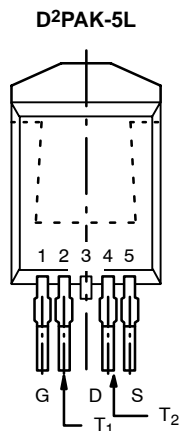




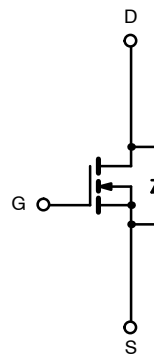
N-Channel 40-V (D-S) MOSFET with Sensing Diode

PRODUCT SUMMARY

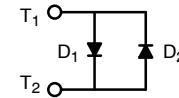
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
40	0.0045 @ $V_{GS} = 10$ V	60 ^a
	0.0065 @ $V_{GS} = 4.5$ V	20 ^a



Ordering Information: SUM60N04-05LT



N-Channel MOSFET



FEATURES

- TrenchFET® Power MOSFETS Plus Temperature Sensing Diode
- 175°C Junction Temperature
- New Low Thermal Resistance Package

APPLICATIONS

- Automotive
- Industrial

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 175^\circ\text{C}$) ^d	I_D	$T_C = 25^\circ\text{C}$	60 ^a
		$T_C = 100^\circ\text{C}$	60 ^a
Pulsed Drain Current	I_{DM}	250	A
Continuous Diode Current (Diode Conduction) ^d	I_S	60 ^a	
Avalanche Current	I_{AR}	60 ^a	
Repetitive Avalanche Energy ^b	E_{AR}	180	mJ
Maximum Power Dissipation ^a	P_D	$T_C = 25^\circ\text{C}$	200 ^c
		$T_A = 25^\circ\text{C}$	3.75 ^d
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 ^d	R_{thJA}	40	$^\circ\text{C}/\text{W}$
Junction-to-Case	R_{thJC}	0.75	

Notes

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

SUM60N04-05LT



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MOSFET SPECIFICATIONS (T _J = 25°C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	40			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _{DS} = 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} = 40 V, V _{GS} = 0 V			1	μA
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 125°C			50	
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 175°C			500	
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 = 60 A		0.0035	0.0045	Ω
		V _{GS} = 4.5 V, I _D = 20 A		0.0051	0.0065	
		V _{GS} = 10 V, I _D = 60 A, T _J = 125°C			0.0069	
		V _{GS} = 10 V, I _D = 60 A, T _J = 175°C			0.0086	
Sense Diode Forward Voltage	V _{FD1} and V _{FD2}	I _F = 50 μA	655		715	mV
		I _F = 25 μA	600		660	
Sense Diode Forward Voltage Increase	ΔV _F	From I _F = 25 μA to I _F = 50 μA	30		80	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 20 A		35		S
Dynamic^b						
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1 MHz		6000		pF
Output Capacitance	C _{oss}			1100		
Reverse Transfer Capacitance	C _{rss}			700		
Total Gate Charge ^c	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 25 A		130		nC
Gate-Source Charge ^c	Q _{gs}			25		
Gate-Drain Charge ^c	Q _{gd}			40		
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 20 V, R _L = 0.8 Ω I _D = 25 A, V _{GEN} = 10 V, R _g = 2.5 Ω		15	20	ns
Rise Time ^c	t _r			80	120	
Turn-Off Delay Time ^c	t _{d(off)}			100	150	
Fall Time ^c	t _f			100	150	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)^b						
Continuous Current	I _s				60	A
Pulsed Current	I _{SM}				200	
Forward Voltage ^a	V _{SD}	I _F = 60 A, V _{GS} = 0 V		1.0	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 60 A, di/dt = 100 A/μs		60	90	ns
Peak Reverse Recovery Current	I _{RM(REC)}			2.1	4	A
Reverse Recovery Charge	Q _{rr}			0.065	0.18	μC

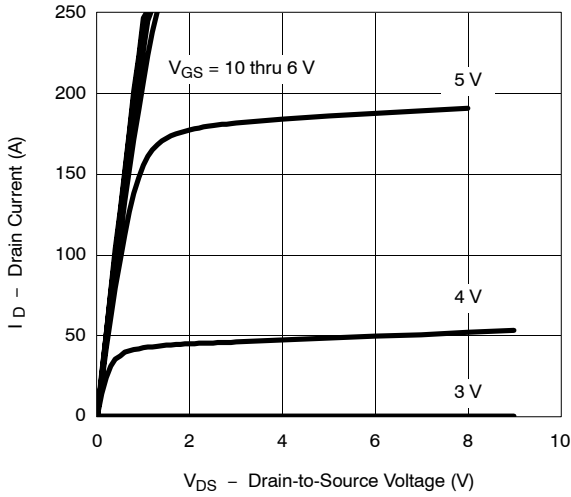
Notes:

- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

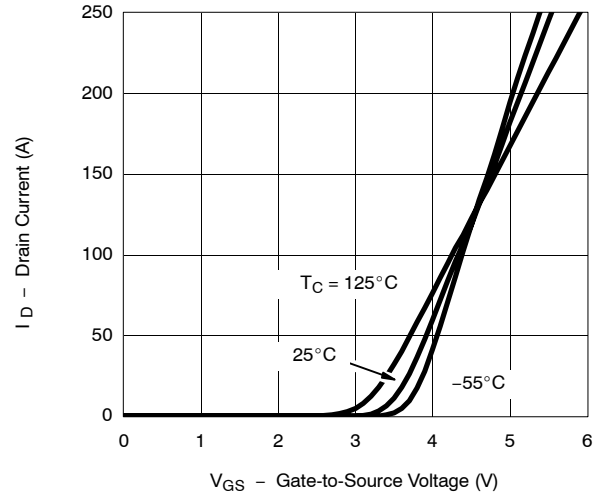


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

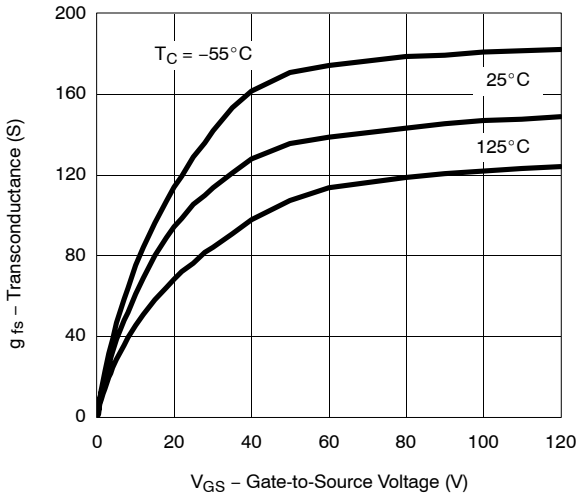
Output Characteristics



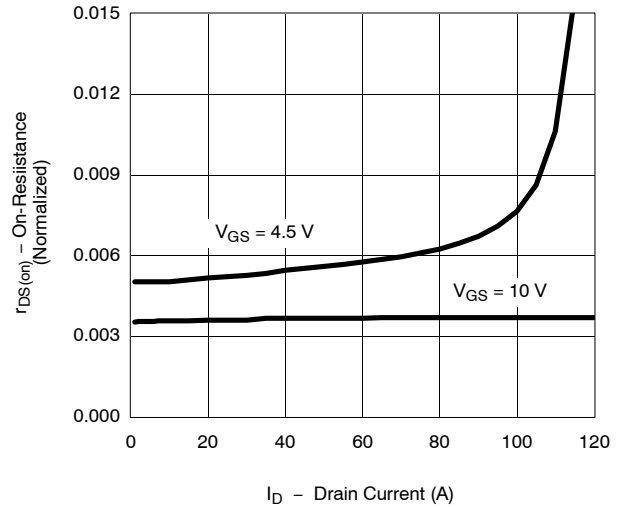
Transfer Characteristics



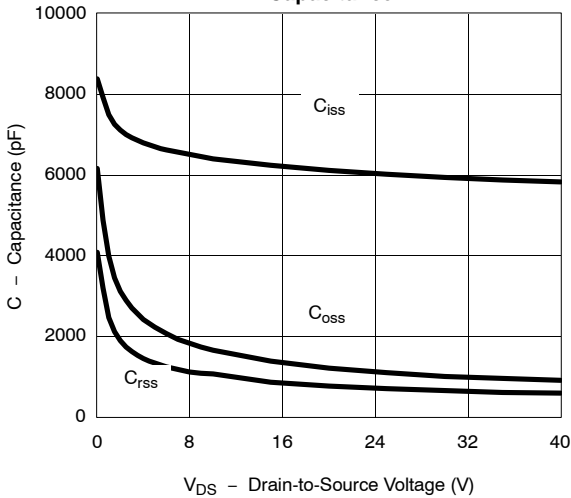
Transconductance



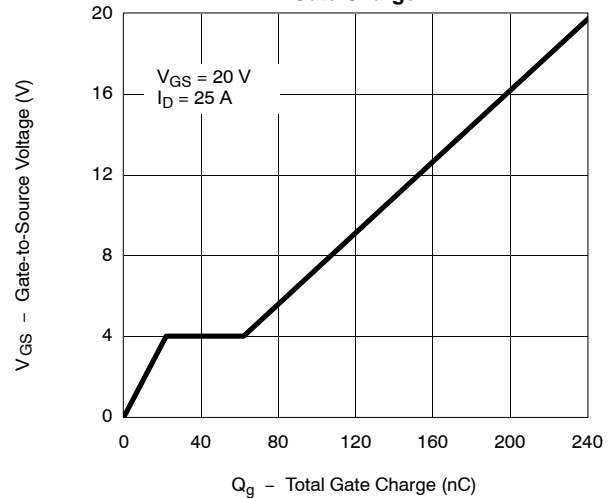
On-Resistance vs. Drain Current



Capacitance



Gate Charge

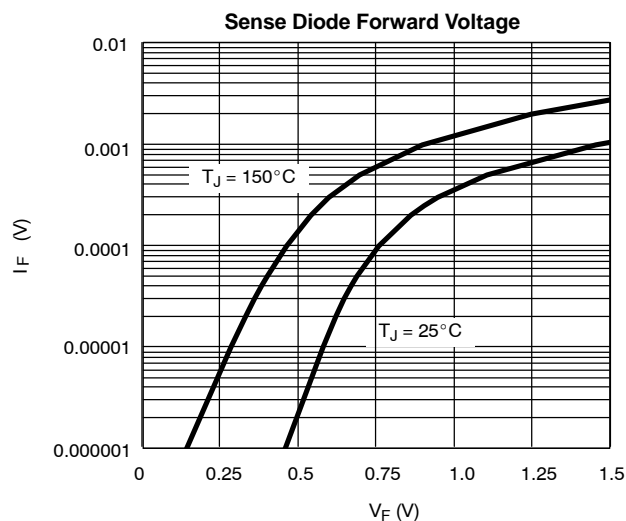
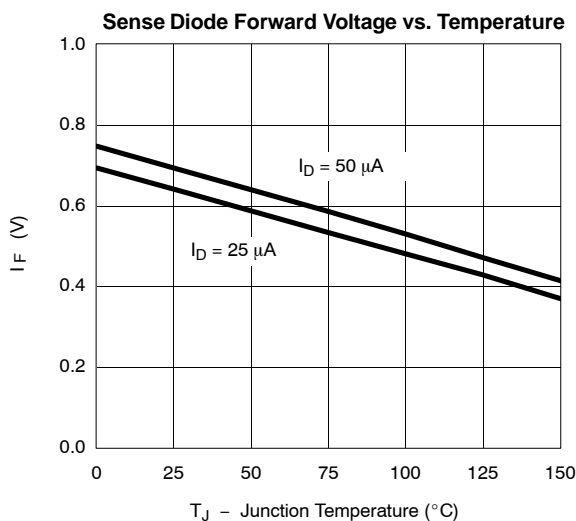
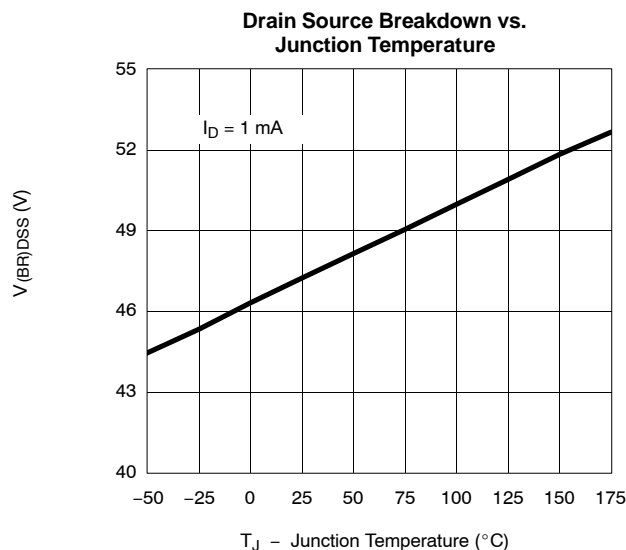
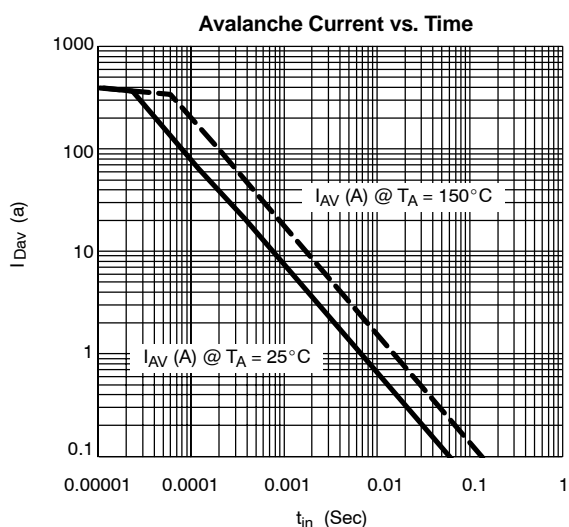
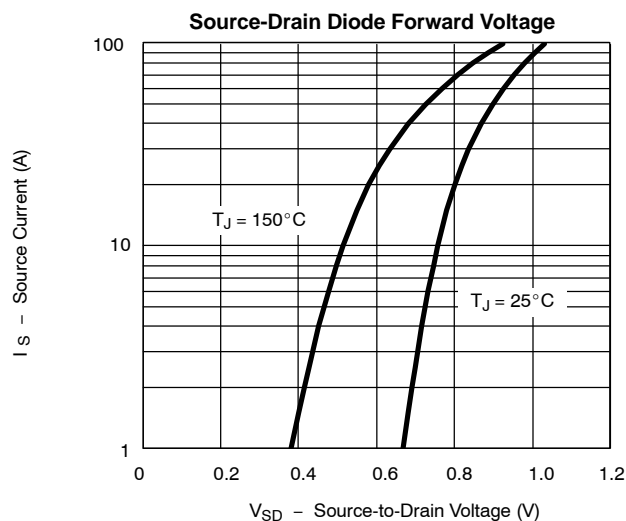
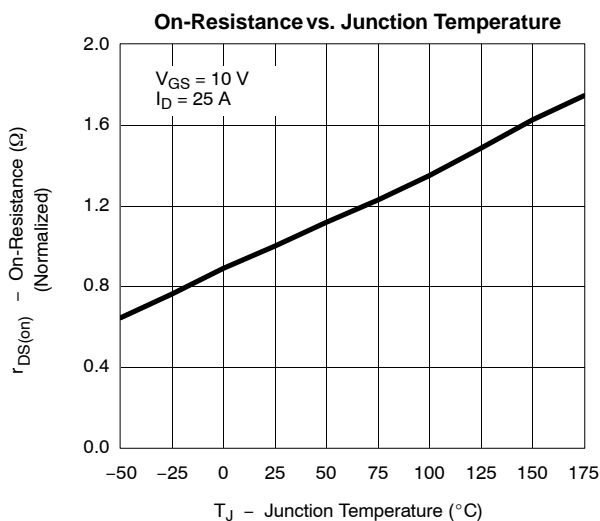


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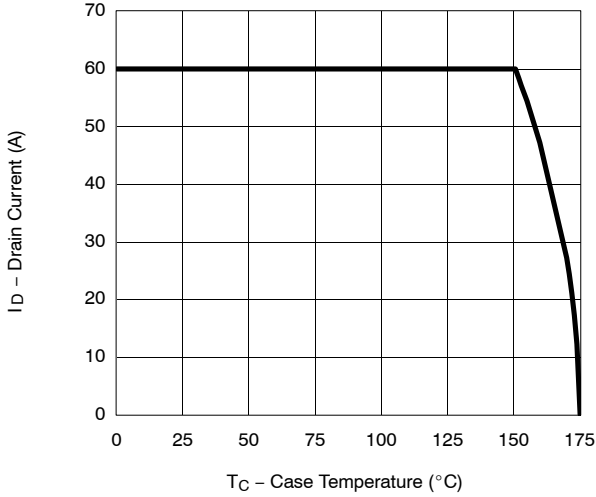
TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



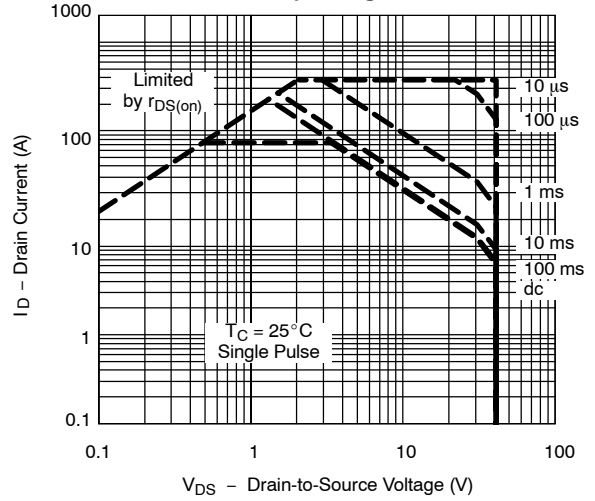


THERMAL RATINGS

Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

