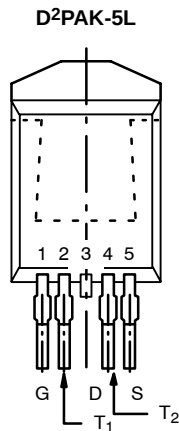




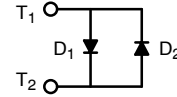
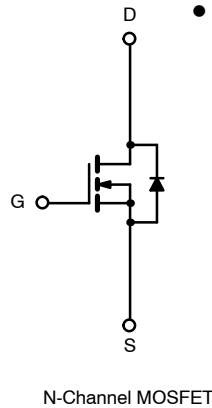
N-Channel 40-V (D-S) MOSFET with Sensing Diode

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



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	$T_C = 25^\circ\text{C}$	I_D	60 ^a	A
	$T_C = 100^\circ\text{C}$		60 ^a	
Pulsed Drain Current		I_{DM}	250	
Continuous Diode Current (Diode Conduction) ^d		I_S	60 ^a	
Avalanche Current		I_{AR}	60 ^a	mJ
Repetitive Avalanche Energy ^b	$L = 0.1$ mH	E_{AR}	180	
Maximum Power Dissipation ^a	$T_C = 25^\circ\text{C}$	P_D	200 ^c	W
	$T_A = 25^\circ\text{C}$		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	PCB Mount ^d	R_{thJA}	40	$^\circ\text{C/W}$
Junction-to-Case		R_{thJC}	0.75	

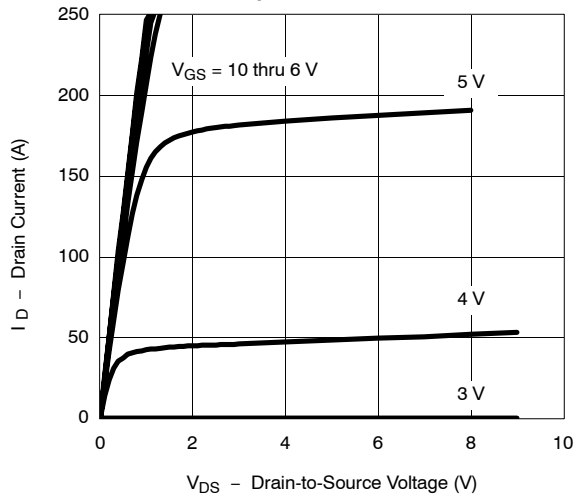
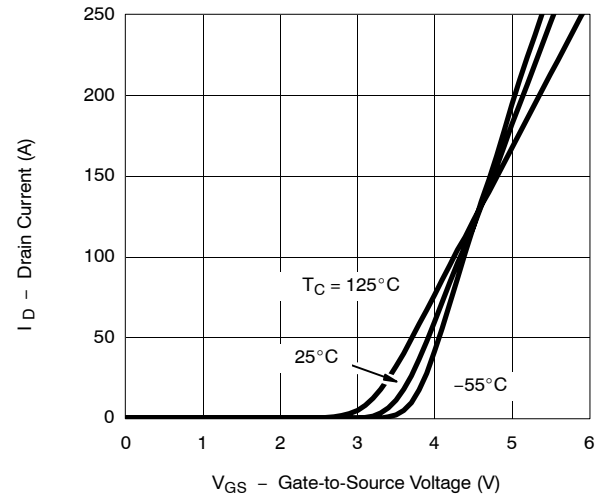
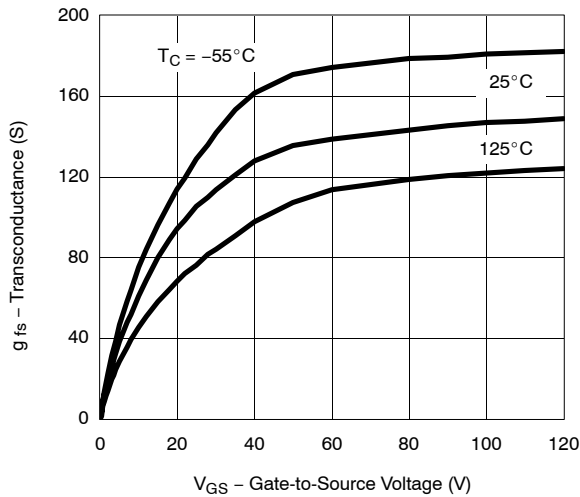
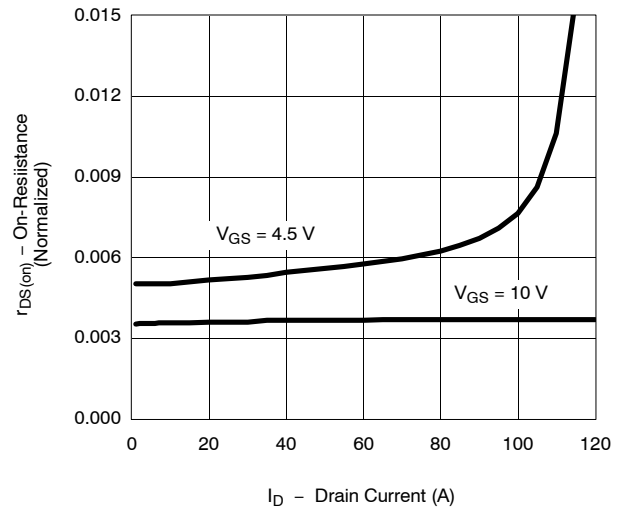
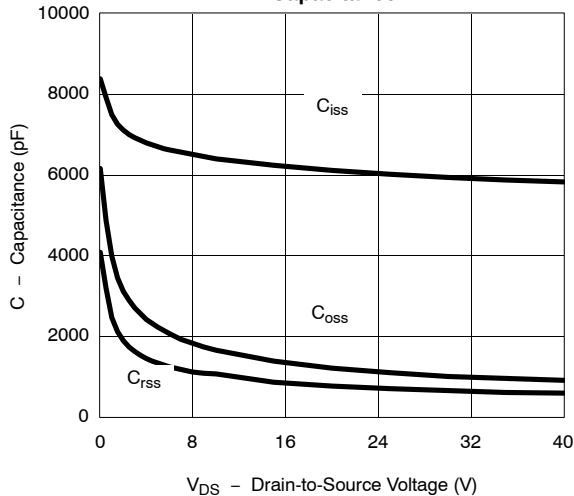
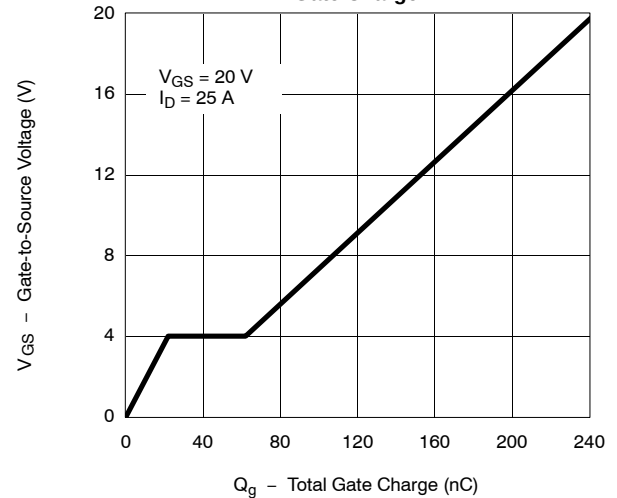
Notes

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

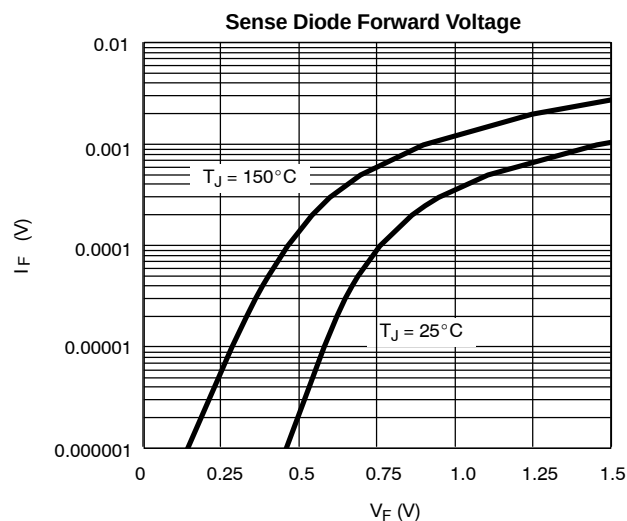
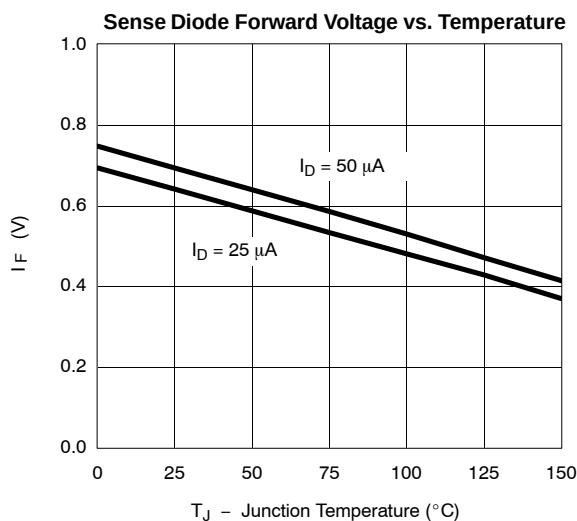
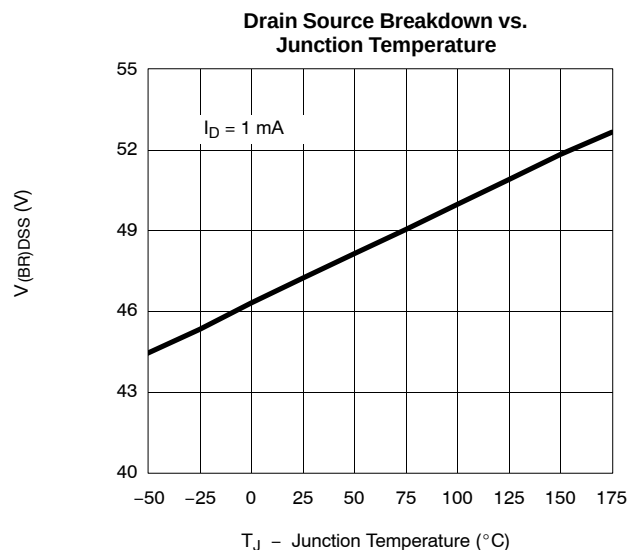
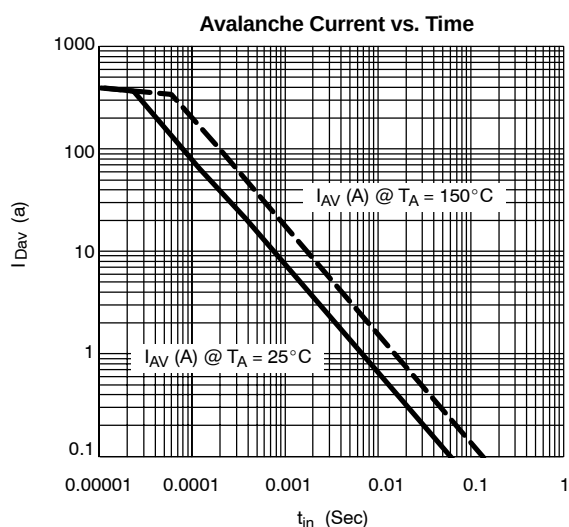
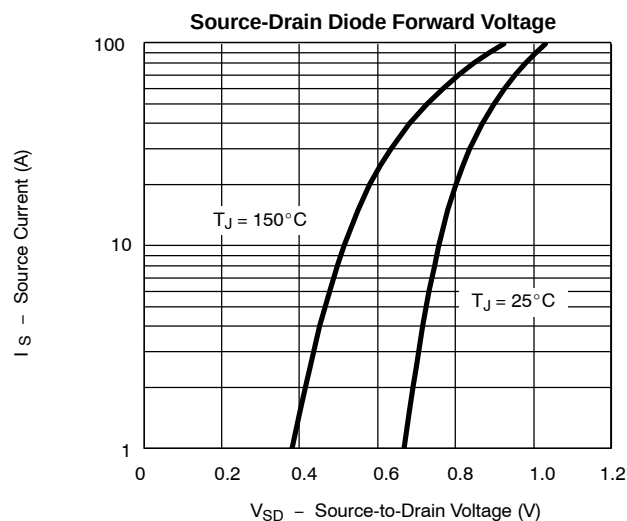
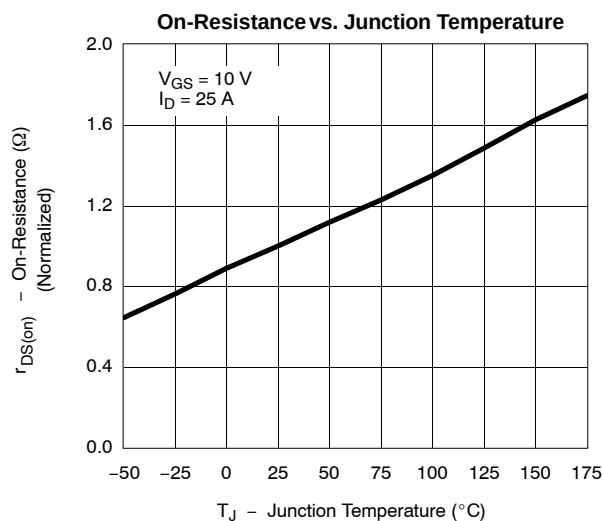
MOSFET SPECIFICATIONS (T _J = 25°C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	40			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _{DS} = 250 μA	1		3	
Gate-Body Leakage	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

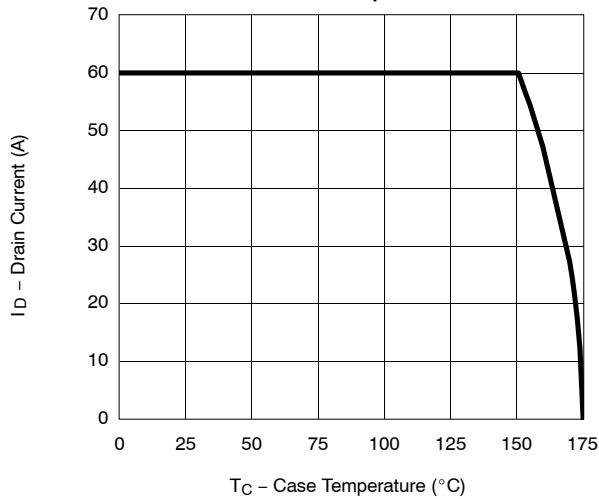
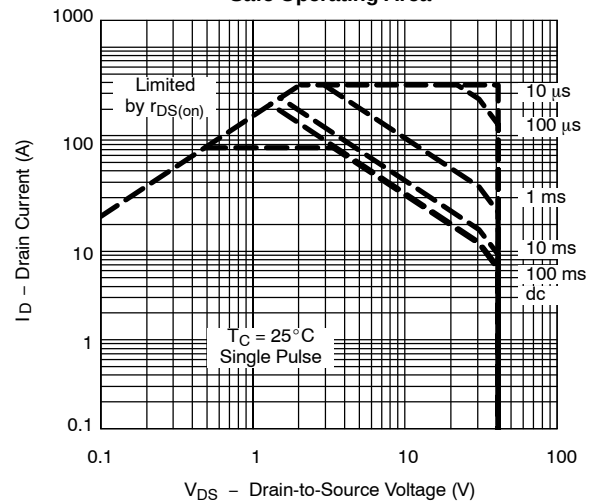
Notes:

- 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.

**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)****Output Characteristics****Transfer Characteristics****Transconductance****On-Resistance vs. Drain Current****Capacitance****Gate Charge**

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**