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

TO-263

Top View

P-Channel MOSFET
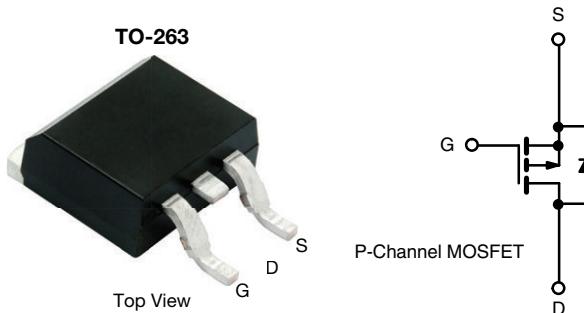
Ordering Information:
SUM110P06-07L-E3 (Lead (Pb)-free)

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)	T_C = 25 °C	I_D	-110	A
	T_C = 125 °C		-95	
Pulsed Drain Current		I_{DM}	-240	
Avalanche Current	L = 0.1 mH	I_{AS}	-75	
Single Pulse Avalanche Energy [a]		E_{AS}	281	mJ
Power Dissipation	T_C = 25 °C [c]	P_D	375	W
	T_A = 25 °C [b]		3.75	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	UNIT
Junction-to-Ambient	PCB mount [b]	R_{thJA}	40	°C/W
Junction-to-Case		R_{thJC}	0.4	

Notes
a. Duty cycle ≤ 1 %.
b. When mounted on 1" square PCB (FR4 material).
c. See SOA curve for voltage derating.
d. 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 ≤ 300 µs, duty cycle ≤ 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)
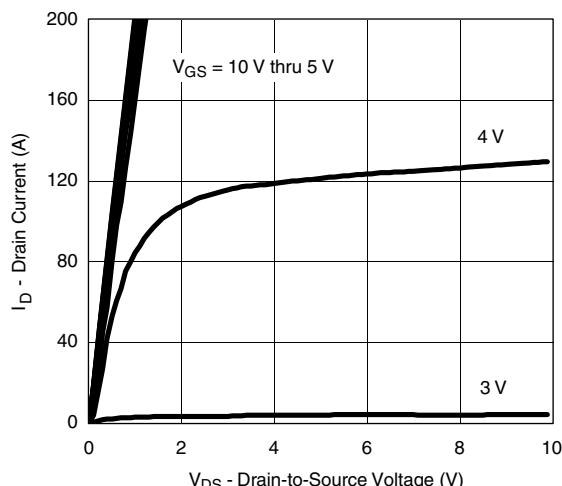

**Output Characteristics**
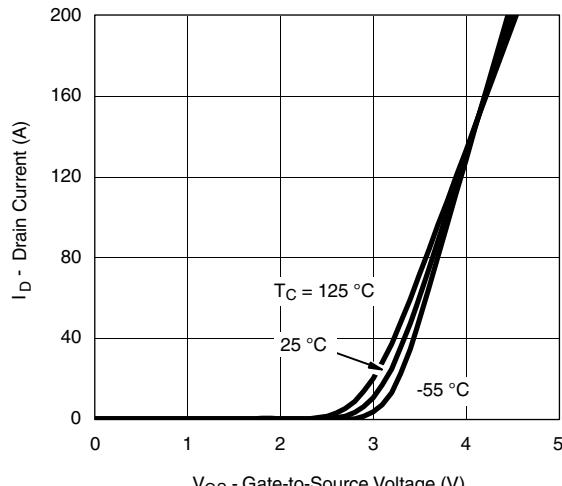
Transfer Characteristics
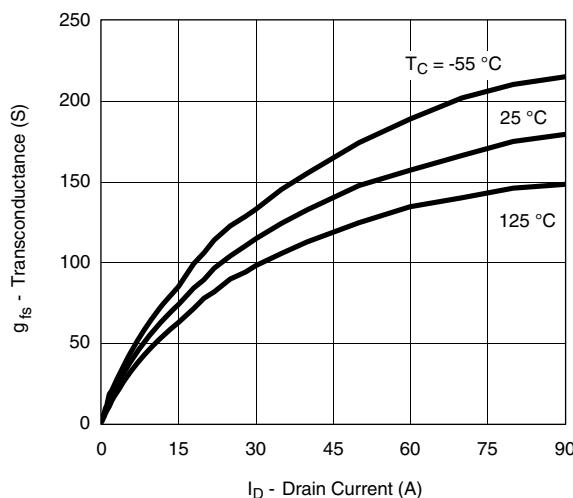

Transconductance
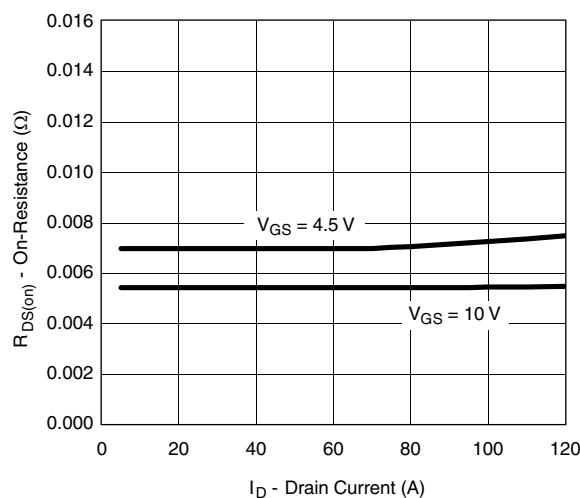

On-Resistance vs. Drain Current
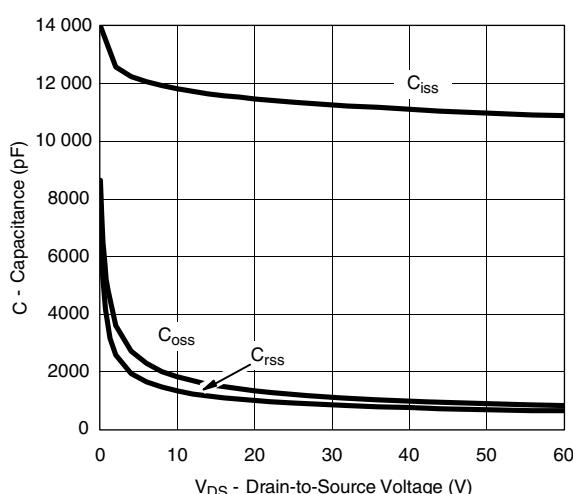

Capacitance
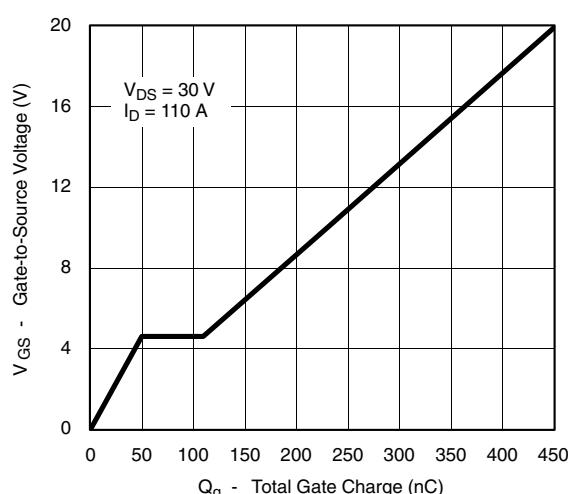
Gate Charge

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

$V_{GS} = 10$ V
$I_D = 30$ A
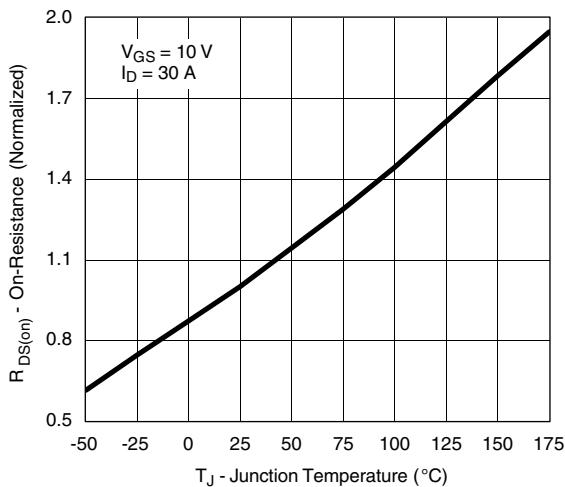
On-Resistance vs. Junction Temperature

$I_D = 250$ µA
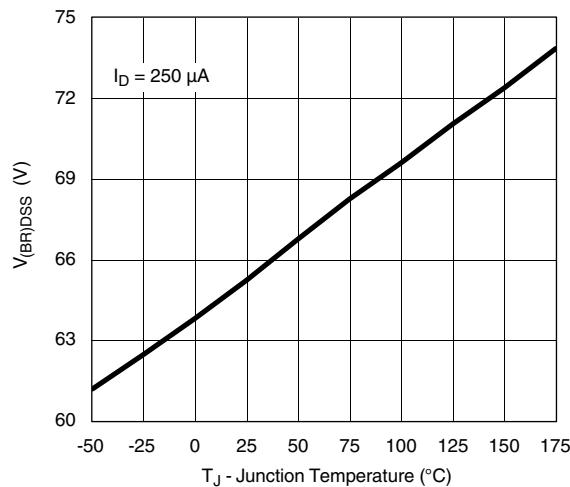
Drain Source Breakdown vs. Junction Temperature

I_{AV} (A) at $T_A = 25$ °C

I_{AV} (A) at $T_A = 150$ °C
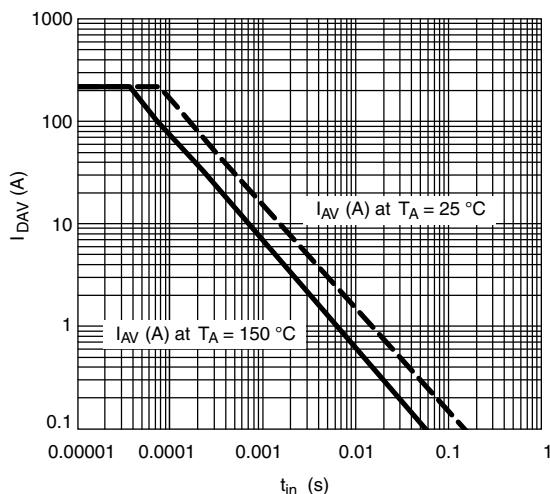
Avalanche Current vs. Time

Package Limited
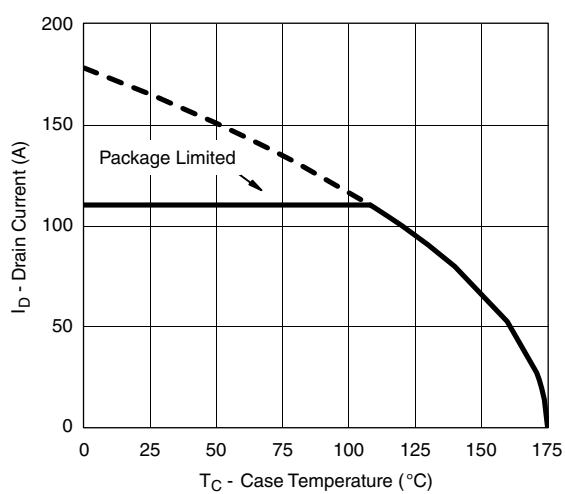
Maximum Avalanche and Drain Current vs. Case Temperature

$T_J = 150$ °C

$T_J = 25$ °C
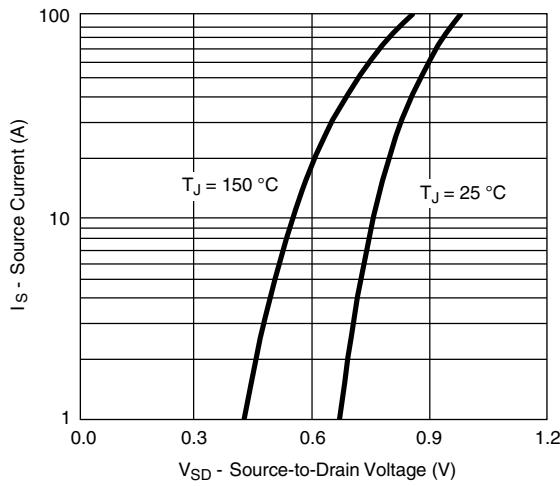
Source-Drain Diode Forward Voltage
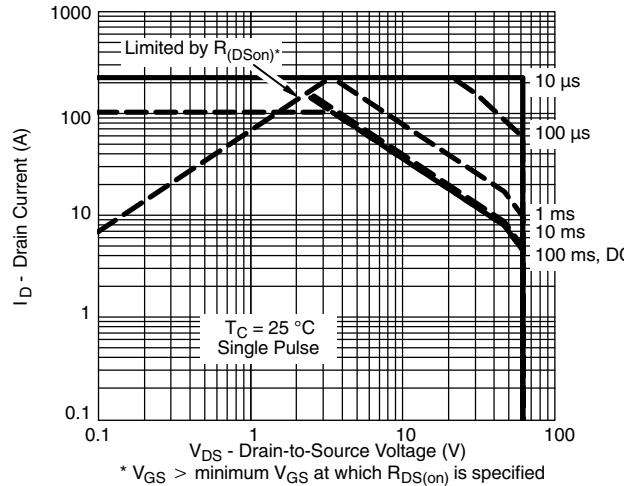
Limited by $R_{(DSon)}$*

10 µs
100 µs
1 ms
10 ms
100 ms, DC

$T_C = 25$ °C
Single Pulse

* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

For technical questions, contact: pmostechsupport@vishay.com

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Notes:
1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 62.5 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

Square Wave Pulse Duration (s)

Normalized Thermal Transient Impedance, Junction-to-Case

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TO-263 (D^{2}PAK): 3-LEAD
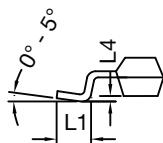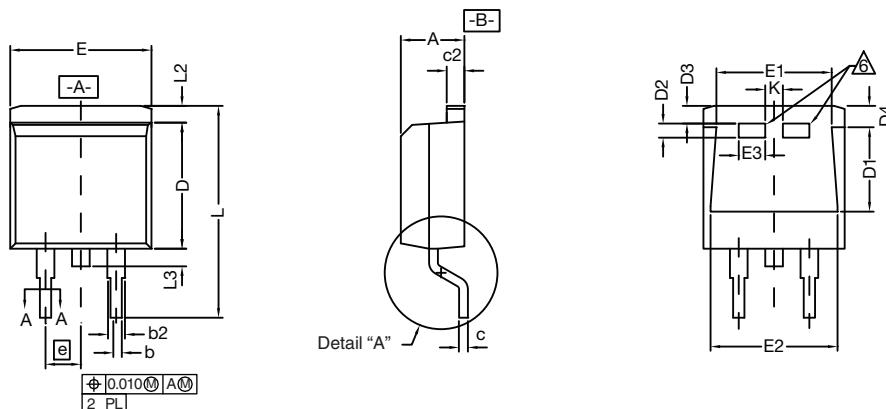
DETAIL A (ROTATED 90°)

SECTION A-A

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

**Notes**

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

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

0.420
(10.668)

0.355
(9.017)

0.635
(16.129)

0.145
(3.683)

0.135
(3.429)

0.200
(5.080)

0.050
(1.257)
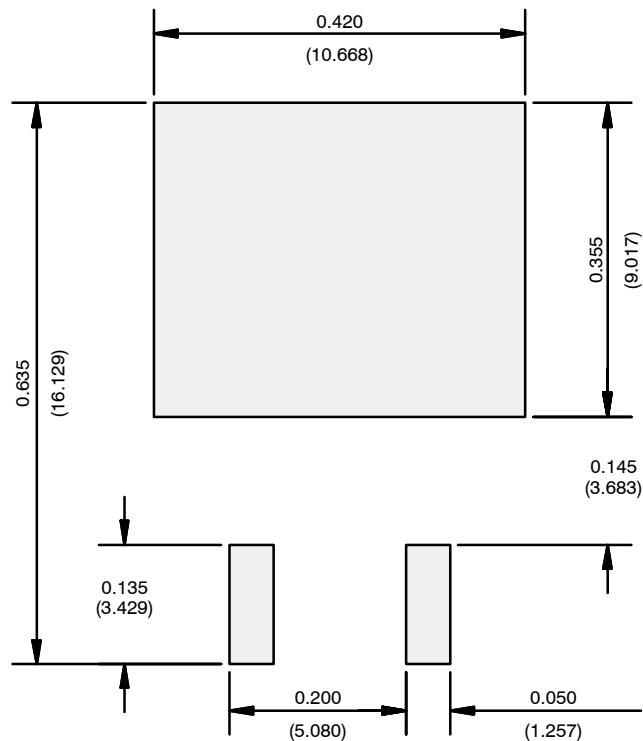
Recommended Minimum Pads
Dimensions in Inches/(mm)

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