

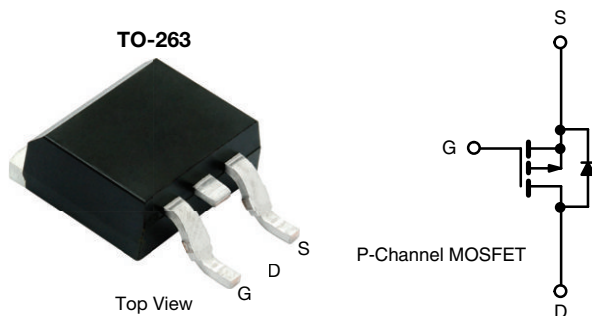
P-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) ^d |
|--------------|-----------------------------|------------------------|
| -60 | 0.0069 at $V_{GS} = -10$ V | -110 |
| | 0.0088 at $V_{GS} = -4.5$ V | |

FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912


RoHS
COMPLIANT


Ordering Information:

SUM110P06-07L-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

| PARAMETER | SYMBOL | LIMIT | UNIT |
|--|----------------|----------------------------|------|
| Drain-Source Voltage | V_{DS} | -60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | |
| Continuous Drain Current ^d ($T_J = 175$ °C) | I_D | $T_C = 25$ °C | A |
| | | $T_C = 125$ °C | |
| Pulsed Drain Current | I_{DM} | -240 | |
| Avalanche Current | I_{AS} | -75 | |
| Single Pulse Avalanche Energy ^a | E_{AS} | 281 | mJ |
| Power Dissipation | P_D | $T_C = 25$ °C ^c | W |
| | | $T_A = 25$ °C ^b | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | °C |

THERMAL RESISTANCE RATINGS

| PARAMETER | SYMBOL | TYPICAL | UNIT |
|---------------------|------------|---------|------|
| Junction-to-Ambient | R_{thJA} | 40 | °C/W |
| Junction-to-Case | R_{thJC} | 0.4 | |

Notes

- Duty cycle ≤ 1 %.
- When mounted on 1" square PCB (FR4 material).
- See SOA curve for voltage derating.
- Limited by package.

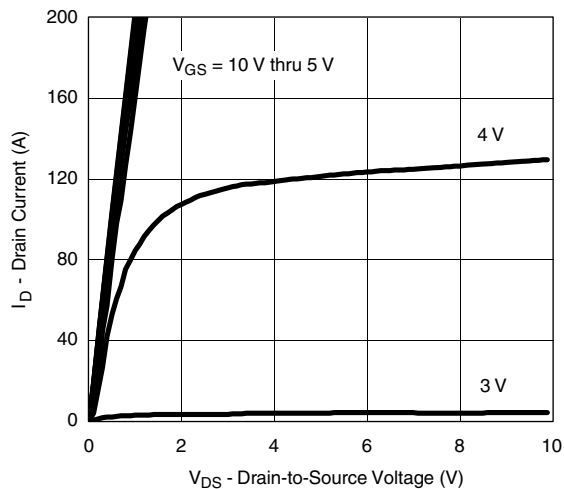
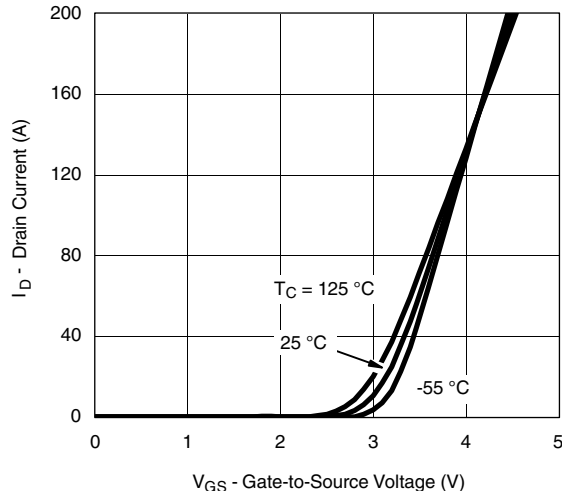
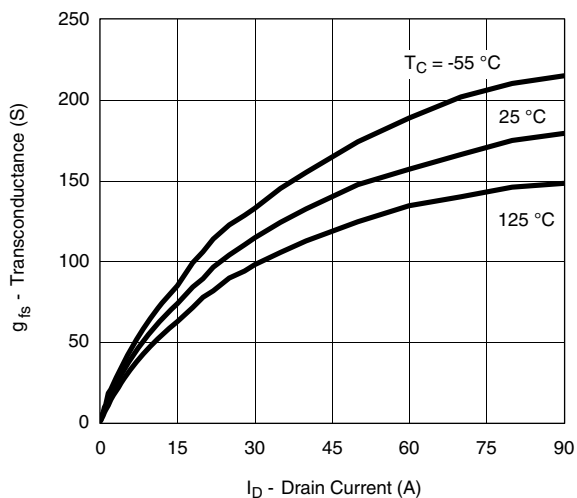
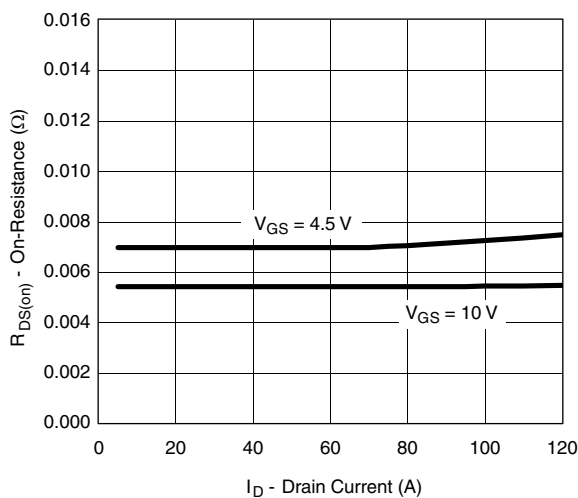
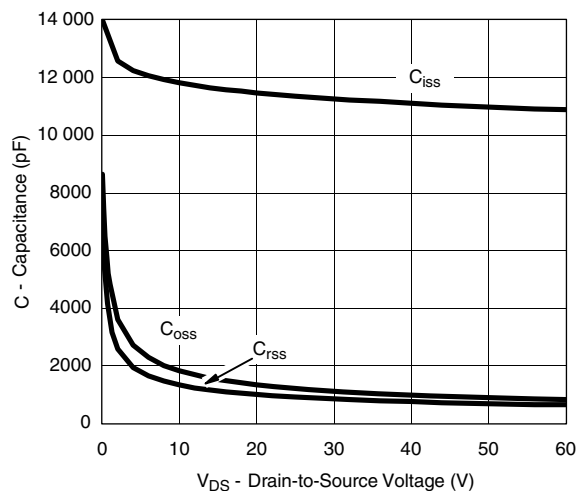
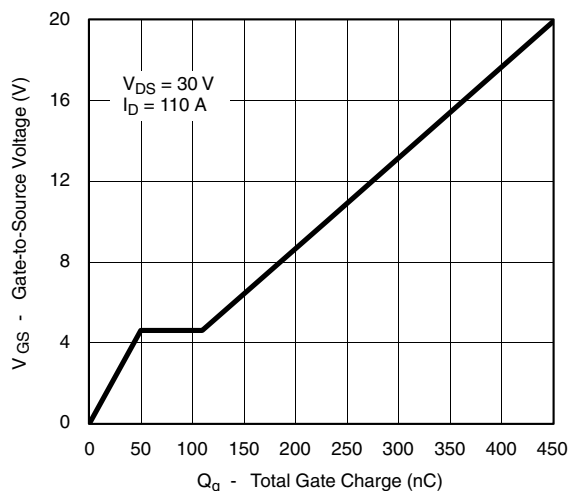


| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | |
|--|----------------------|---|------|--------|--------|------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{DS} | V _{GS} = 0 V, I _D = -250 μA | -60 | - | - | V |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = -250 μA | -1 | - | -3 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = -60 V, V _{GS} = 0 V | - | - | -1 | μA |
| | | V _{DS} = -60 V, V _{GS} = 0 V, T _J = 125 °C | - | - | -50 | |
| | | V _{DS} = -60 V, V _{GS} = 0 V, T _J = 175 °C | - | - | -250 | |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} = -5 V, V _{GS} = -10 V | -120 | - | - | A |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | V _{GS} = -10 V, I _D = -30 A | - | 0.0055 | 0.0069 | Ω |
| | | V _{GS} = -10 V, I _D = -30 A, T _J = 125 °C | - | - | 0.0115 | |
| | | V _{GS} = -10 V, I _D = -30 A, T _J = 175 °C | - | - | 0.0138 | |
| | | V _{GS} = -4.5 V, I _D = -20 A | - | 0.0070 | 0.0088 | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = -15 V, I _D = -50 A | 20 | - | - | S |
| Dynamic ^b | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = -25 V, f = 1 MHz | - | 11 400 | - | pF |
| Output Capacitance | C _{oss} | | - | 1200 | - | |
| Reverse Transfer Capacitance | C _{rss} | | - | 900 | - | |
| Total Gate Charge ^c | Q _g | V _{DS} = -30 V, V _{GS} = -10 V, I _D = -110 A | - | 230 | 345 | nC |
| Gate-Source Charge ^c | Q _{gs} | | - | 50 | - | |
| Gate-Drain Charge ^c | Q _{gd} | | - | 60 | - | |
| Gate Resistance | R _g | f = 1 MHz | - | 3 | - | Ω |
| Turn-On Delay Time ^c | t _{d(on)} | V _{DD} = -30 V, R _L = 0.27 Ω I _D ≡ -110 A, V _{GEN} = -10 V, R _g = 1 Ω | - | 20 | 30 | ns |
| Rise Time ^c | t _r | | - | 25 | 40 | |
| Turn-Off Delay Time ^c | t _{d(off)} | | - | 110 | 200 | |
| Fall Time ^c | t _f | | - | 50 | 100 | |
| Drain-Source Body Diode Characteristics (T _C = 25 °C ^b) | | | | | | |
| Continuous Current | I _S | | - | - | -110 | A |
| Pulsed Current | I _{SM} | | - | - | -240 | |
| Forward Voltage ^a | V _{SD} | I _F = -85 A, V _{GS} = 0 V | - | -1 | -1.5 | V |
| Reverse Recovery Time | t _{rr} | I _F = -85 A, dI/dt = 100 A/μs | - | 91 | 137 | ns |
| Peak Reverse Recovery Charge | I _{RM(REC)} | | - | -6 | -9 | A |
| Reverse Recovery Charge | Q _{rr} | | - | 0.21 | 0.44 | μC |

Notes

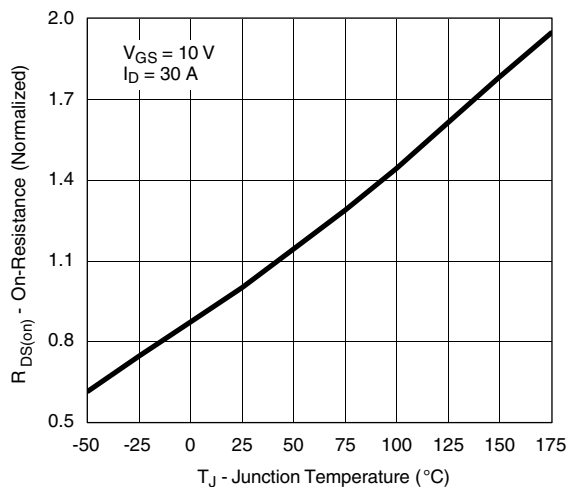
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

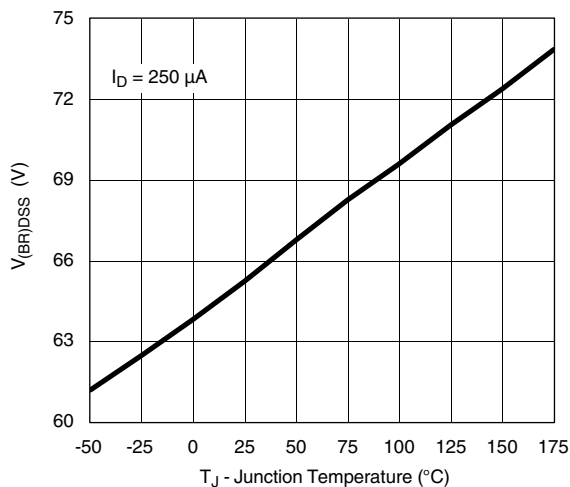
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

Gate Charge



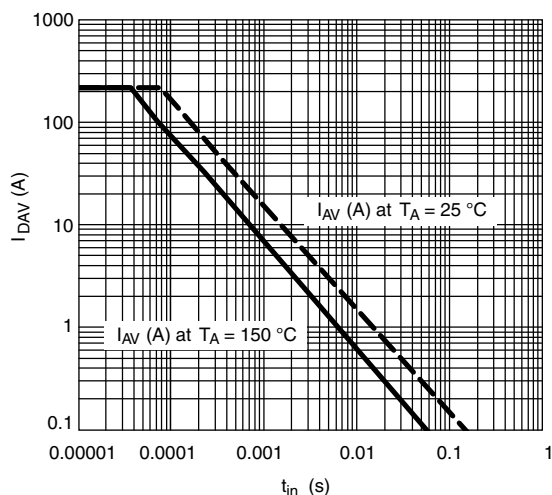
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



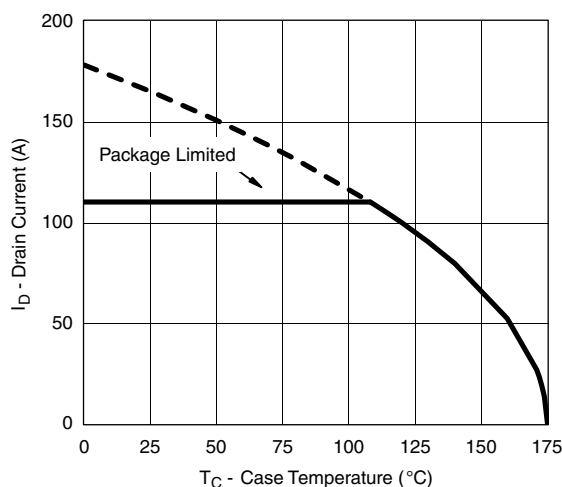
On-Resistance vs. Junction Temperature



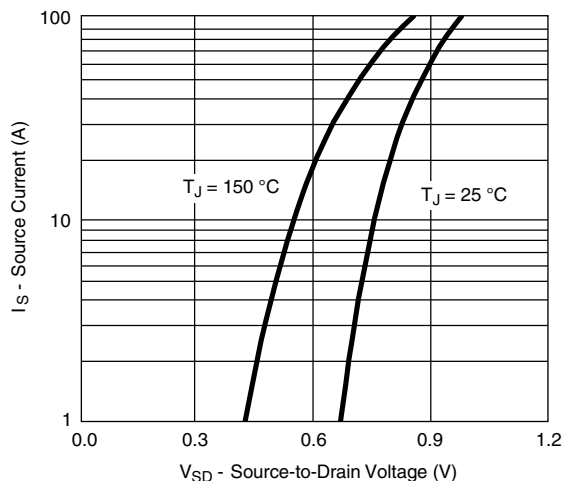
Drain Source Breakdown vs. Junction Temperature



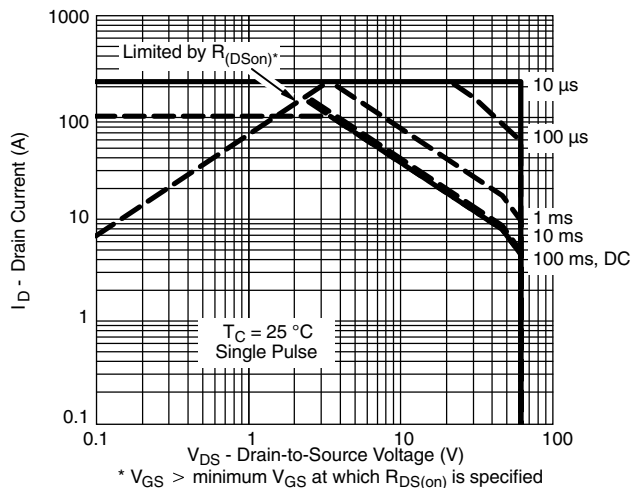
Avalanche Current vs. Time



Maximum Avalanche and Drain Current vs. Case Temperature



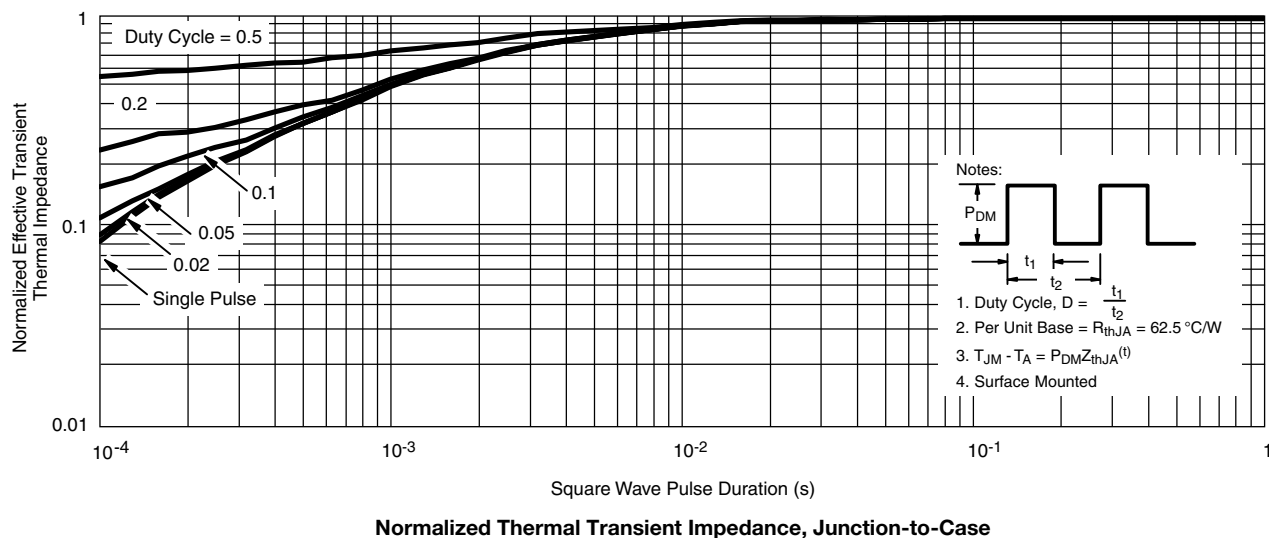
Source-Drain Diode Forward Voltage



Safe Operating Area



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?72439.

TO-263 (D²PAK): 3-LEAD





DETAIL A (ROTATED 90°)



SECTION A-A

Notes

- Plane B includes maximum features of heat sink tab and plastic.
- No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- Pin-to-pin coplanarity max. 4 mils.
- *: Thin lead is for SUB, SYB.
Thick lead is for SUM, SYM, SQM.
- Use inches as the primary measurement.
-  This feature is for thick lead.

| DIM. | | INCHES | | MILLIMETERS | |
|--|------------|-----------|-------|-------------|--------|
| | | MIN. | MAX. | MIN. | MAX. |
| A | | 0.160 | 0.190 | 4.064 | 4.826 |
| b | | 0.020 | 0.039 | 0.508 | 0.990 |
| b1 | | 0.020 | 0.035 | 0.508 | 0.889 |
| b2 | | 0.045 | 0.055 | 1.143 | 1.397 |
| c* | Thin lead | 0.013 | 0.018 | 0.330 | 0.457 |
| | Thick lead | 0.023 | 0.028 | 0.584 | 0.711 |
| c1 | Thin lead | 0.013 | 0.017 | 0.330 | 0.431 |
| | Thick lead | 0.023 | 0.027 | 0.584 | 0.685 |
| c2 | | 0.045 | 0.055 | 1.143 | 1.397 |
| D | | 0.340 | 0.380 | 8.636 | 9.652 |
| D1 | | 0.220 | 0.240 | 5.588 | 6.096 |
| D2 | | 0.038 | 0.042 | 0.965 | 1.067 |
| D3 | | 0.045 | 0.055 | 1.143 | 1.397 |
| D4 | | 0.044 | 0.052 | 1.118 | 1.321 |
| E | | 0.380 | 0.410 | 9.652 | 10.414 |
| E1 | | 0.245 | - | 6.223 | - |
| E2 | | 0.355 | 0.375 | 9.017 | 9.525 |
|  E3 | | 0.072 | 0.078 | 1.829 | 1.981 |
| e | | 0.100 BSC | | 2.54 BSC | |
| K | | 0.045 | 0.055 | 1.143 | 1.397 |
| L | | 0.575 | 0.625 | 14.605 | 15.875 |
| L1 | | 0.090 | 0.110 | 2.286 | 2.794 |
| L2 | | 0.040 | 0.055 | 1.016 | 1.397 |
| L3 | | 0.050 | 0.070 | 1.270 | 1.778 |
| L4 | | 0.010 BSC | | 0.254 BSC | |
| M | | - | 0.002 | - | 0.050 |
| ECN: T13-0707-Rev. K, 30-Sep-13 | | | | | |
| DWG: 5843 | | | | | |

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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