

P-Channel 100 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω) Max.	I_D (A) ^c	Q_g (Typ.)
- 100	0.138 at $V_{GS} = - 10$ V	- 16.3	24 nC
	0.141 at $V_{GS} = - 7.5$ V	- 16.1	
	0.142 at $V_{GS} = - 6$ V	- 16.1	

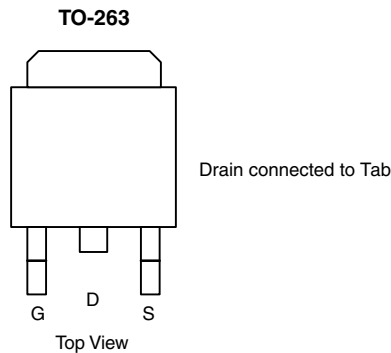
FEATURES

- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912

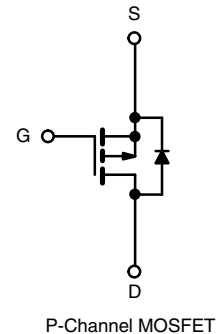


APPLICATIONS

- DC/DC Converters
- Motor Control



Ordering Information:
SUM25P10-138-E3 (Lead (Pb)-free)



ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	- 100	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	- 16.7
		$T_C = 125$ °C	- 9.6
Pulsed Drain Current ($t = 100$ μ s)	I_{DM}	- 40	A
Avalanche Current	I_{AS}	L = 0.1 mH	- 25
Single Pulse Avalanche Energy ^a			E_{AS}
Power Dissipation	P_D	$T_C = 25$ °C	88.2 ^b
		$T_A = 25$ °C	3.75
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient Free Air	R_{thJA}	40	°C/W
Junction-to-Case	R_{thJC}	1.7	

Notes:

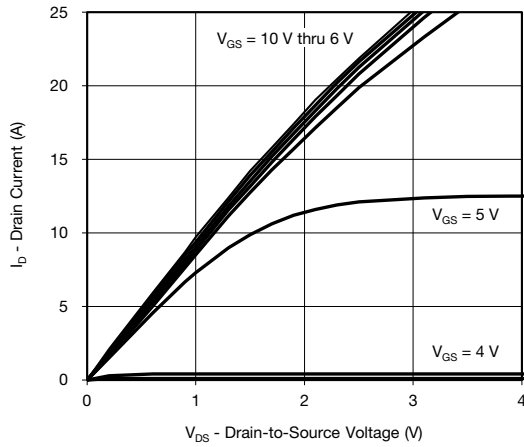
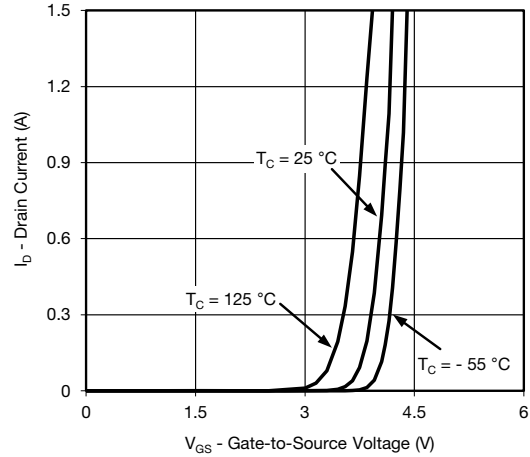
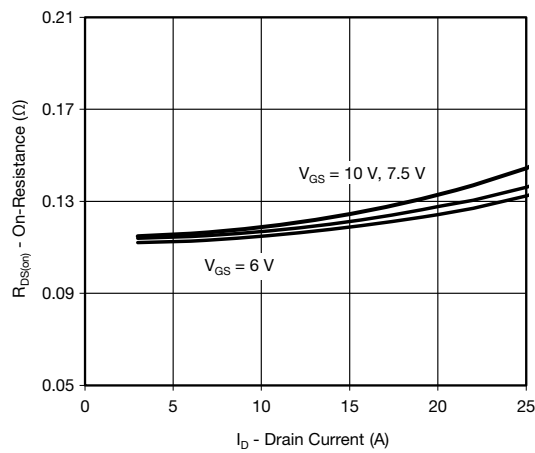
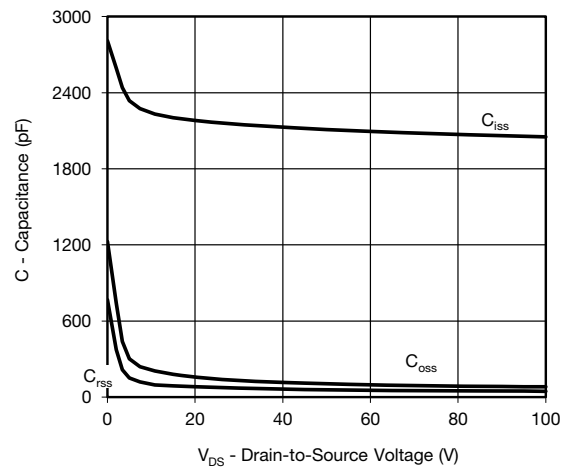
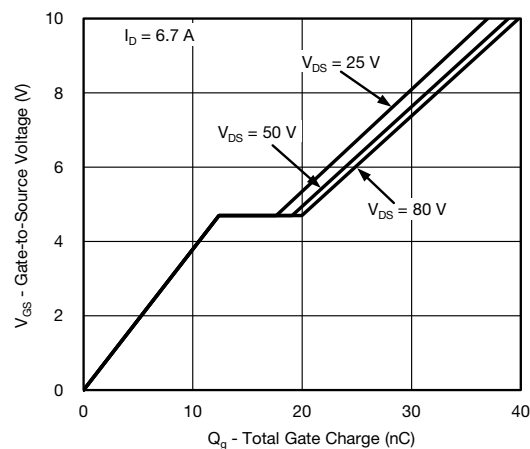
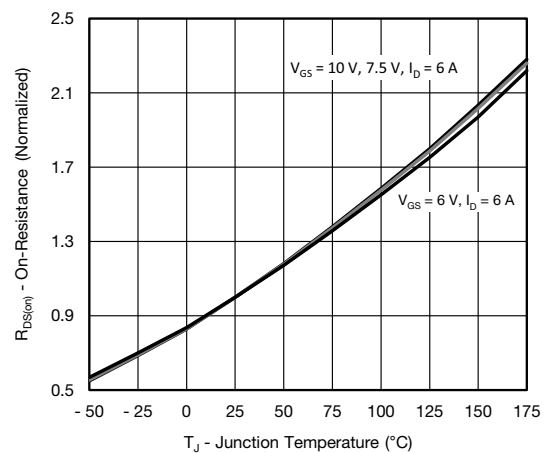
- Duty cycle ≤ 1 %.
- See SOA curve for voltage derating.
- $T_C = 25$ °C

SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-2		-4	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-105		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = -250\text{ }\mu\text{A}$		6.6		
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			-50	
		$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$			-200	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -10\text{ V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -6\text{ A}$		0.115	0.138	Ω
		$V_{GS} = -7.5\text{ V}, I_D = -6\text{ A}$		0.117	0.141	
		$V_{GS} = -6\text{ V}, I_D = -6\text{ A}$		0.118	0.142	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}, I_D = -6\text{ A}$		18		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = -50\text{ V}, f = 1\text{ MHz}$		2110		μF
Output Capacitance	C_{oss}		105			
Reverse Transfer Capacitance	C_{rss}		58			
Total Gate Charge ^c	Q_g	$V_{DS} = -50\text{ V}, V_{GS} = -10\text{ V}, I_D = -6.7\text{ A}$		40	60	nC
		$V_{DS} = -50\text{ V}, V_{GS} = -6\text{ V}, I_D = -6.7\text{ A}$		24	36	
Gate-Source Charge ^c	Q_{gs}	$V_{DS} = -50\text{ V}, V_{GS} = -6\text{ V}, I_D = -6.7\text{ A}$		12.5		
Gate-Drain Charge ^c	Q_{gd}	$V_{DS} = -50\text{ V}, V_{GS} = -6\text{ V}, I_D = -6.7\text{ A}$		6.7		
Gate Resistance	R_g	$f = 1\text{ MHz}$	2	8	16	Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = -50\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		7	14	ns
Rise Time ^c	t_r		12	20		
Turn-Off Delay Time ^c	$t_{d(off)}$		46	70		
Fall Time ^c	t_f		40	60		
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = -50\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		12	20	
Rise Time ^c	t_r		105	160		
Turn-Off Delay Time ^c	$t_{d(off)}$		36	54		
Fall Time ^c	t_f		34	51		
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^\circ\text{C}^b$						
Continuous Current	I_S				-16.3	A
Pulsed Current ($t = 100\text{ }\mu\text{s}$)	I_{SM}				-40	
Forward Voltage ^a	V_{SD}	$I_F = -5\text{ A}, V_{GS} = 0\text{ V}$		-0.85	-1.5	V
Reverse Recovery Time	t_{rr}	$I_F = -5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		70	105	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$		-7	-14	A	
Reverse Recovery Charge	Q_{rr}			220	330	nC

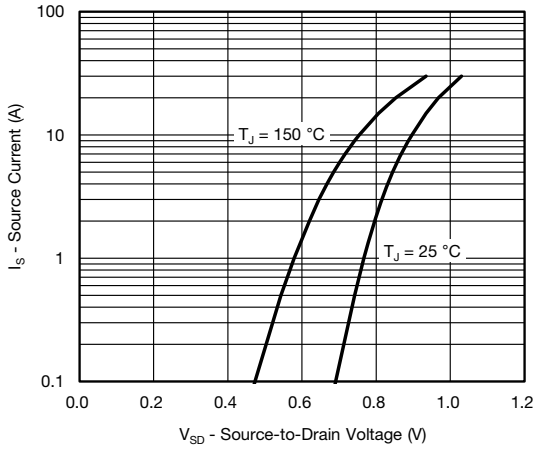
Notes:

- 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.

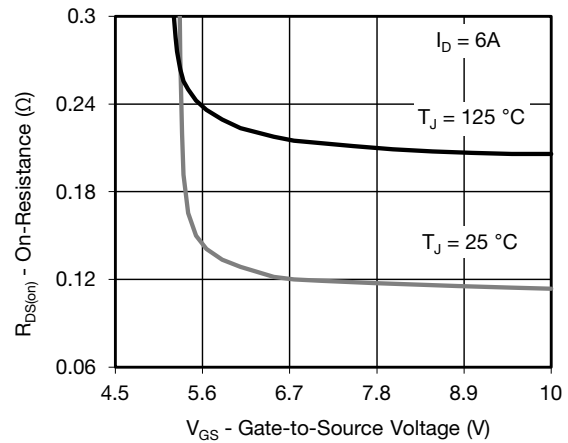
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

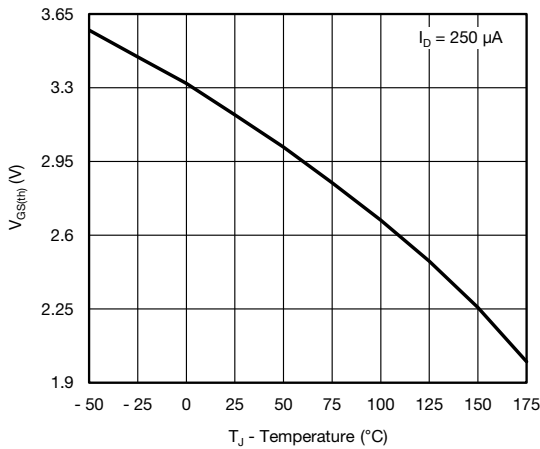
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



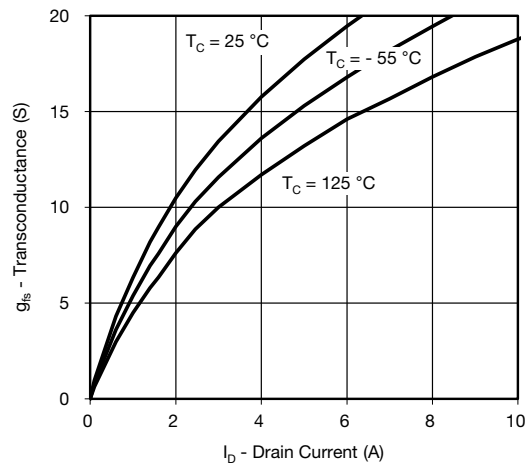
Source-Drain Diode Forward Voltage



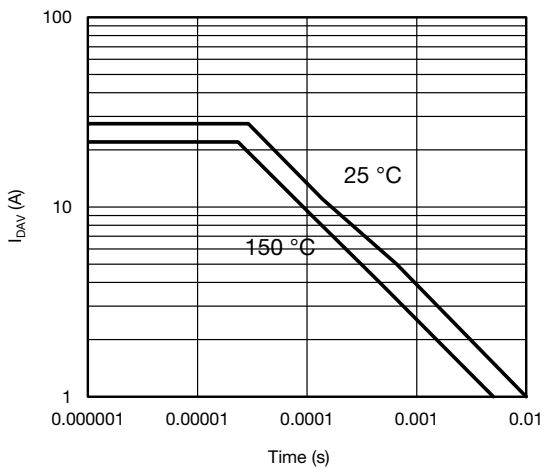
On-Resistance vs. Gate-to-Source Voltage



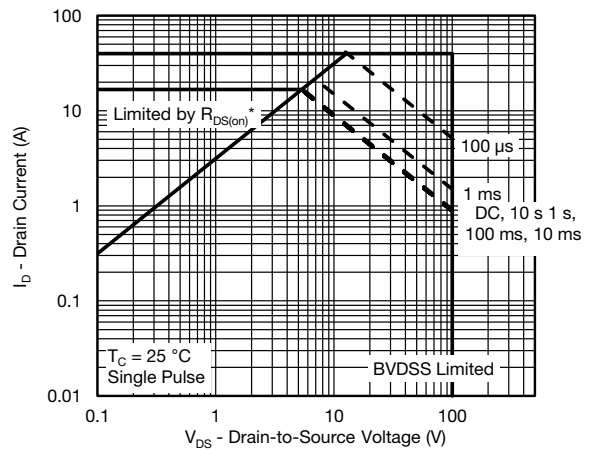
Threshold Voltage



Transconductance



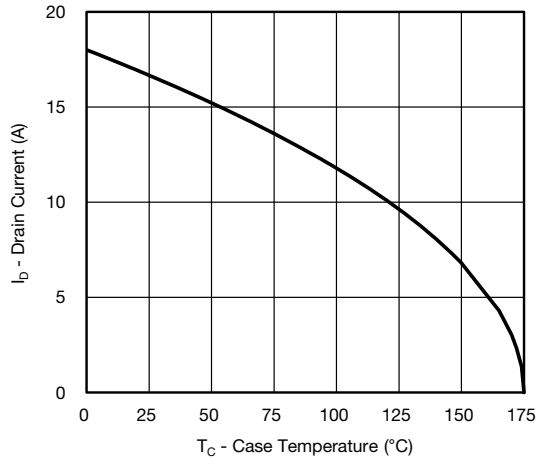
Single Pulse Avalanche Capability



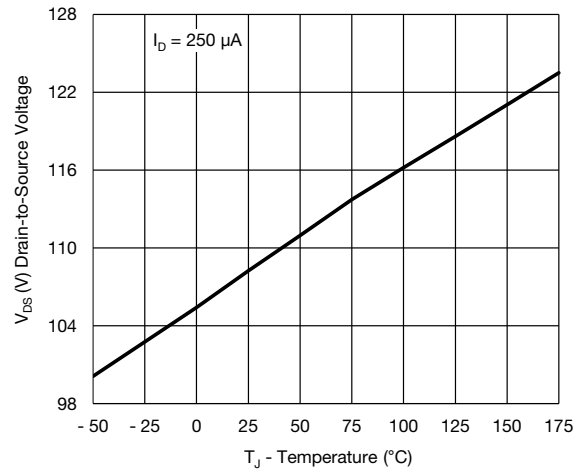
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

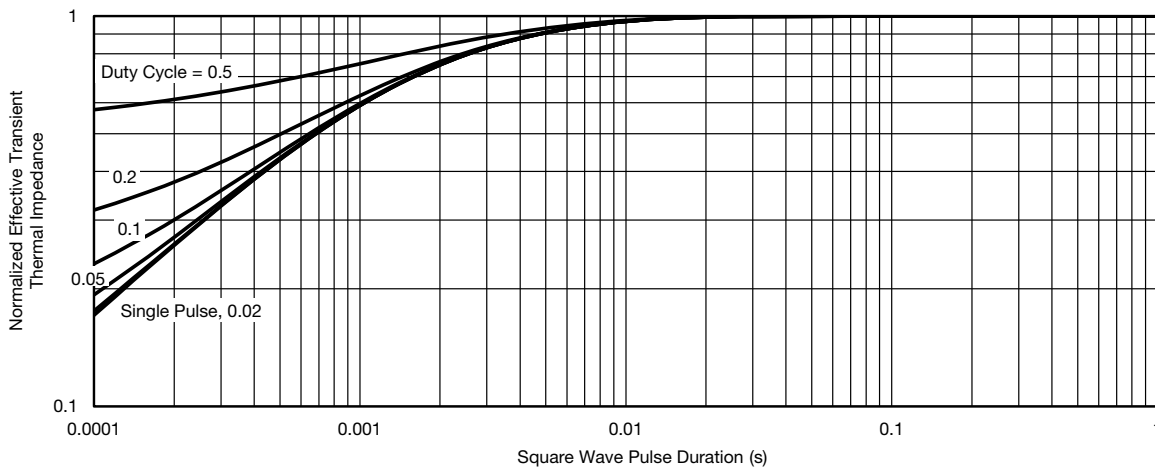


Current Derating*



Drain Source Breakdown vs. Junction Temperature

* The power dissipation P_D is based on T_{J(max.)} = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



Normalized Thermal Transient Impedance, Junction-to-Case

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TO-263 (D²PAK): 3-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					

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.

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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