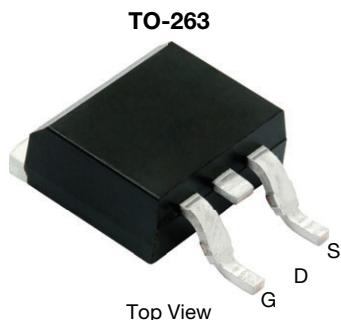


N-Channel 60 V (D-S) MOSFET



FEATURES

- TrenchFET® Gen IV power MOSFET
- Maximum 175 °C junction temperature
- Very low Q_{gd} reduces power loss from passing through $V_{plateau}$
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Power supply
- Secondary synchronous rectification
- DC/DC converter
- Power tools
- Motor drive switch
- DC/AC inverter
- Battery management
- OR-ing / e-fuse



N-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	60
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.00173
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.0023
Q_g typ. (nC)	192
I_D (A) ^d	150
Configuration	Single

ORDERING INFORMATION

Package	D ² PAK (TO-263)
Lead (Pb)-free and halogen-free	SUM50010EL-GE3

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	V
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	150 ^d
		$T_C = 70$ °C	150 ^d
Pulsed drain current ($t = 100$ μ s)	I_{DM}	500	A
Avalanche current	I_{AS}	60	A
Single avalanche energy ^a	E_{AS}	180	mJ
Maximum power dissipation ^a	P_D	$T_C = 25$ °C	375 ^b
		$T_C = 125$ °C	125 ^b
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-ambient (PCB mount) ^c	R_{thJA}	40	°C/W
Junction-to-case (drain)	R_{thJC}	0.4	°C/W

Notes

- Duty cycle ≤ 1 %
- See SOA curve for voltage derating
- When mounted on 1" square PCB (FR4 material)
- Package limited

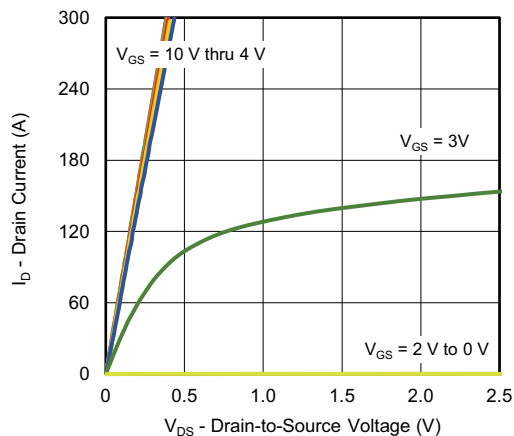
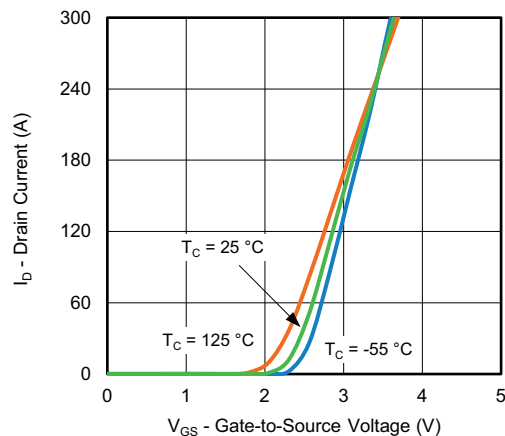
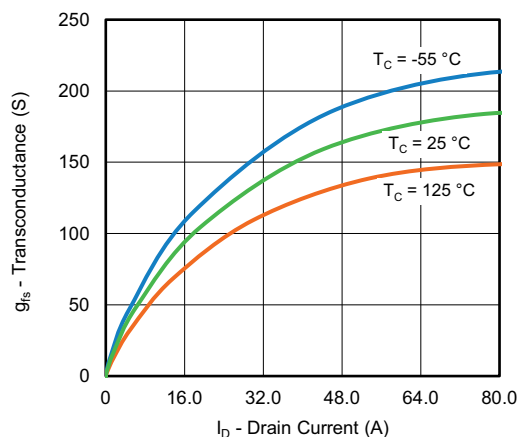
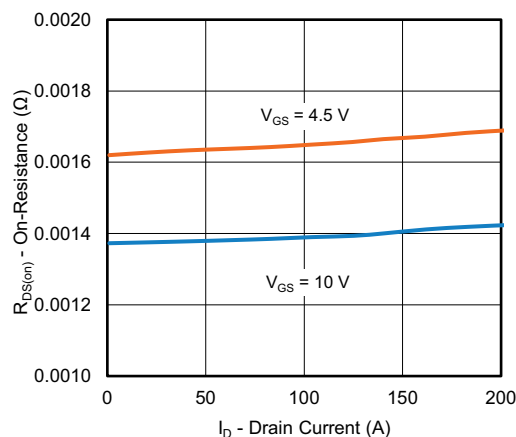
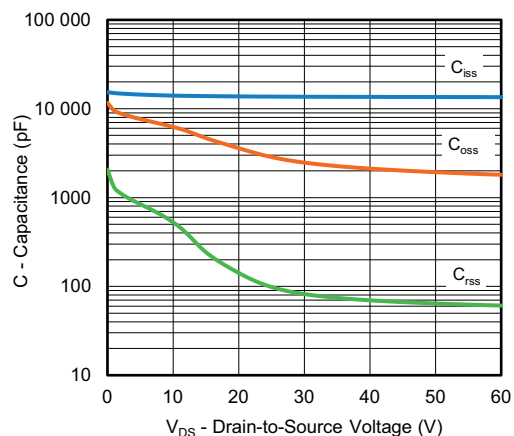
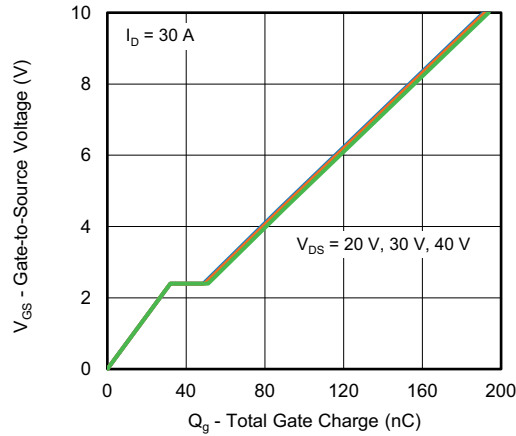


SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 1 mA	60	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1	-	2.5	
Gate-body leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	± 250	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	-	-	150	
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 175 °C	-	-	5	mA
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 30 A	-	0.00138	0.00173	Ω
		V _{GS} = 4.5 V, I _D = 20 A	-	0.00165	0.0023	
Forward transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 30 A	-	140	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 30 V, f = 1 MHz	-	13 646	-	pF
Output capacitance	C _{oss}		-	2474	-	
Reverse transfer capacitance	C _{rss}		-	82	-	
Total gate charge ^c	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 30 A	-	192	288	nC
Gate-source charge ^c	Q _{gs}		-	32	-	
Gate-drain charge ^c	Q _{gd}		-	17.5	-	
Output charge	Q _{oss}	V _{DS} = 30 V, V _{GS} = 0 V	-	156	235	
Gate resistance	R _g	f = 1 MHz	0.4	0.9	1.6	Ω
Turn-on delay time ^c	t _{d(on)}	V _{DD} = 30 V, R _L = 3 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	-	19	38	ns
Rise time ^c	t _r		-	11	22	
Turn-off delay time ^c	t _{d(off)}		-	68	130	
Fall time ^c	t _f		-	14	28	
Drain-Source Body Diode Ratings and Characteristics ^b (T _C = 25 °C)						
Pulsed current (t = 100 μs)	I _{SM}		-	-	250	A
Forward voltage ^a	V _{SD}	I _F = 10 A, V _{GS} = 0 V	-	0.74	1.5	V
Reverse recovery time	t _{rr}	I _F = 34 A, di/dt = 100 A/μs	-	81	160	ns
Peak reverse recovery charge	I _{RM(REC)}		-	3.5	7	A
Reverse recovery charge	Q _{rr}		-	0.16	0.32	μC
Reverse recovery fall time	t _a		-	48	-	ns
Reverse recovery rise time	t _b		-	33	-	

Notes

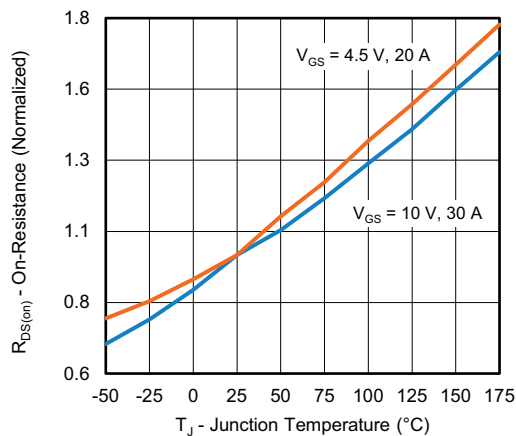
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

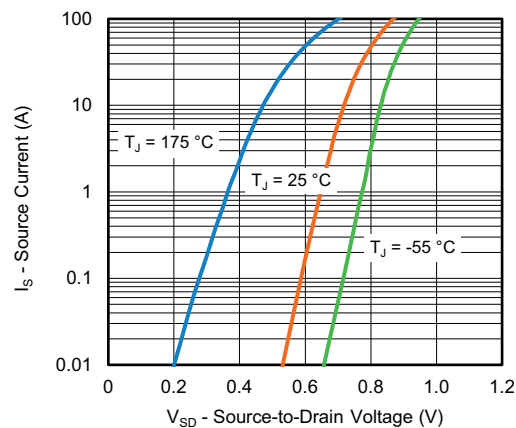
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

Gate Charge



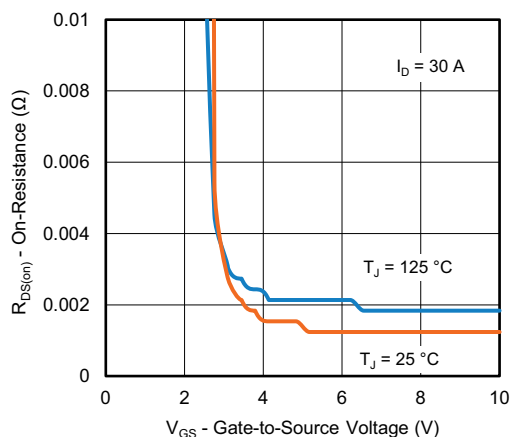
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



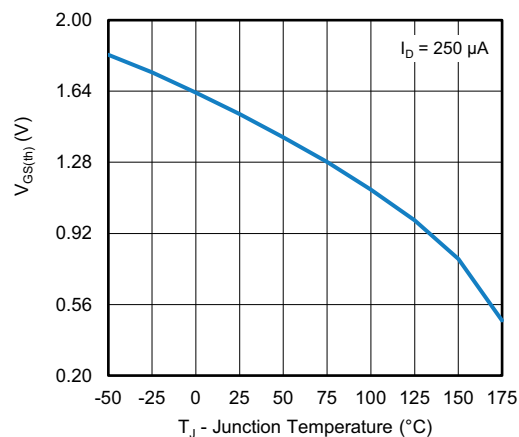
On-Resistance vs. Junction Temperature



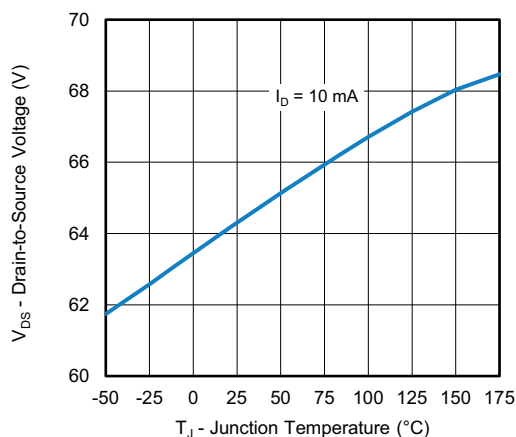
Source Drain Diode Forward Voltage



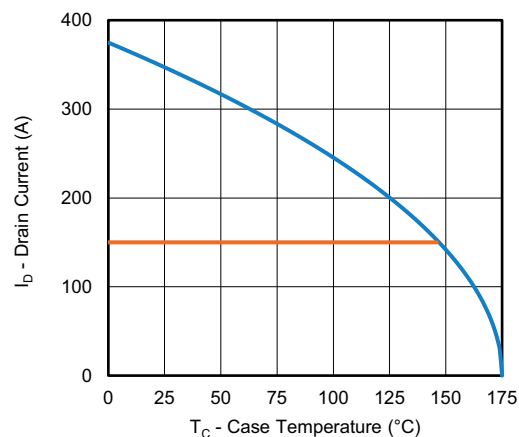
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



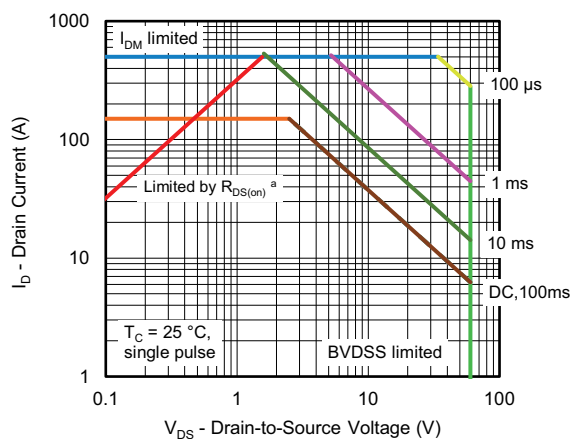
Drain Source Breakdown vs. Junction Temperature



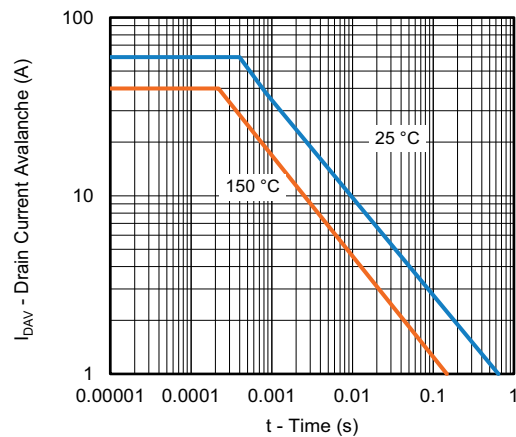
Current Derating



THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



Safe Operating Area



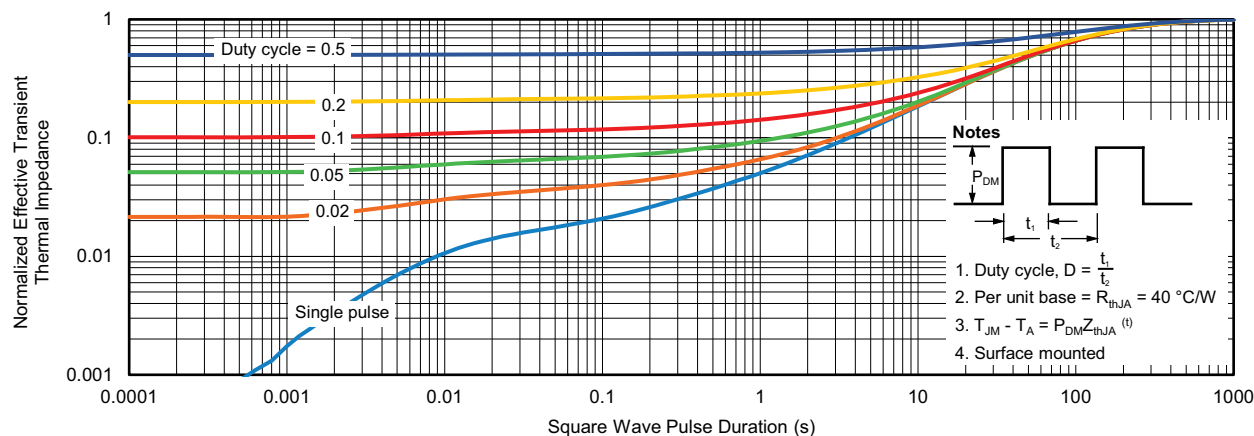
Avalanche Current vs. Time

Note

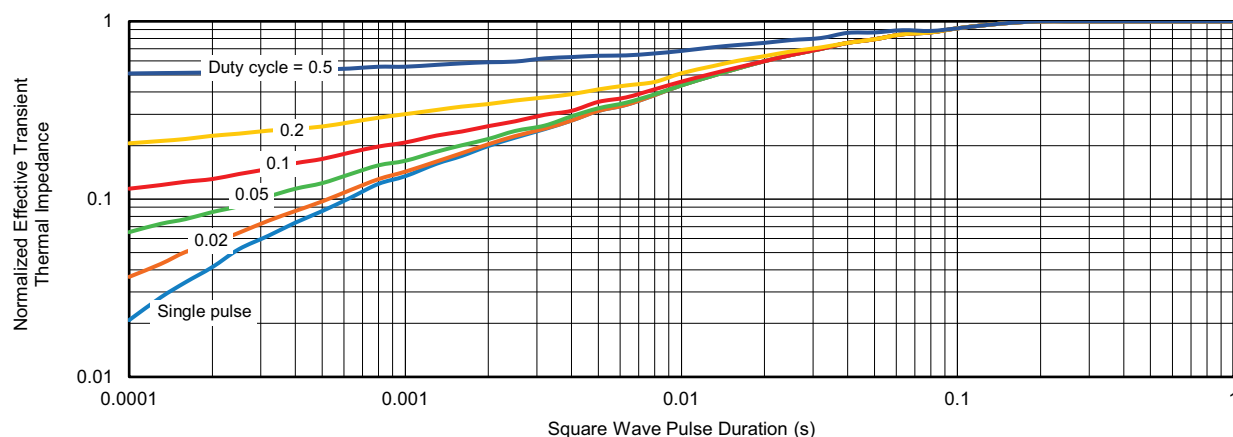
- a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



THERMAL RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Case ($25\text{ }^{\circ}\text{C}$)
- are given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

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