

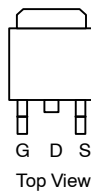


## P-Channel 60-V (D-S) 175°C MOSFET

## PRODUCT SUMMARY

| $V_{DS}$ (V) | $r_{DS(on)}$ ( $\Omega$ )  | $I_D$ (A) <sup>d</sup> |
|--------------|----------------------------|------------------------|
| -60          | 0.0069 @ $V_{GS} = -10$ V  | -110                   |
|              | 0.0088 @ $V_{GS} = -4.5$ V | -110                   |

TO-263



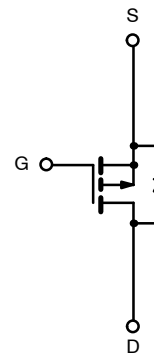
Ordering Information: SUM110P06-07L  
SUM110P06-07L—E3 (Lead Free)

## FEATURES

- TrenchFET® Power MOSFET
- New Package with Low Thermal Resistance

## APPLICATIONS

- Automotive
  - 12-V Boardnet
  - High-Side Switches
  - Motor Drives



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

| Parameter                                                              |                            | Symbol         | Limit            | Unit             |
|------------------------------------------------------------------------|----------------------------|----------------|------------------|------------------|
| Drain-Source Voltage                                                   |                            | $V_{DS}$       | -60              | V                |
| Gate-Source Voltage                                                    |                            | $V_{GS}$       | $\pm 20$         |                  |
| Continuous Drain Current <sup>d</sup><br>( $T_J = 175^\circ\text{C}$ ) | $T_C = 25^\circ\text{C}$   | $I_D$          | -110             | A                |
|                                                                        | $T_C = 125^\circ\text{C}$  |                | -95              |                  |
| Pulsed Drain Current                                                   |                            | $I_{DM}$       | -240             |                  |
| Avalanche Current                                                      | L = 0.1 mH                 | $I_{AS}$       | -75              |                  |
| Single Pulse Avalanche Energy <sup>a</sup>                             |                            | $E_{AS}$       | 281              | mJ               |
| Power Dissipation                                                      | $T_C = 25^\circ\text{C}$   | $P_D$          | 375 <sup>c</sup> | W                |
|                                                                        | $T_A = 25^\circ\text{C}^b$ |                | 3.75             |                  |
| Operating Junction and Storage Temperature Range                       |                            | $T_J, T_{stg}$ | -55 to 175       | $^\circ\text{C}$ |

## THERMAL RESISTANCE RATINGS

| Parameter                                  | Symbol     | Limit | Unit               |
|--------------------------------------------|------------|-------|--------------------|
| Junction-to-Ambient PCB Mount <sup>b</sup> | $R_{thJA}$ | 40    | $^\circ\text{C/W}$ |
| Junction-to-Case                           | $R_{thJC}$ | 0.4   |                    |

## Notes:

- Duty cycle  $\leq 1\%$ .
- When mounted on 1" square PCB (FR-4 material).
- See SOA curve for voltage derating.
- Limited by package.

**SPECIFICATIONS ( $T_J = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)**

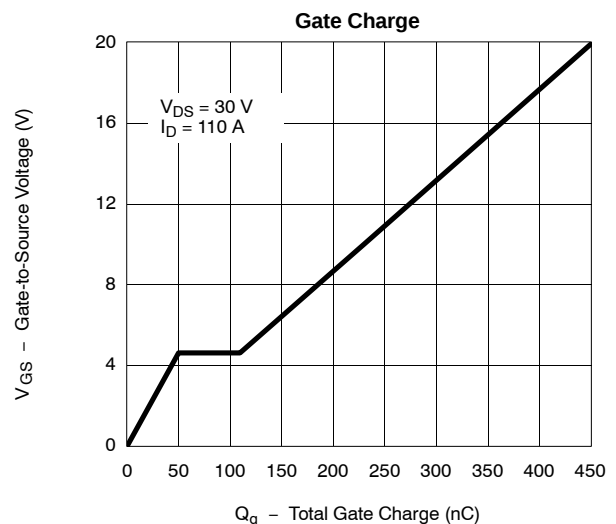
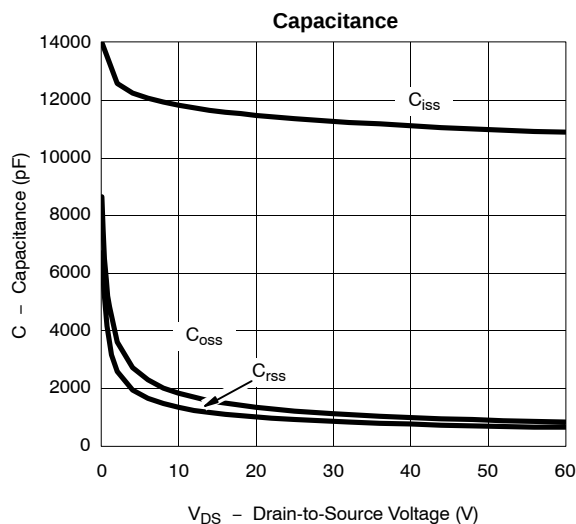
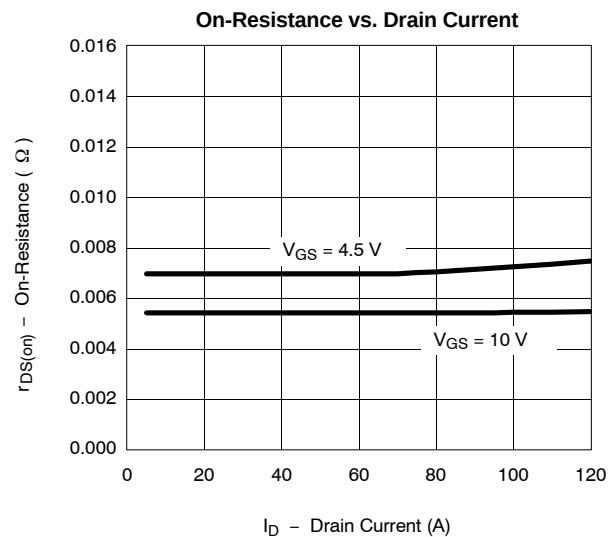
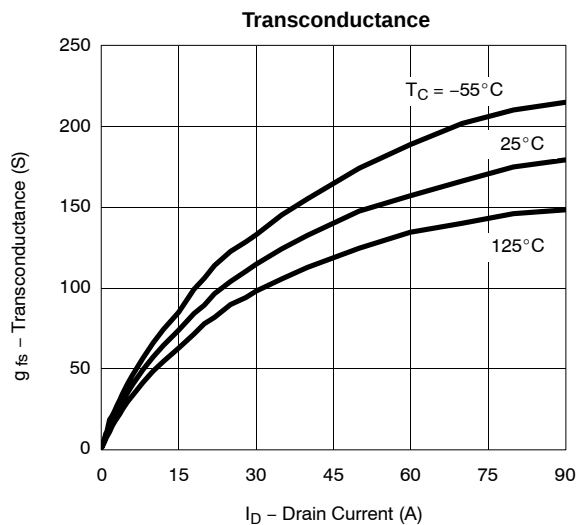
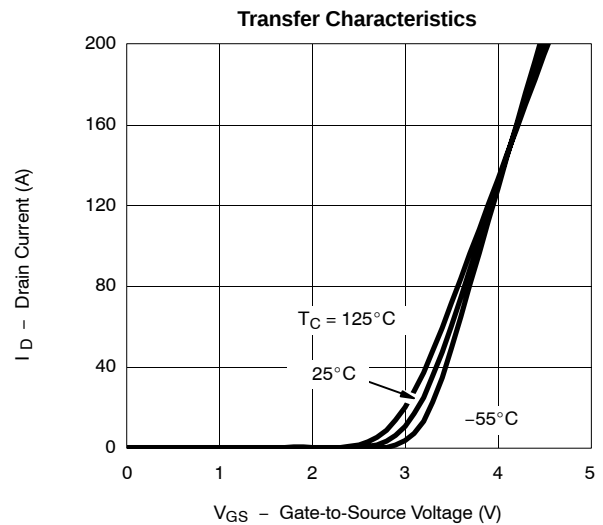
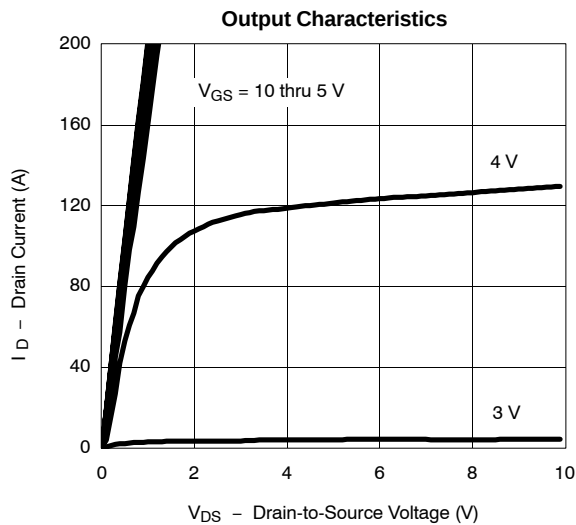
| Parameter                                                                           | Symbol               | Test Condition                                                                                                                | Min  | Typ    | Max    | Unit |
|-------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------|------|--------|--------|------|
| Static                                                                              |                      |                                                                                                                               |      |        |        |      |
| Drain-Source Breakdown Voltage                                                      | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA                                                                               | -60  |        |        | V    |
| Gate Threshold Voltage                                                              | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA                                                                  | -1   |        | -3     |      |
| Gate-Body Leakage                                                                   | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V                                                                                |      |        | ±100   | nA   |
| Zero Gate Voltage Drain Current                                                     | I <sub>DSS</sub>     | V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V                                                                                |      |        | -1     | μA   |
|                                                                                     |                      | V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C                                                        |      |        | -50    |      |
|                                                                                     |                      | V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175°C                                                        |      |        | -250   |      |
| On-State Drain Current <sup>a</sup>                                                 | I <sub>D(on)</sub>   | V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -10 V                                                                               | -120 |        |        | A    |
| Drain-Source On-State Resistance <sup>a</sup>                                       | r <sub>DS(on)</sub>  | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -30 A                                                                               |      | 0.0055 | 0.0069 | Ω    |
|                                                                                     |                      | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -30 A, T <sub>J</sub> = 125°C                                                       |      |        | 0.0115 |      |
|                                                                                     |                      | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -30 A, T <sub>J</sub> = 175°C                                                       |      |        | 0.0138 |      |
|                                                                                     |                      | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -20 A                                                                              |      | 0.007  | 0.0088 |      |
| Forward Transconductance <sup>a</sup>                                               | g <sub>fs</sub>      | V <sub>DS</sub> = -15 V, I <sub>D</sub> = -50 A                                                                               | 20   |        |        | S    |
| Dynamic <sup>b</sup>                                                                |                      |                                                                                                                               |      |        |        |      |
| Input Capacitance                                                                   | C <sub>iss</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -25 V, f = 1 MHz                                                                     |      | 11400  |        | pF   |
| Output Capacitance                                                                  | C <sub>oss</sub>     |                                                                                                                               |      | 1200   |        |      |
| Reversen Transfer Capacitance                                                       | C <sub>rss</sub>     |                                                                                                                               |      | 900    |        |      |
| Total Gate Charge <sup>c</sup>                                                      | Q <sub>g</sub>       | V <sub>DS</sub> = -30 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -110 A                                                     |      | 230    | 345    | nC   |
| Gate-Source Charge <sup>c</sup>                                                     | Q <sub>gs</sub>      |                                                                                                                               |      | 50     |        |      |
| Gate-Drain Charge <sup>c</sup>                                                      | Q <sub>gd</sub>      |                                                                                                                               |      | 60     |        |      |
| Gate Resistance                                                                     | R <sub>g</sub>       | f = 1.0 MHz                                                                                                                   |      | 3      |        | Ω    |
| Turn-On Delay Time <sup>c</sup>                                                     | t <sub>d(on)</sub>   | V <sub>DD</sub> = -30 V, R <sub>L</sub> = 0.27 Ω<br>I <sub>D</sub> ≈ -110 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 2.5 Ω |      | 20     | 30     | ns   |
| Rise Time <sup>c</sup>                                                              | t <sub>r</sub>       |                                                                                                                               |      | 160    | 240    |      |
| Turn-Off Delay Time <sup>c</sup>                                                    | t <sub>d(off)</sub>  |                                                                                                                               |      | 200    | 300    |      |
| Fall Time <sup>c</sup>                                                              | t <sub>f</sub>       |                                                                                                                               |      | 240    | 360    |      |
| Source-Drain Diode Ratings and Characteristics (T <sub>C</sub> = 25°C) <sup>b</sup> |                      |                                                                                                                               |      |        |        |      |
| Continuous Current                                                                  | I <sub>s</sub>       |                                                                                                                               |      |        | -110   | A    |
| Pulsed Current                                                                      | I <sub>SM</sub>      |                                                                                                                               |      |        | -240   |      |
| Forward Voltage <sup>a</sup>                                                        | V <sub>SD</sub>      | I <sub>F</sub> = -85 A, V <sub>GS</sub> = 0 V                                                                                 |      | -1.0   | -1.5   | V    |
| Reverse Recovery Time                                                               | t <sub>rr</sub>      | I <sub>F</sub> = -85 A, di/dt = 100 A/μs                                                                                      |      | 65     | 100    | ns   |
| Peak Reverse Recovery Current                                                       | I <sub>RM(REC)</sub> |                                                                                                                               |      | -4.2   | -6.3   | A    |
| Reverse Recovery Charge                                                             | Q <sub>rr</sub>      |                                                                                                                               |      | 0.14   | 0.32   | μC   |

## Notes:

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.  
c. Independent of operating temperature.

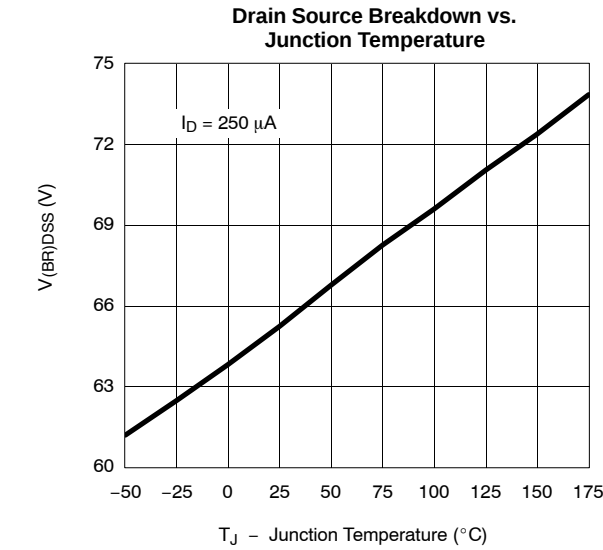
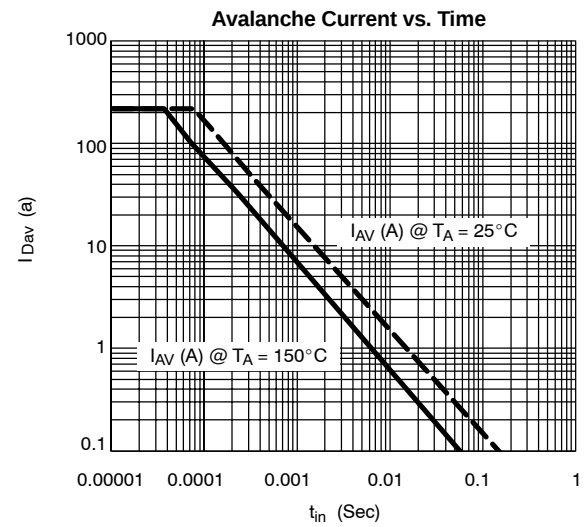
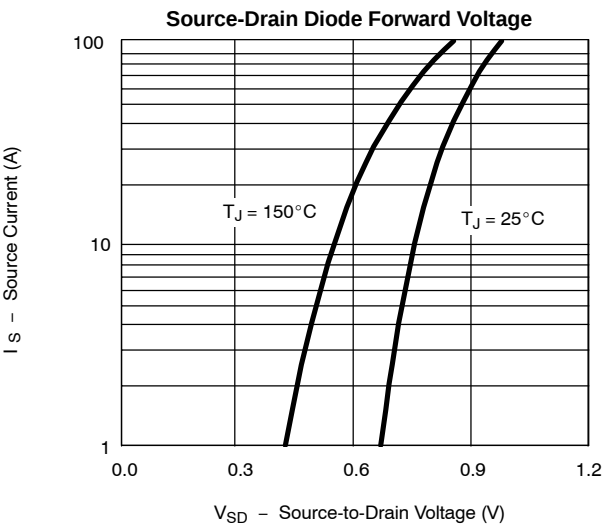
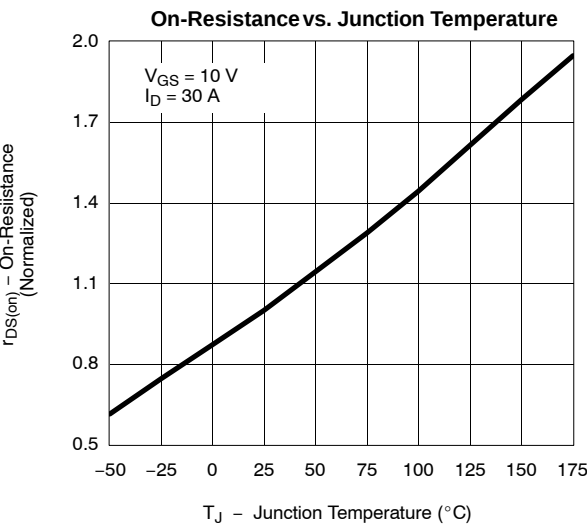


**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**





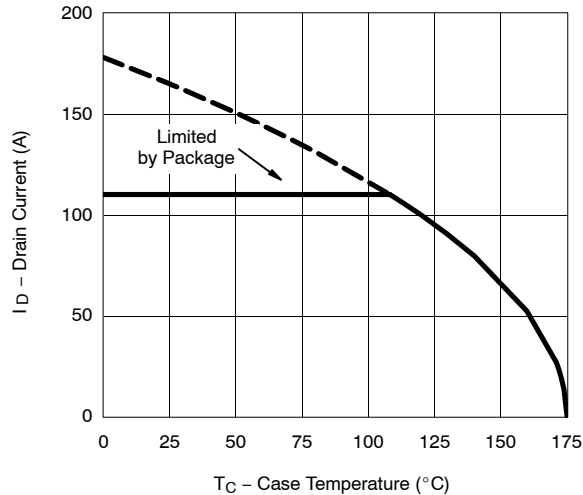
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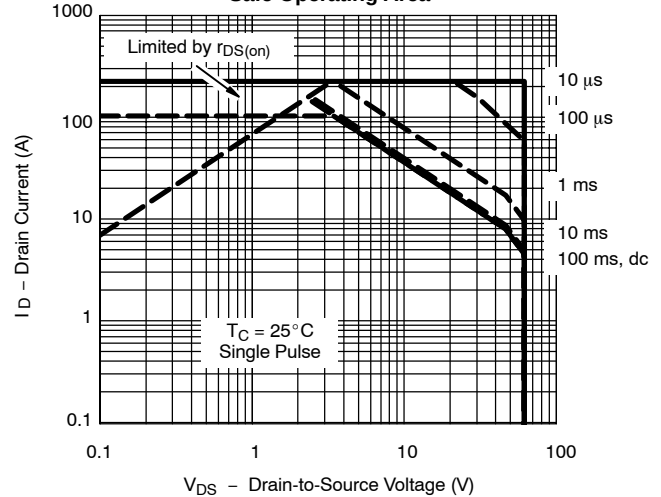


**THERMAL RATINGS**

**Maximum Avalanche and Drain Current vs. Case Temperature**



**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Case**

