 | °C/W |

## ELECTRICAL CHARACTERISTICS

| | | | | |
|---|---|---|---|---|
| Maximum Instantaneous Forward Voltage (Note 1.) ($I_F$ = 15 A) | $V_F$ | **$T_J$ = 25°C** | **$T_J$ = 150°C** | V |
| *Typical* | | 1.8<br>*1.5* | 1.4<br>*1.2* | |
| Maximum Instantaneous Reverse Current ($V_R$ = 600 V) | $I_R$ | **$T_J$ = 25°C** | **$T_J$ = 150°C** | μA |
| *Typical* | | 15<br>*0.4* | 5000<br>*100* | |
| Maximum Reverse Recovery Time (Note 2.) ($V_R$ = 30 V, $I_F$ = 1 A, di/dt = 100 A/μs) | $t_{rr}$ | **$T_J$ = 25°C** | **$T_J$ = 100°C** | ns |
| *Typical* | | 45<br>*35* | 65<br>*54* | |
| Typical Recovery Softness Factor ($V_R$ = 30 V, $I_F$ = 1 A, di/dt = 100 A/μs) | $s = t_b/t_a$ | *.67* | *.74* | |
| Typical Peak Reverse Recovery Current ($V_R$ = 30 V, $I_F$ = 1 A, di/dt = 100 A/μs) | $I_{RRM}$ | 2.3 | 3.2 | A |
| Typical Reverse Recovery Charge ($V_R$ = 30 V, $I_F$ = 1 A, di/dt = 100 A/μs) | $Q_{RR}$ | 31 | 78 | nC |

1. Pulse Test: Pulse Width ≤ 380 μs, Duty Cycle ≤ 2%
2. $T_{RR}$ measured projecting from 25% of $I_{RRM}$ to zero current

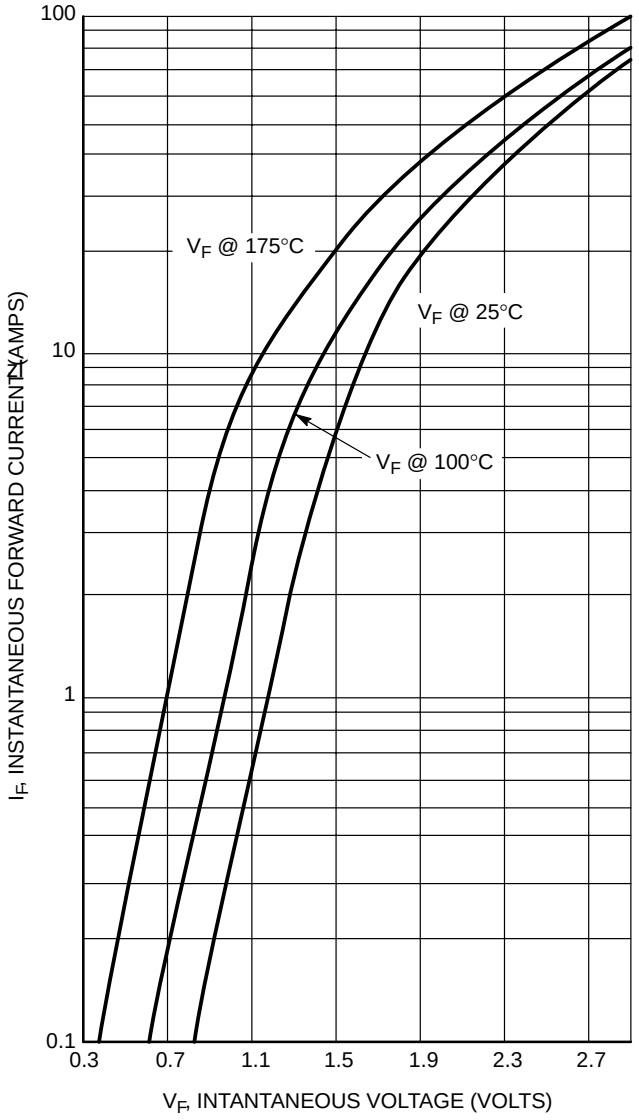



**Figure 1. Maximum Forward Voltage**

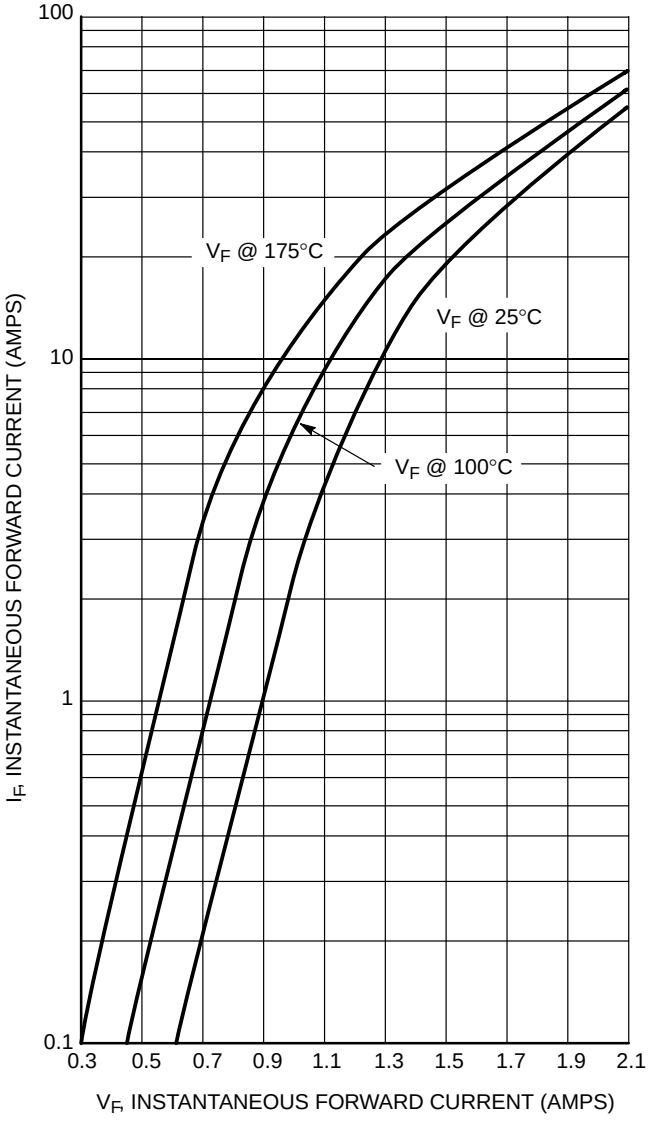



**Figure 2. Typical Forward Voltage**

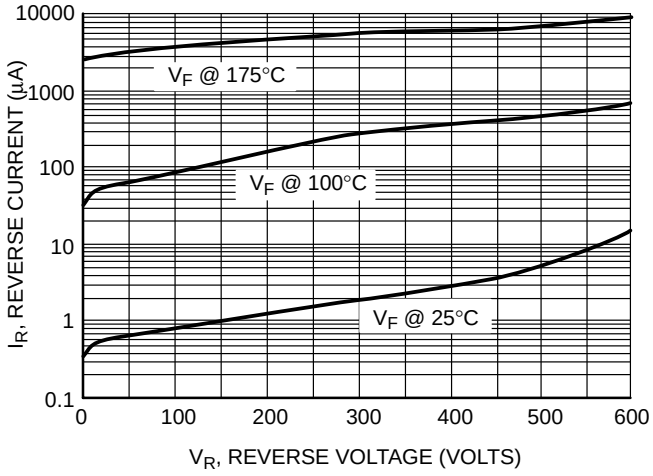



**Figure 3. Maximum Reverse Current**

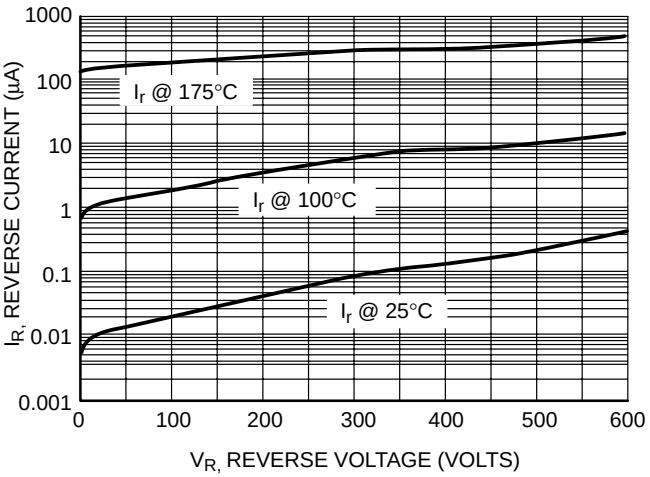



**Figure 4. Typical Reverse Current**

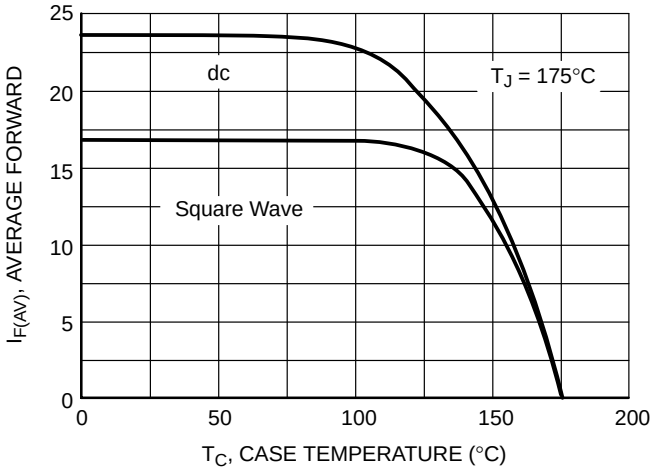



**Figure 5. Current Derating**

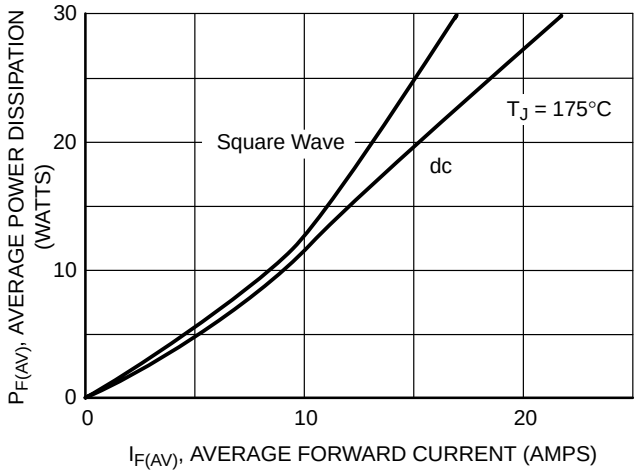



**Figure 6. Power Dissipation**

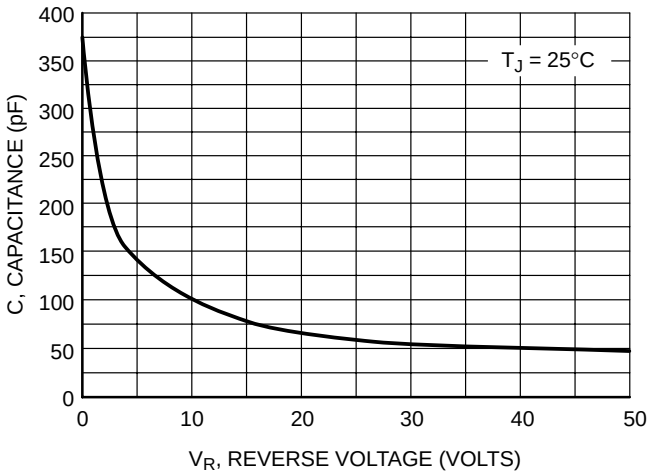



**Figure 7. Maximum Capacitance**

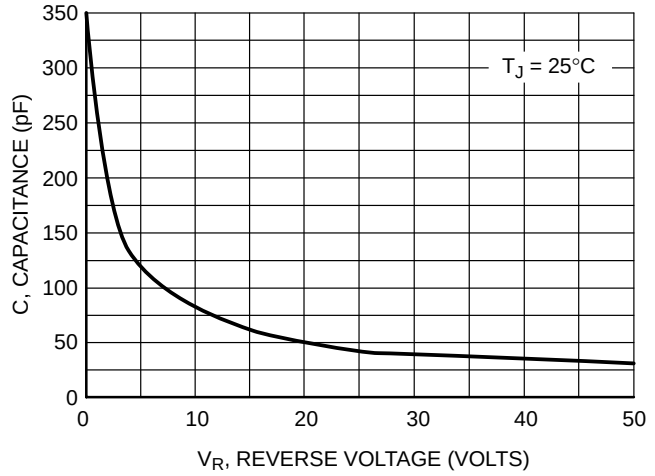



**Figure 8. Typical Capacitance**

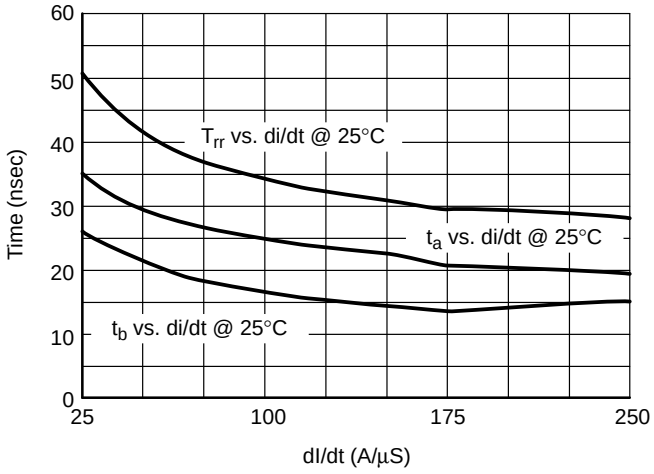



**Figure 9. Typical Trr vs. di/dt**

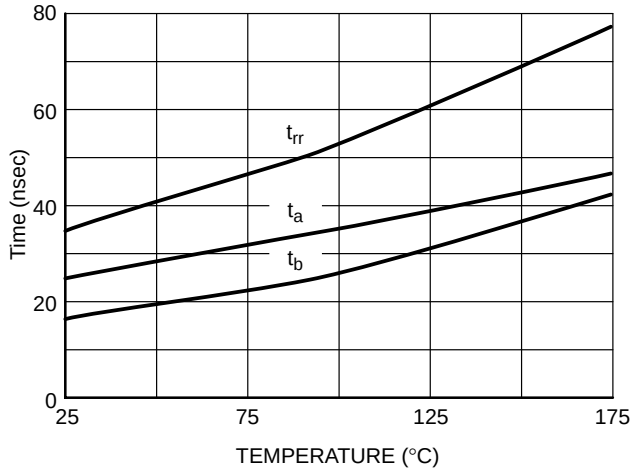



**Figure 10. Typical Trr vs. Temperature**

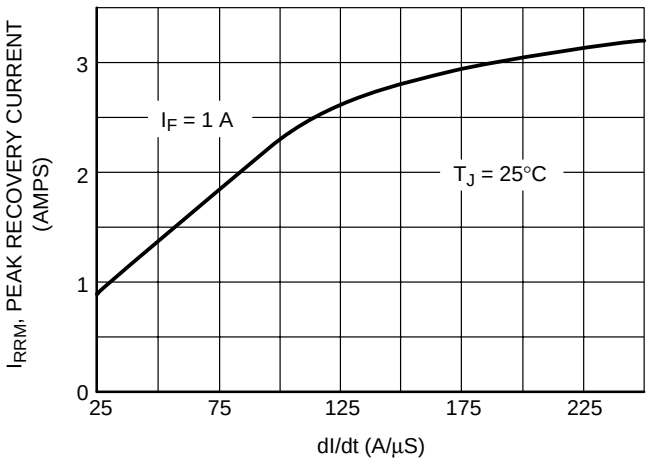



**Figure 11. Typical Peak Reverse Recovery Current**

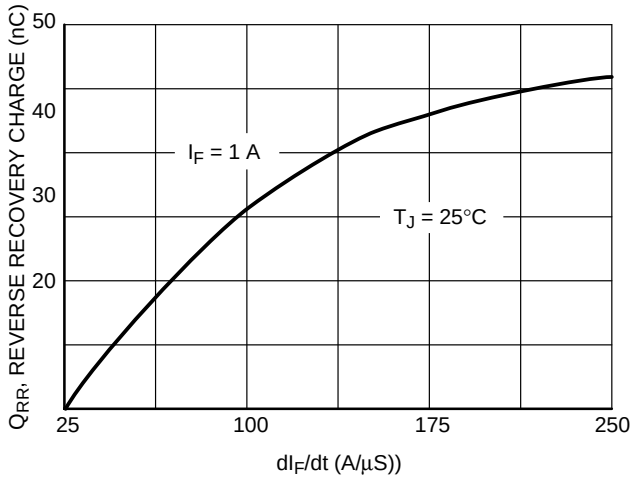



**Figure 12. Typical Reverse Recovery Charge**

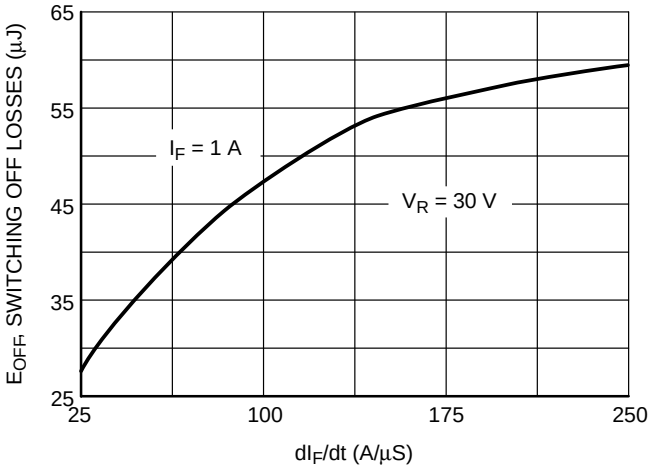



**Figure 13. Typical Switching Off Losses**

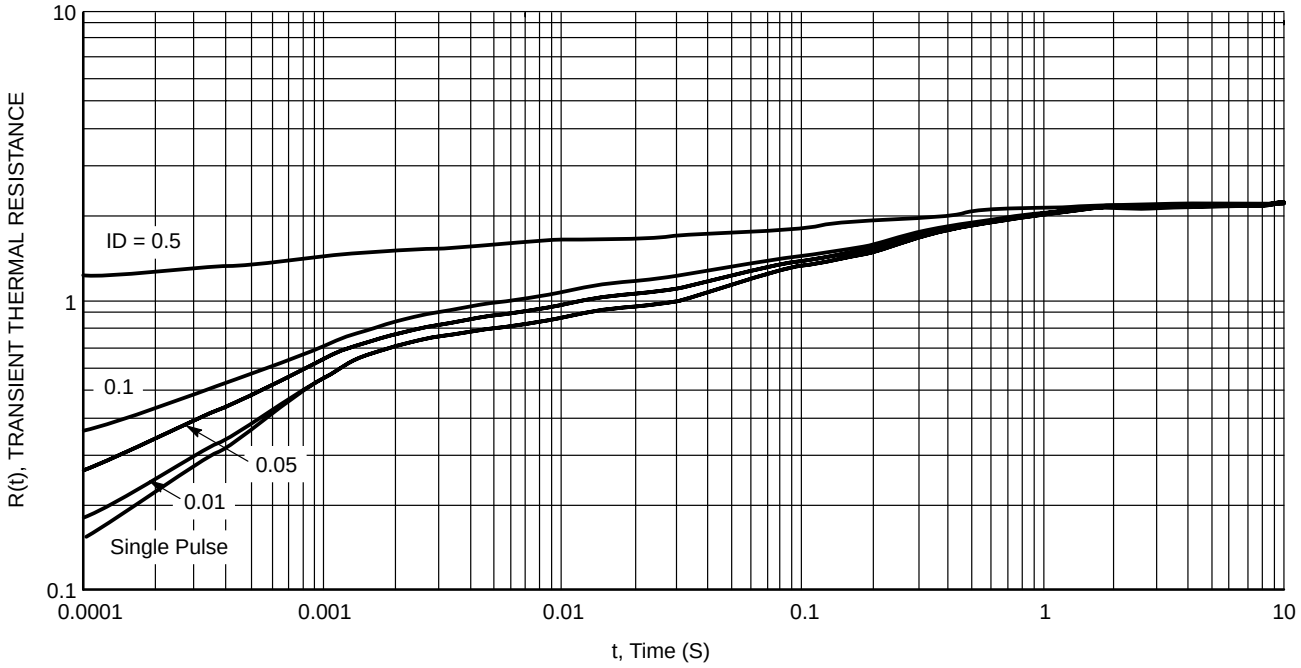
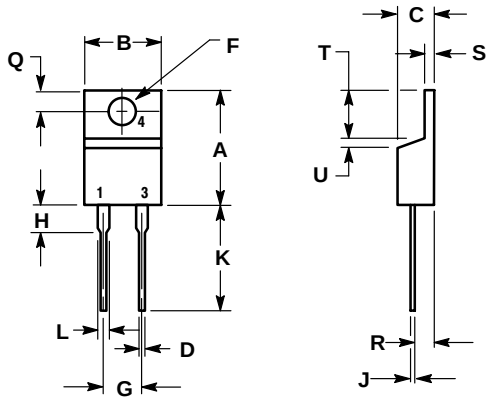



**Figure 14. Transient Thermal Response**

## PACKAGE DIMENSIONS

**TO–220**
PLASTIC
CASE 221B–04
ISSUE D




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.595 | 0.620 | 15.11 | 15.75 |
| B | 0.380 | 0.405 | 9.65 | 10.29 |
| C | 0.160 | 0.190 | 4.06 | 4.82 |
| D | 0.025 | 0.035 | 0.64 | 0.89 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.190 | 0.210 | 4.83 | 5.33 |
| H | 0.110 | 0.130 | 2.79 | 3.30 |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.14 | 1.52 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.14 | 1.39 |
| T | 0.235 | 0.255 | 5.97 | 6.48 |
| U | 0.000 | 0.050 | 0.000 | 1.27 |

STYLE 1:
PIN 1. CATHODE
2. N/A
3. ANODE
4. CATHODE

SWITCHMODE ia a trademark of Semiconductor Components Industries, LLC (SCILLC).



## PUBLICATION ORDERING INFORMATION

**NORTH AMERICA Literature Fulfillment**:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
**Phone**: 303–675–2175 or 800–344–3860 Toll Free USA/Canada
**Fax**: 303–675–2176 or 800–344–3867 Toll Free USA/Canada
**Email**: ONlit@hibbertco.com
Fax Response Line: 303–675–2167 or 800–344–3810 Toll Free USA/Canada

**N. American Technical Support**: 800–282–9855 Toll Free USA/Canada

**EUROPE:** LDC for ON Semiconductor – European Support
**German Phone**: (+1) 303–308–7140 (Mon–Fri 2:30pm to 7:00pm CET)
**Email**: ONlit–german@hibbertco.com
**French Phone**: (+1) 303–308–7141 (Mon–Fri 2:00pm to 7:00pm CET)
**Email**: ONlit–french@hibbertco.com
**English Phone**: (+1) 303–308–7142 (Mon–Fri 12:00pm to 5:00pm GMT)
**Email**: ONlit@hibbertco.com

**EUROPEAN TOLL–FREE ACCESS*: 00–800–4422–3781**
*Available from Germany, France, Italy, UK, Ireland

**CENTRAL/SOUTH AMERICA:**
**Spanish Phone**: 303–308–7143 (Mon–Fri 8:00am to 5:00pm MST)
**Email**: ONlit–spanish@hibbertco.com

**ASIA/PACIFIC**: LDC for ON Semiconductor – Asia Support
**Phone**: 303–675–2121 (Tue–Fri 9:00am to 1:00pm, Hong Kong Time)
**Toll Free** from Hong Kong & Singapore:
**001–800–4422–3781**
**Email**: ONlit–asia@hibbertco.com

**JAPAN**: ON Semiconductor, Japan Customer Focus Center
4–32–1 Nishi–Gotanda, Shinagawa–ku, Tokyo, Japan 141–0031
**Phone**: 81–3–5740–2700
**Email**: r14525@onsemi.com

**ON Semiconductor Website**: http://onsemi.com

For additional information, please contact your local
Sales Representative.