

**RoHS Compliant Product**  
A suffix of "-C" specifies halogen and lead-free

## DESCRIPTION

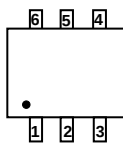
These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $R_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

## FEATURES

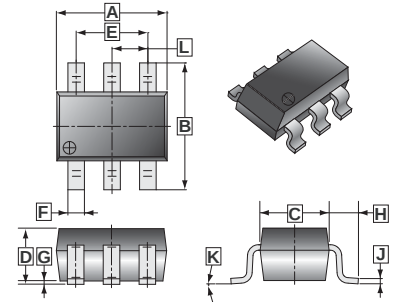
- Low  $R_{DS(on)}$  provides higher efficiency and extends battery life.
- Low thermal impedance copper leadframe TSOP-6 saves board space.
- Fast switching speed.
- High performance trench technology.

## PRODUCT SUMMARY

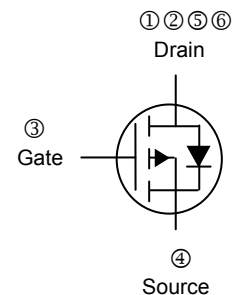
| PRODUCT SUMMARY |                        |          |
|-----------------|------------------------|----------|
| $V_{DS}(V)$     | $R_{DS(on)} (m\Omega)$ | $I_D(A)$ |
| -20             | 42@ $V_{GS} = -4.5V$   | -5.7     |
|                 | 57@ $V_{GS} = -2.5V$   | -4.9     |
|                 | 80@ $V_{GS} = -1.8V$   | -4.1     |



## TSOP-6



| REF. | Millimeter |      | REF. | Millimeter |      |
|------|------------|------|------|------------|------|
|      | Min.       | Max. |      | Min.       | Max. |
| A    | 2.70       | 3.10 | G    | 0          | 0.10 |
| B    | 2.60       | 3.00 | H    | 0.60       | REF. |
| C    | 1.40       | 1.80 | J    | 0.12       | REF. |
| D    | 1.10       | MAX. | K    | 0°         | 10°  |
| E    | 1.90       | REF. | L    | 0.95       | REF. |
| F    | 0.30       | 0.50 |      |            |      |



## ABSOLUTE MAXIMUM RATINGS( $T_A=25^\circ C$ UNLESS OTHERWISE NOTED)

| Parameter                                                 | Symbol                 | Ratings   | Unit       |
|-----------------------------------------------------------|------------------------|-----------|------------|
|                                                           |                        | Maximum   |            |
| Drain-Source Voltage                                      | $V_{DS}$               | -20       | V          |
| Gate-Source Voltage                                       | $V_{GS}$               | $\pm 8$   | V          |
| Continuous Drain Current <sup>a</sup>                     | $I_D @ T_A=25^\circ C$ | -5.7      | A          |
|                                                           | $I_D @ T_A=70^\circ C$ | -4.7      |            |
| Pulsed Drain Current <sup>b</sup>                         | $I_{DM}$               | $\pm 20$  | A          |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$                  | -1.7      | A          |
| Power Dissipation <sup>a</sup>                            | $P_D @ T_A=25^\circ C$ | 2.0       | W          |
|                                                           | $P_D @ T_A=70^\circ C$ | 1.3       |            |
| Operating Junction and Storage Temperature Range          | $T_j, T_{stg}$         | -55 ~ 150 | $^\circ C$ |

## THERMAL RESISTANCE RATINGS

| Parameter                                |                        | Symbol          | Maximum | Unit           |
|------------------------------------------|------------------------|-----------------|---------|----------------|
| Maximum Junction to Ambient <sup>a</sup> | $t \leq 5 \text{ sec}$ | $R_{\theta JA}$ | 50      | $^\circ C / W$ |
|                                          | Steady State           |                 | 90      |                |

### Notes

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature.

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

| Parameter                               | Symbol       | Min. | Typ. | Max.      | Unit          | Test Conditions                                                                             |
|-----------------------------------------|--------------|------|------|-----------|---------------|---------------------------------------------------------------------------------------------|
| Gate-Threshold Voltage                  | $V_{GS(th)}$ | -0.4 | -    | -         | V             | $V_{DS}=V_{GS}$ , $I_D = -250\mu\text{A}$                                                   |
| Gate-Body Leakage                       | $I_{GSS}$    | -    | -    | $\pm 100$ | nA            | $V_{DS} = 0\text{V}$ , $V_{GS} = \pm 8\text{V}$                                             |
| Zero Gate Voltage Drain Current         | $I_{DSS}$    | -    | -    | -1        | $\mu\text{A}$ | $V_{DS} = -16\text{V}$ , $V_{GS} = 0\text{V}$                                               |
|                                         |              | -    | -    | -5        |               | $V_{DS} = -16\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 55^\circ\text{C}$                    |
| On-State Drain Current <sup>a</sup>     | $I_{D(on)}$  | -20  | -    | -         | A             | $V_{DS} = -4.5\text{V}$ , $V_{GS} = -4.5\text{V}$                                           |
| Drain-Source On-Resistance <sup>a</sup> | $R_{DS(ON)}$ | -    | -    | 42        | m $\Omega$    | $V_{GS} = -4.5\text{V}$ , $I_D = -5.7\text{A}$                                              |
|                                         |              | -    | -    | 57        |               | $V_{GS} = -2.5\text{V}$ , $I_D = -4.9\text{A}$                                              |
|                                         |              | -    | -    | 80        |               | $V_{GS} = -1.8\text{V}$ , $I_D = -4.1\text{A}$                                              |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$     | -    | 10   | -         | S             | $V_{DS} = -10\text{V}$ , $I_D = -4.9\text{A}$                                               |
| Diode Forward Voltage <sup>a</sup>      | $V_{SD}$     | -    | -0.7 | -         | V             | $I_S = 1.7\text{A}$ , $V_{GS} = 0\text{V}$                                                  |
| <b>DYNAMIC <sup>b</sup></b>             |              |      |      |           |               |                                                                                             |
| Total Gate Charge                       | $Q_g$        | -    | 8    | -         | nC            | $V_{DS} = -10\text{V}$ , $V_{GS} = -4.5\text{V}$ ,<br>$I_D = -5.7\text{A}$                  |
| Gate-Source Charge                      | $Q_{gs}$     | -    | 1.8  | -         |               |                                                                                             |
| Gate-Drain Charge                       | $Q_{gd}$     | -    | 1.9  | -         |               |                                                                                             |
| Turn-on Delay Time                      | $T_{d(on)}$  | -    | 22   | -         | nS            | $V_{DD} = -10\text{V}$ , $V_{GEN} = -4.5\text{V}$ ,<br>$R_L = 6\Omega$ , $I_D = -1\text{A}$ |
| Rise Time                               | $T_r$        | -    | 35   | -         |               |                                                                                             |
| Turn-off Delay Time                     | $T_{d(off)}$ | -    | 45   | -         |               |                                                                                             |
| Fall Time                               | $T_f$        | -    | 25   | -         |               |                                                                                             |

Notes

- Pulse test :  $PW \leq 300\text{ us}$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

## CHARACTERISTIC CURVES

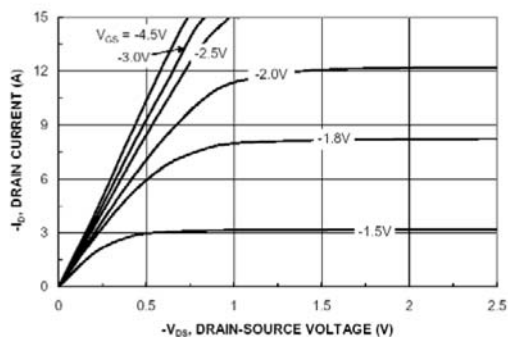


Figure 1. On-Region Characteristics

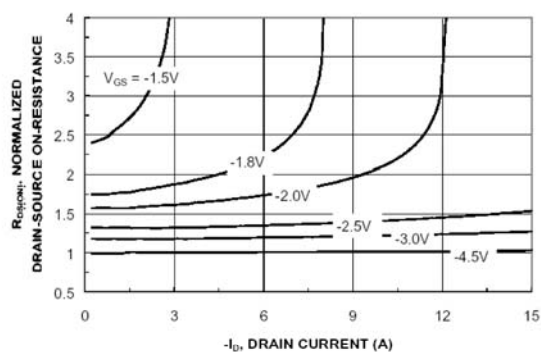


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

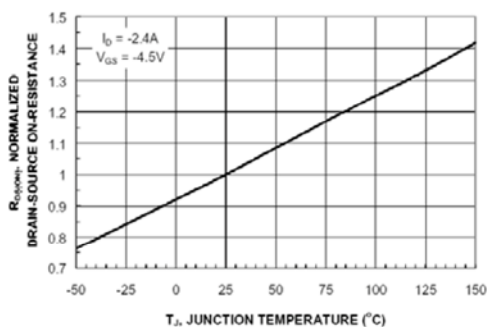


Figure 3. On-Resistance Variation with Temperature

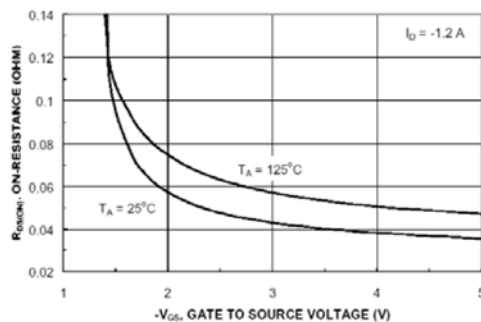


Figure 4. On-Resistance Variation with Gate to Source Voltage

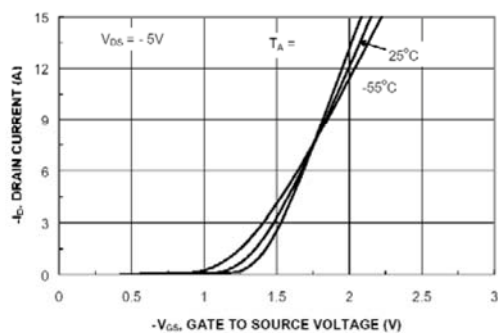


Figure 5. Transfer Characteristics

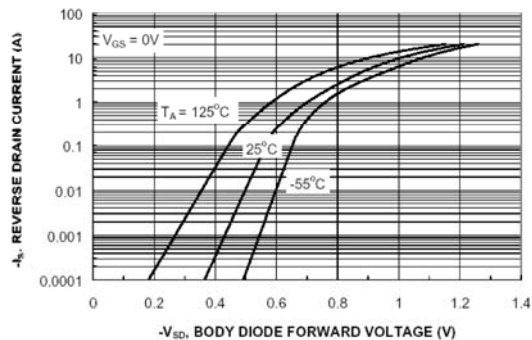


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

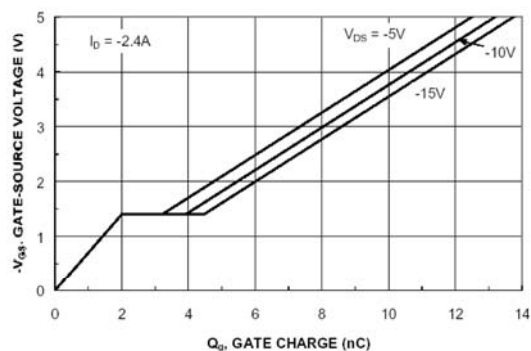


Figure 7. Gate Charge Characteristic

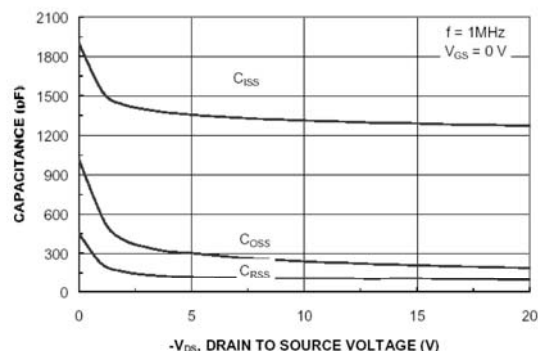


Figure 8. Capacitance Characteristic

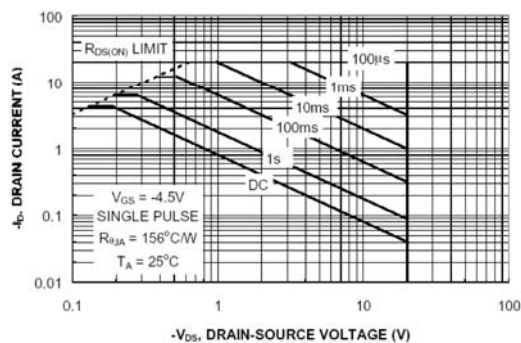


Figure 9. Maximum Safe Operating Area

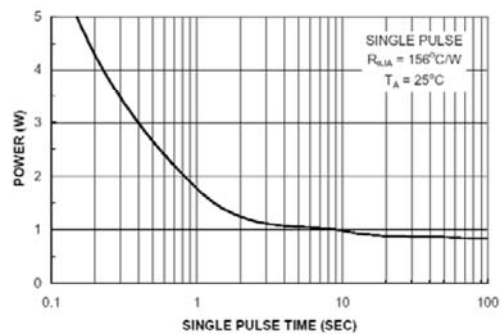


Figure 10. Single Pulse Maximum Power Dissipation

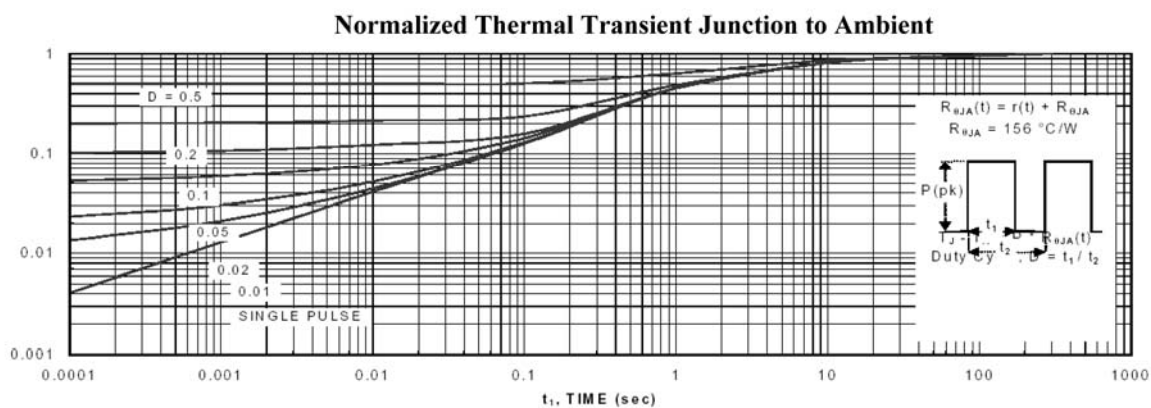


Figure 11. Transient Thermal Response Curve.