

## N-Channel 60-V (D-S), 175 °C MOSFET, Logic Level

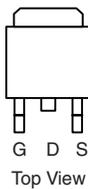
**PRODUCT SUMMARY**

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
60	0.016 at $V_{GS} = 10$ V	50
	0.022 at $V_{GS} = 4.5$ V	43

**FEATURES**

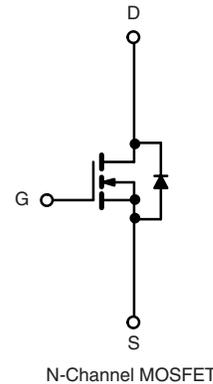
- TrenchFET<sup>®</sup> Power MOSFET
- 175 °C Junction Temperature


**RoHS\***  
COMPLIANT

**TO-263**


DRAIN connected to TAB

Ordering Information: SUM50N06-16L  
SUM50N06-16L-E3 (Lead (Pb)-free)



N-Channel MOSFET

**ABSOLUTE MAXIMUM RATINGS**  $T_C = 25$  °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	50
		$T_C = 100$ °C	35
Pulsed Drain Current	$I_{DM}$	100	A
Avalanche Current	$I_{AR}$	40	
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	80	mJ
Power Dissipation	$P_D$	$T_C = 25$ °C	93 <sup>b</sup>
		$T_A = 25$ °C <sup>c</sup>	3.7 <sup>c</sup>
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C

**THERMAL RESISTANCE RATINGS**

Parameter	Symbol	Limit	Unit
Junction-to-Ambient	$R_{thJA}$	40	°C/W
Junction-to-Case	$R_{thJC}$	1.6	

Notes:

- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- Surface mounted on FR4 Board,  $t \leq 10$  s.

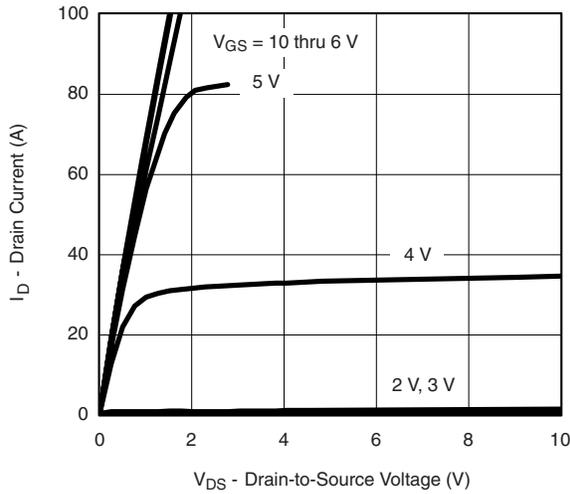
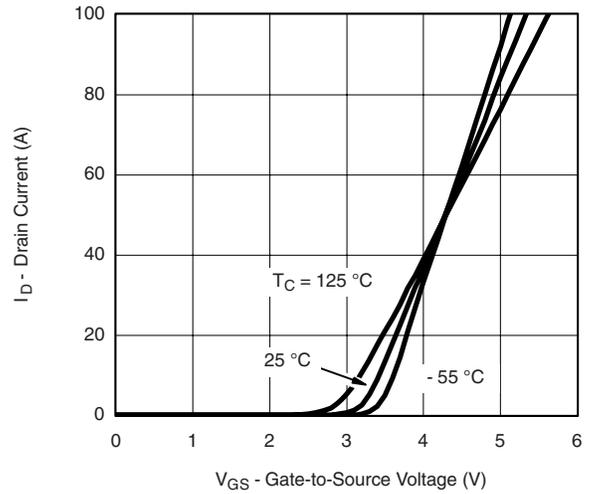
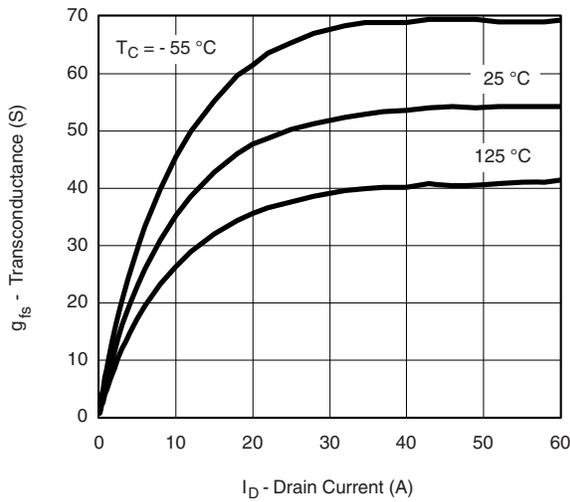
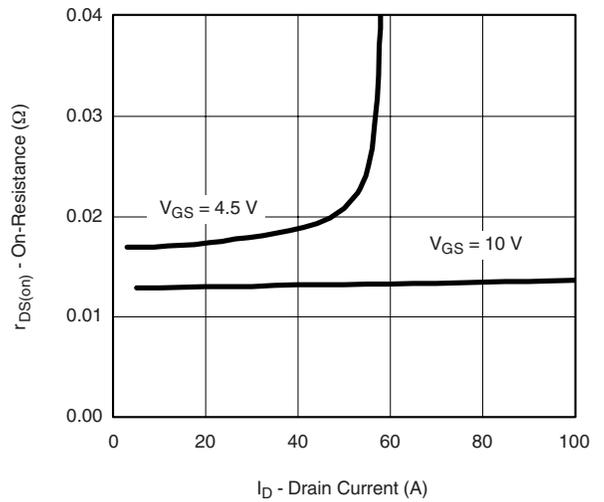
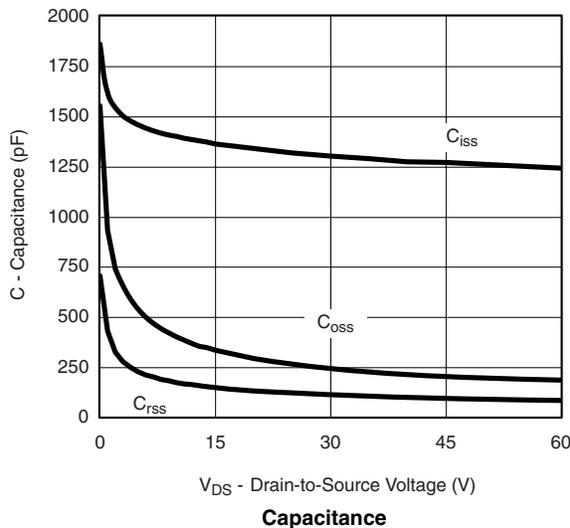
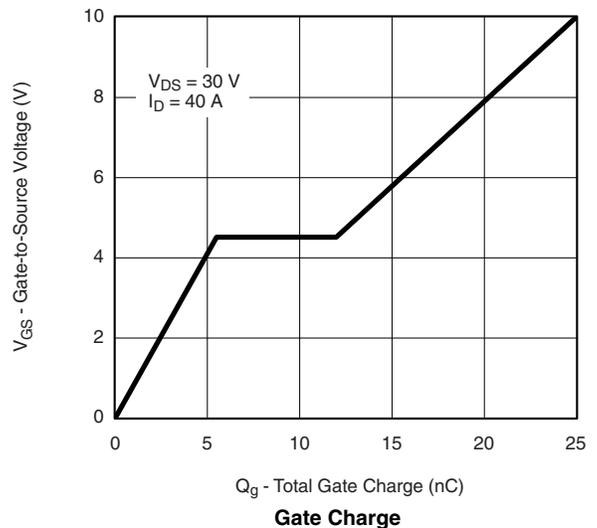
\* Pb containing terminations are not RoHS compliant, exemptions may apply.

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	60			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_{DS} = 250\text{ }\mu\text{A}$	1.0	2.0	3.0	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 175\text{ }^\circ\text{C}$			150	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}$ , $V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$		0.013	0.016	$\Omega$
		$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$			0.028	
		$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 175\text{ }^\circ\text{C}$			0.036	
		$V_{GS} = 4.5\text{ V}$ , $I_D = 20\text{ A}$		0.017	0.022	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 20\text{ A}$		50		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		1325		$\mu\text{F}$
Output Capacitance	$C_{oss}$			265		
Reverse Transfer Capacitance	$C_{rss}$			115		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 50\text{ A}$		25	40	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			5.5		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			6.5		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 0.8\text{ }\Omega$ $I_D \cong 50\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_G = 2.5\text{ }\Omega$		10	20	ns
Rise Time <sup>c</sup>	$t_r$			9	20	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			25	50	
Fall Time <sup>c</sup>	$t_f$			7	15	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>						
Continuous Current	$I_S$				50	A
Pulsed Current	$I_{SM}$				100	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 50\text{ A}$ , $V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 50\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		35	70	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			2.3	4	A
Reverse Recovery Charge	$Q_{rr}$			0.04	0.14	$\mu\text{C}$

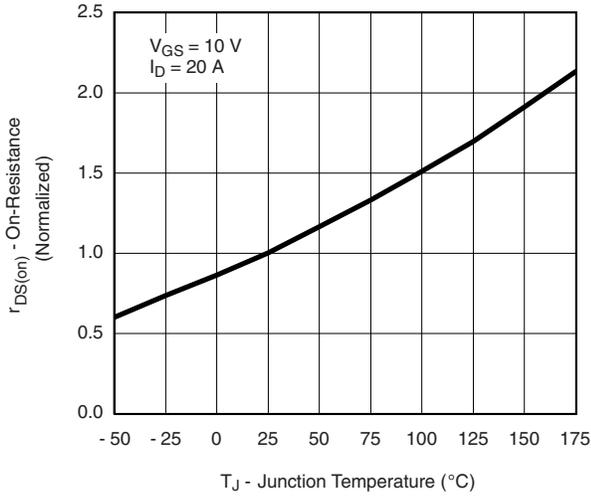
Notes:

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

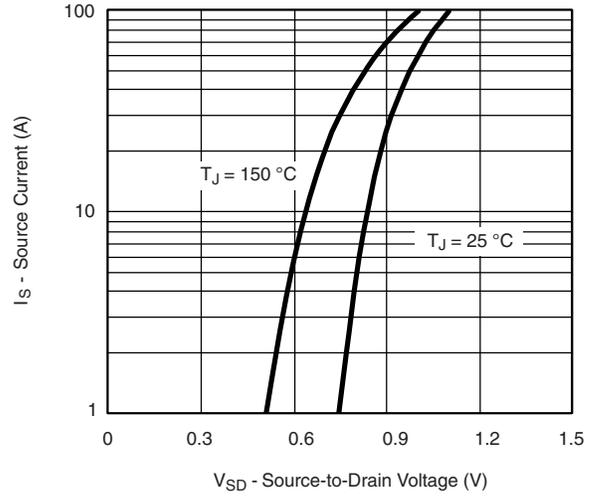
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

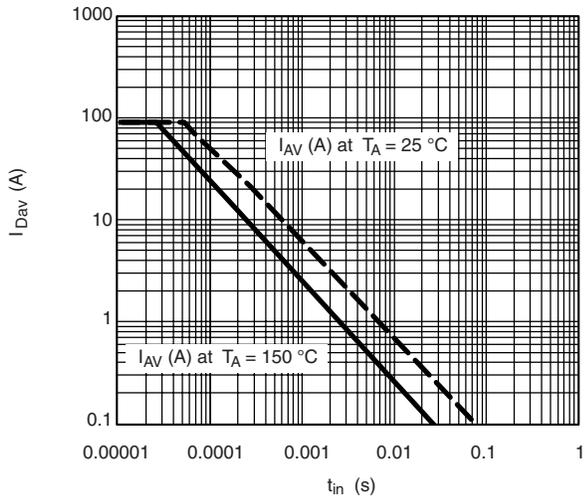
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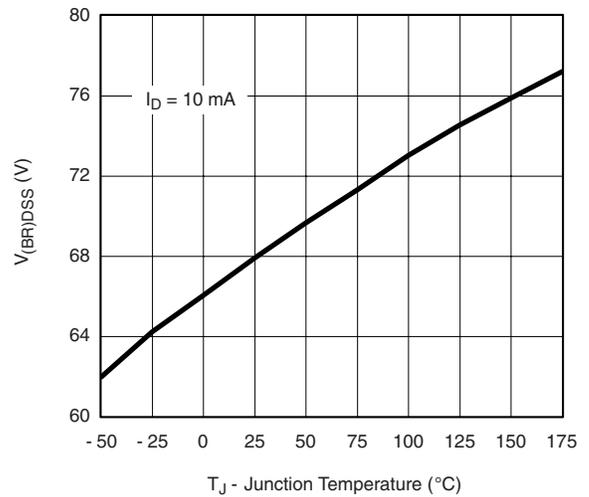
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

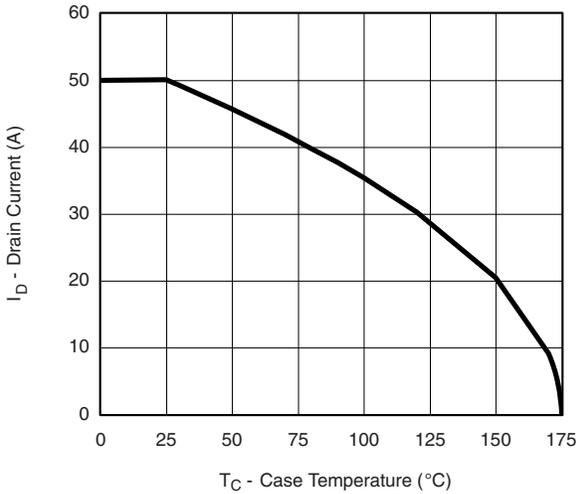


**Drain Source Breakdown vs. Junction Temperature**

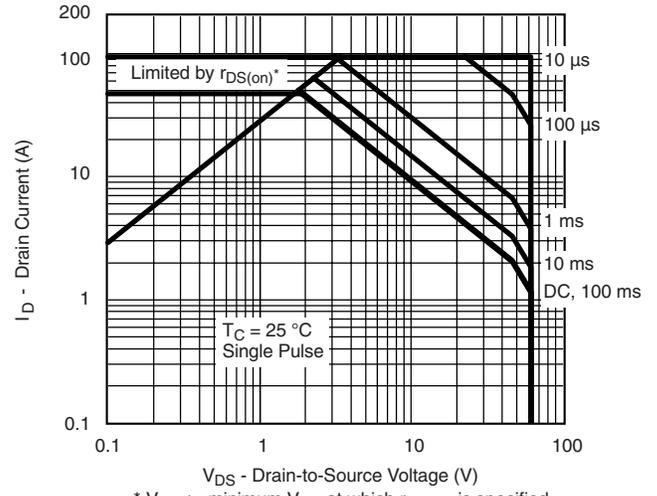




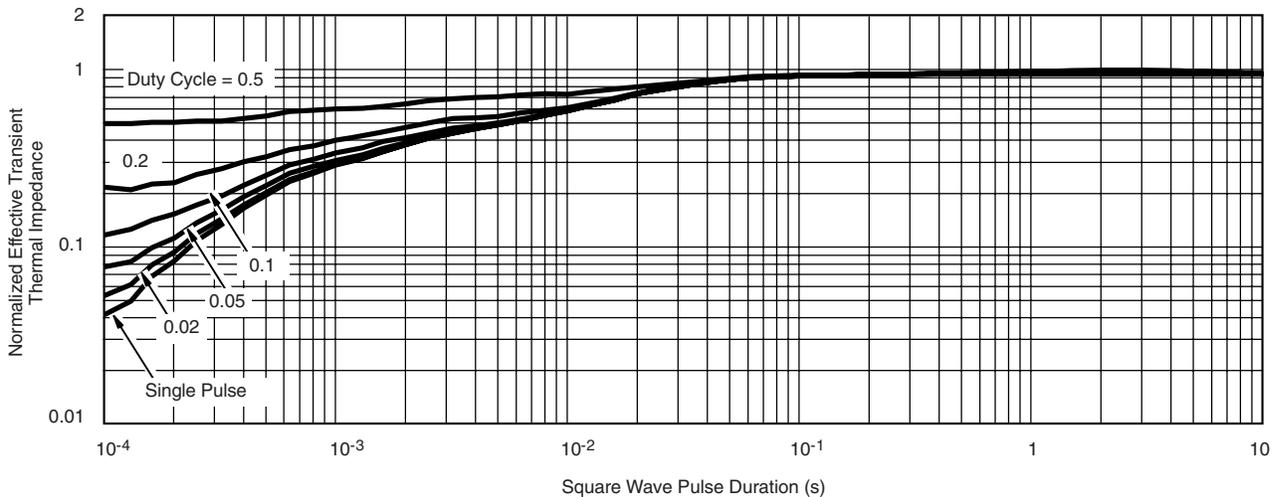
**THERMAL RATINGS**



**Drain Current vs. Case Temperature**



**Safe Operating Area**  
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified



**Normalized Thermal Transient Impedance, Junction-to-Case**

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