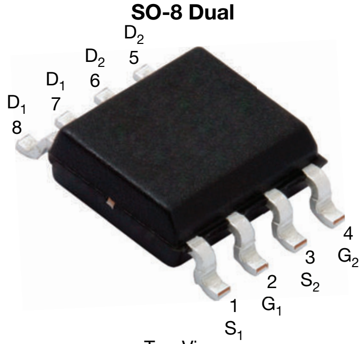
Automotive N-and P-Channel 30 V (D-S) 175 °C MOSFET

SO-8 Dual



Top View

Marking Code: Q4532A

FEATURES

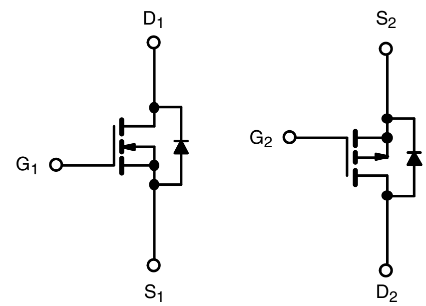
- TrenchFET® power MOSFET
- AEC-Q101 qualified [c]
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE



N-Channel MOSFET P-Channel MOSFET

PRODUCT SUMMARY		
	N-CHANNEL	P-CHANNEL
V_{DS} (V)	30	-30
$R_{DS(on)}$ (Ω) at V_{GS} = ± 10 V	0.031	0.070
$R_{DS(on)}$ (Ω) at V_{GS} = ± 4.5 V	0.042	0.190
I_D (A)	7.3	-5.3
Configuration	N- and p-pair	

ORDERING INFORMATION	
Package	SO-8
Lead (Pb)-free and halogen-free	SQ4532AEY (for detailed order number please see www.vishay.com/doc?79771)

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)					
PARAMETER		SYMBOL	N-CHANNEL	P-CHANNEL	UNIT
Drain-source voltage		V_{DS}	30	-30	V
Gate-source voltage		V_{GS}	± 20		
Continuous drain current	T_C = 25 °C	I_D	7.3	-5.3	A
	T_C = 125 °C		4.2	-3	
Continuous source current (diode conduction)		I_S	4.2	-3	
Pulsed drain current [a]		I_{DM}	29	-21	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	10	-9	
Single pulse avalanche energy		E_{AS}	5	4	mJ
Maximum power dissipation [a]	T_C = 25 °C	P_D	3.3	3.3	W
	T_C = 125 °C		1.1	1.1	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175		°C

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	N-CHANNEL	P-CHANNEL	UNIT
Junction-to-ambient	PCB mount [b]	R_{thJA}	110	105	°C/W
Junction-to-foot (drain)		R_{thJF}	45	45	

Notes

a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
b. When mounted on 1" square PCB (FR4 material)
c. Parametric verification ongoing

SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT
Static								
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0, I_D = 250 µA		N-Ch	30	-	-	V
		V_{GS} = 0, I_D = -250 µA		P-Ch	-30	-	-	
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		N-Ch	1.5	2	2.5	
		V_{DS} = V_{GS}, I_D = -250 µA		P-Ch	-1.5	-2	-2.5	
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		N-Ch	-	-	± 100	nA
				P-Ch	-	-	± 100	
Zero gate voltage drain current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 30 V	N-Ch	-	-	1	µA
		V_{GS} = 0 V	V_{DS} = -30 V	P-Ch	-	-	-1	
		V_{GS} = 0 V	V_{DS} = 30 V, T_J = 125 °C	N-Ch	-	-	50	
		V_{GS} = 0 V	V_{DS} = -30 V, T_J = 125 °C	P-Ch	-	-	-50	
		V_{GS} = 0 V	V_{DS} = 30 V, T_J = 175 °C	N-Ch	-	-	150	
		V_{GS} = 0 V	V_{DS} = -30 V, T_J = 175 °C	P-Ch	-	-	-150	
On-state drain current [a]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} = 5 V	N-Ch	15	-	-	A
		V_{GS} = -10 V	V_{DS} = -5 V	P-Ch	-15	-	-	
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 4.9 A	N-Ch	-	0.021	0.031	Ω
		V_{GS} = -10 V	I_D = -3.5 A	P-Ch	-	0.056	0.070	
		V_{GS} = 10 V	I_D = 4.9 A, T_J = 125 °C	N-Ch	-	-	0.064	
		V_{GS} = -10 V	I_D = -3.5 A, T_J = 125 °C	P-Ch	-	-	0.100	
		V_{GS} = 10 V	I_D = 4.9 A, T_J = 175 °C	N-Ch	-	-	0.082	
		V_{GS} = -10 V	I_D = -3.5 A, T_J = 175 °C	P-Ch	-	-	0.117	
		V_{GS} = 4.5 V	I_D = 4.1 A	N-Ch	-	0.033	0.042	
		V_{GS} = -4.5 V	I_D = -2.5 A	P-Ch	-	0.157	0.190	
Forward transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 4.9 A		N-Ch	-	22	-	S
		V_{DS} = -15 V, I_D = -3.5 A		P-Ch	-	5.5	-	
Dynamic [b]								
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 15 V, f = 1 MHz	N-Ch	-	357	535	pF
		V_{GS} = 0 V	V_{DS} = -15 V, f = 1 MHz	P-Ch	-	352	528	
Output capacitance	C_{oss}	V_{GS} = 0 V	V_{DS} = 15 V, f = 1 MHz	N-Ch	-	82	123	
		V_{GS} = 0 V	V_{DS} = -15 V, f = 1 MHz	P-Ch	-	95	142	
Reverse transfer capacitance	C_{rss}	V_{GS} = 0 V	V_{DS} = 15 V, f = 1 MHz	N-Ch	-	36	53	
		V_{GS} = 0 V	V_{DS} = -15 V, f = 1 MHz	P-Ch	-	59	88	
Total gate charge	Q_g	V_{GS} = 10 V	V_{DS} = 15 V, I_D = 3.9 A	N-Ch	-	5.9	7.8	nC
		V_{GS} = -10 V	V_{DS} = -15 V, I_D = -2.5 A	P-Ch	-	7.9	10.2	
Gate-source charge	Q_{gs}	V_{GS} = 10 V	V_{DS} = 15 V, I_D = 3.9 A	N-Ch	-	1	-	
		V_{GS} = -10 V	V_{DS} = -15 V, I_D = -2.5 A	P-Ch	-	1.1	-	
Gate-drain charge [c]	Q_{gd}	V_{GS} = 10 V	V_{DS} = 15 V, I_D = 3.9 A	N-Ch	-	1.9	-	
		V_{GS} = -10 V	V_{DS} = -15 V, I_D = -2.5 A	P-Ch	-	2.7	-	
Gate resistance	R_g	f = 1 MHz		N-Ch	1.7	3.4	5.1	Ω
				P-Ch	2.8	5.8	8.6	

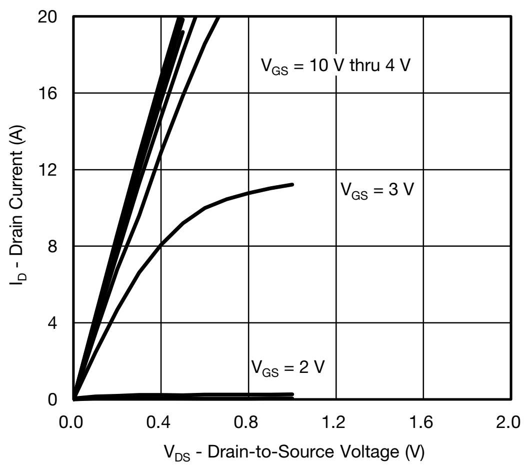
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Turn-on delay time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 1 Ω	N-Ch	-	7	10	ns
		V_{DD} = -15 V, R_L = 15 Ω $I_D \cong$ -1 A, V_{GEN} = -10 V, R_g = 1 Ω	P-Ch	-	6	9	
Rise time	t_r	V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 1 Ω	N-Ch	-	17	21	
		V_{DD} = -15 V, R_L = 15 Ω $I_D \cong$ -1 A, V_{GEN} = -10 V, R_g = 1 Ω	P-Ch	-	17	21	
Turn-off delay time	$t_{d(off)}$	V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 1 Ω	N-Ch	-	10	14	
		V_{DD} = -15 V, R_L = 15 Ω $I_D \cong$ -1 A, V_{GEN} = -10 V, R_g = 1 Ω	P-Ch	-	19	24	
Fall time	t_f	V_{DD} = 15 V, R_L = 15 Ω $I_D \cong$ 1 A, V_{GEN} = 10 V, R_g = 1 Ω	N-Ch	-	19	24	
		V_{DD} = -15 V, R_L = 15 Ω $I_D \cong$ -1 A, V_{GEN} = -10 V, R_g = 1 Ω	P-Ch	-	16	20	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed current [a]	I_{SM}		N-Ch	-	-	29	A
			P-Ch	-	-	-21	
Forward voltage	V_{SD}	I_S = 2 A	N-Ch	-	0.8	1.2	V
		I_S = -1.5 A	P-Ch	-	-0.8	-1.2	

Notes

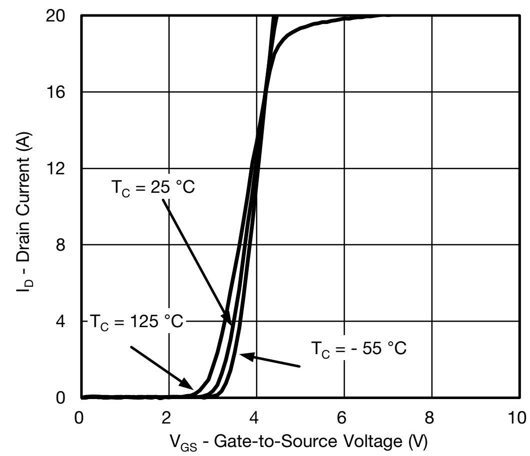
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

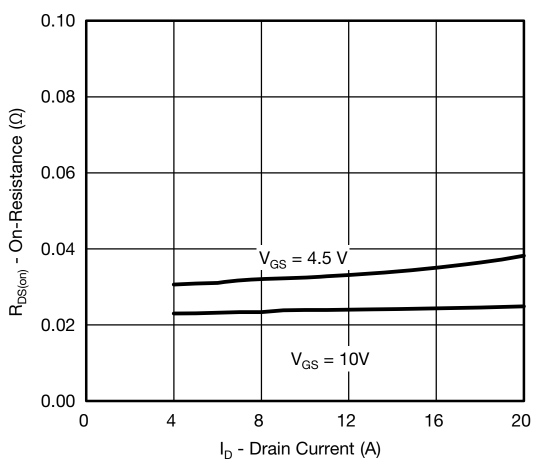
N-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



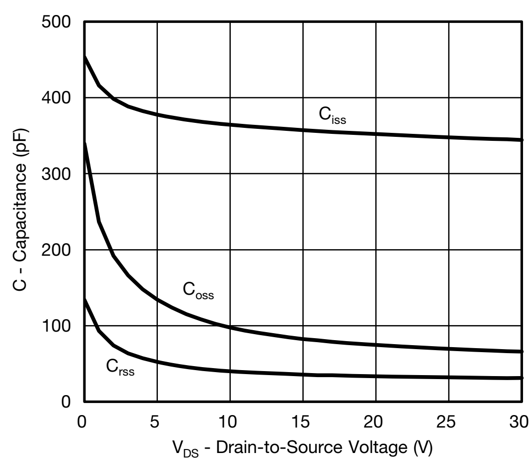
Output Characteristics



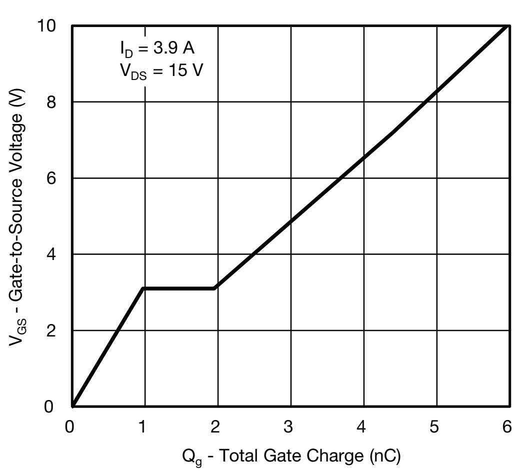
Transfer Characteristics



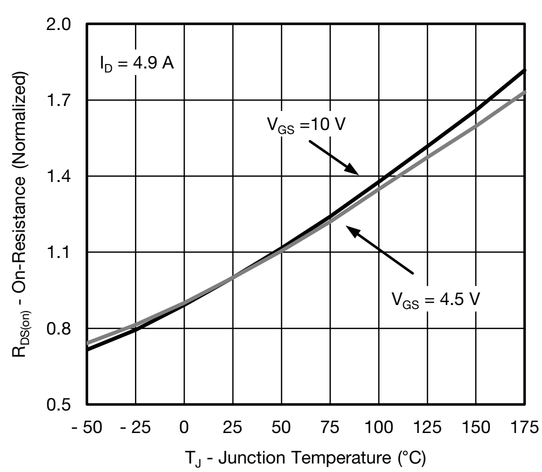
On-Resistance vs. Drain Current



Capacitance

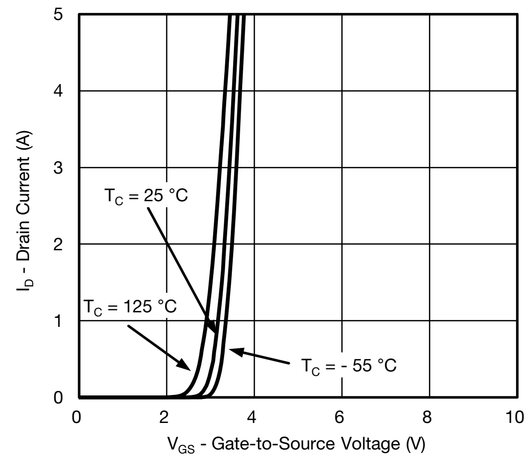


Gate Charge

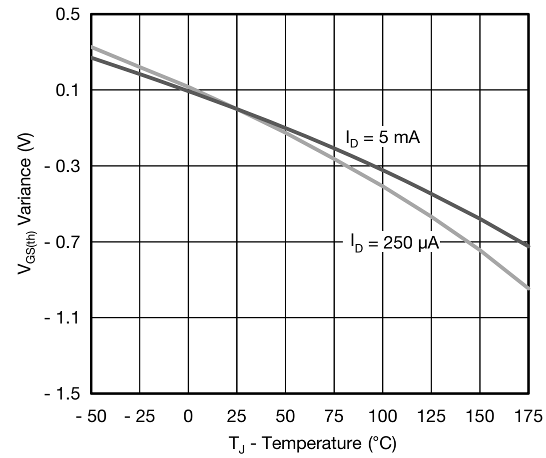


On-Resistance vs. Junction Temperature

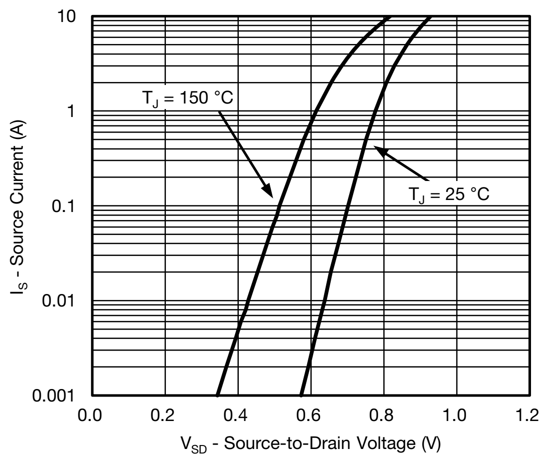
N-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



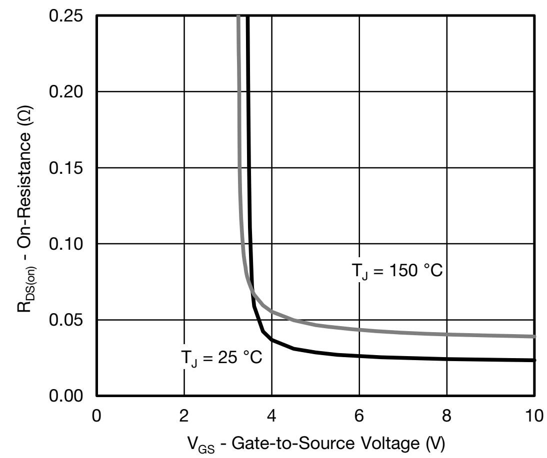
Transfer Characteristics



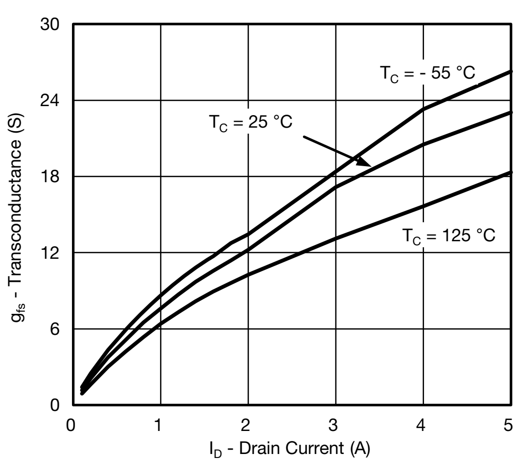
Threshold Voltage



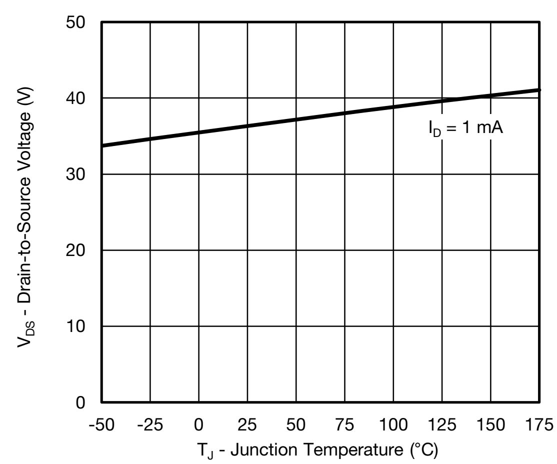
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

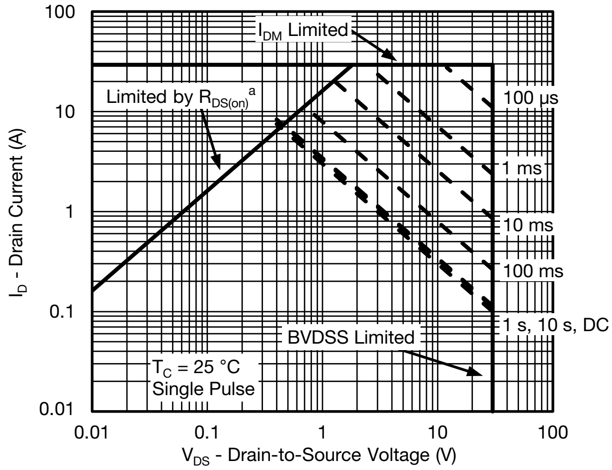


Transconductance



Drain Source Breakdown vs. Junction Temperature

N-CHANNEL THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)

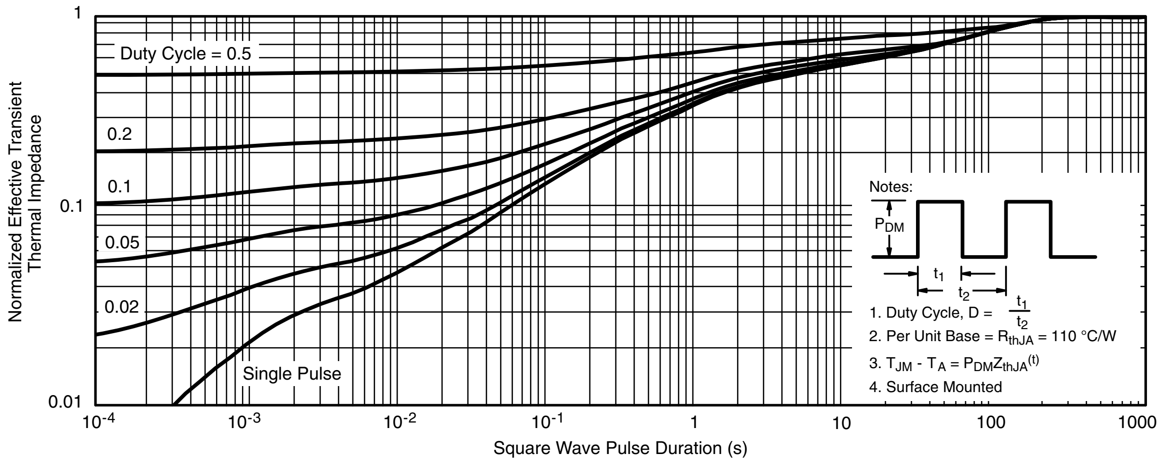


Safe Operating Area

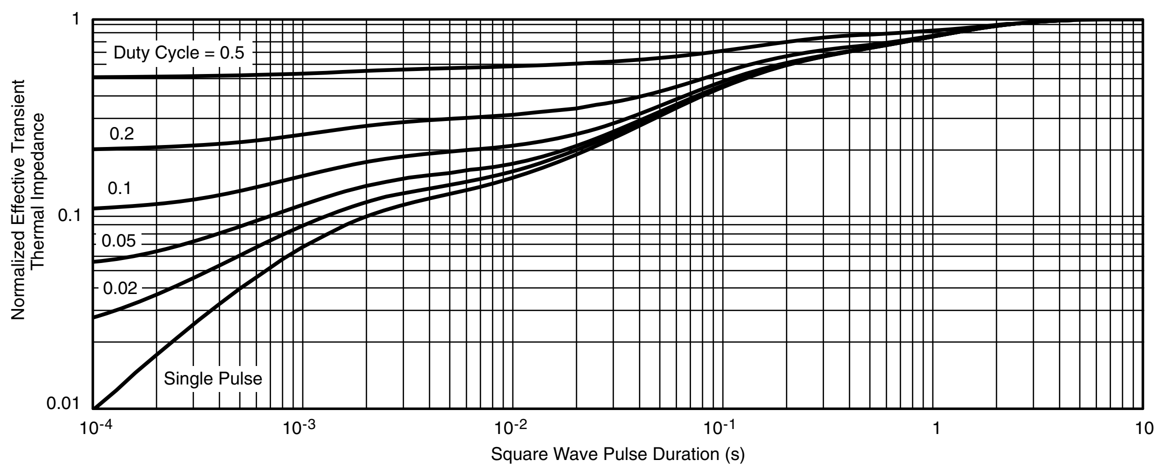
Note

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

N-CHANNEL THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



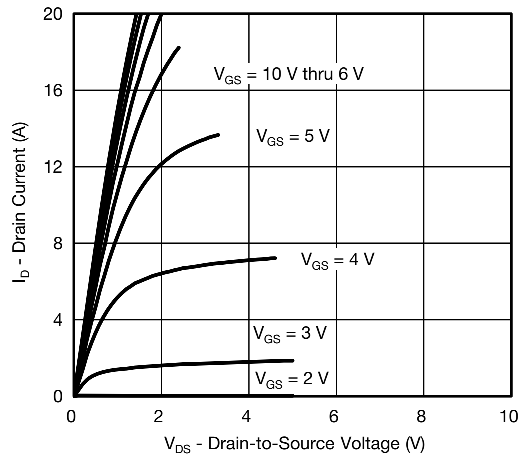
Normalized Thermal Transient Impedance, Junction-to-Foot

Note

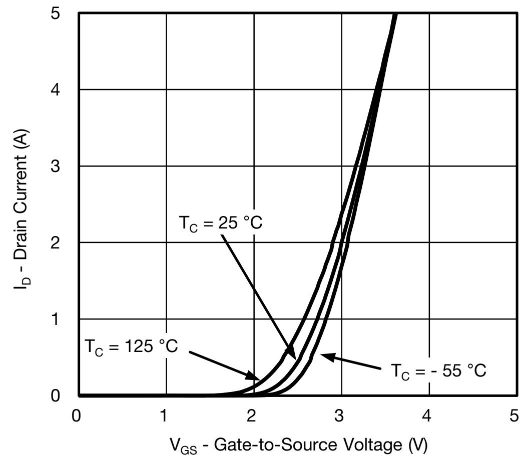
- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)

  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.

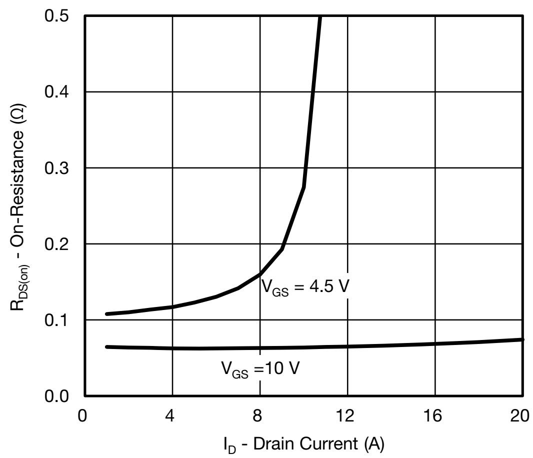
P-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



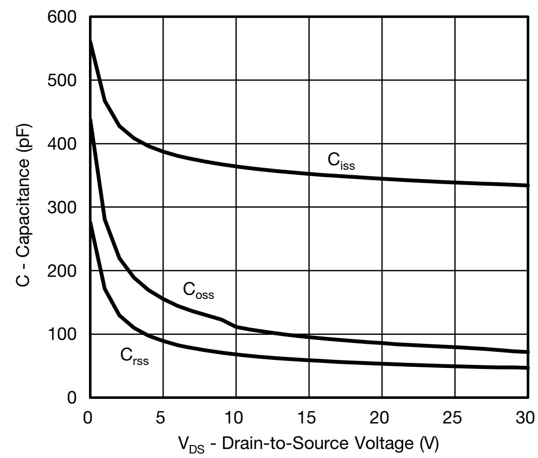
Output Characteristics



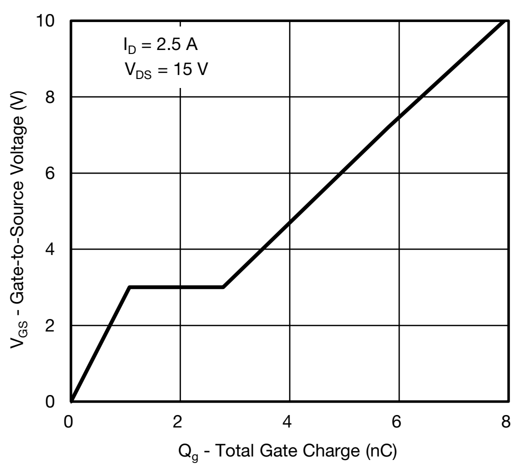
Transfer Characteristics



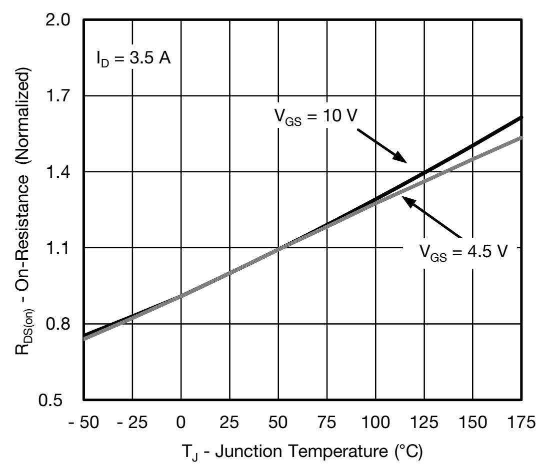
On-Resistance vs. Drain Current



Capacitance

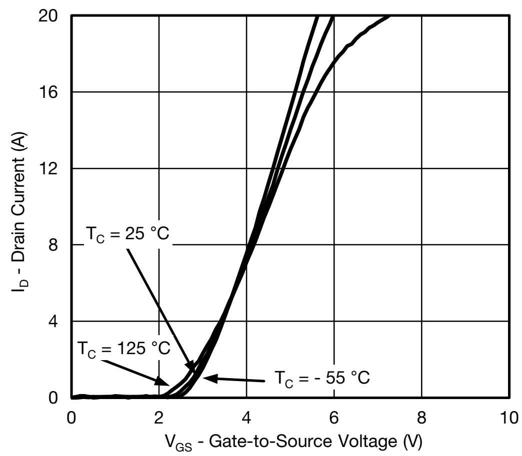


Gate Charge

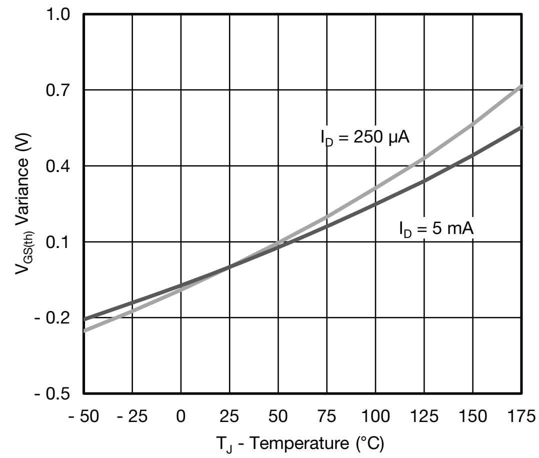


On-Resistance vs. Junction Temperature

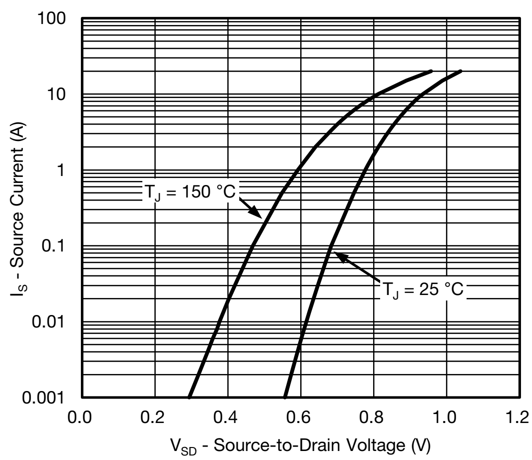
P-CHANNEL TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



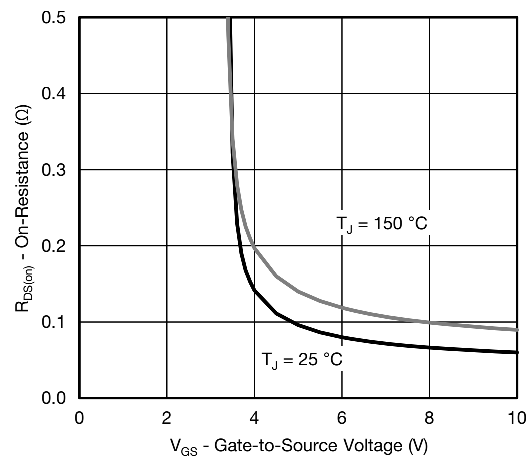
Transfer Characteristics



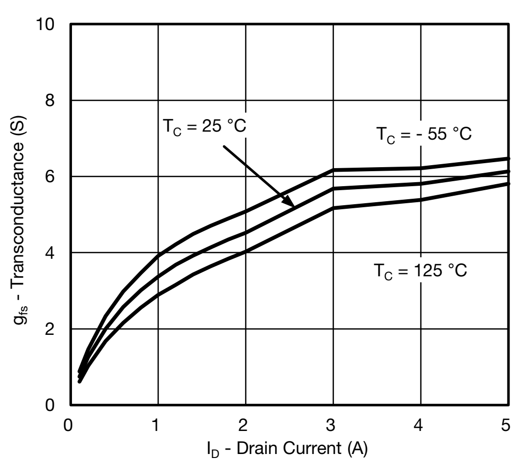
Threshold Voltage



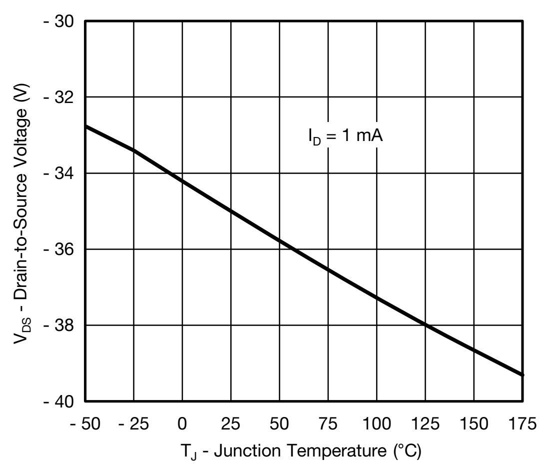
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

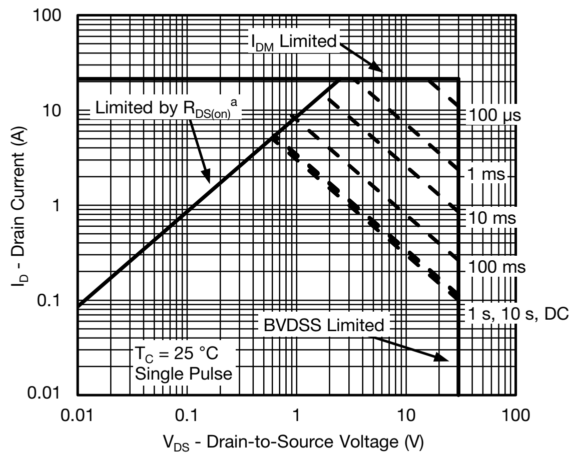


Transconductance



Drain Source Breakdown vs. Junction Temperature

P-CHANNEL THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)

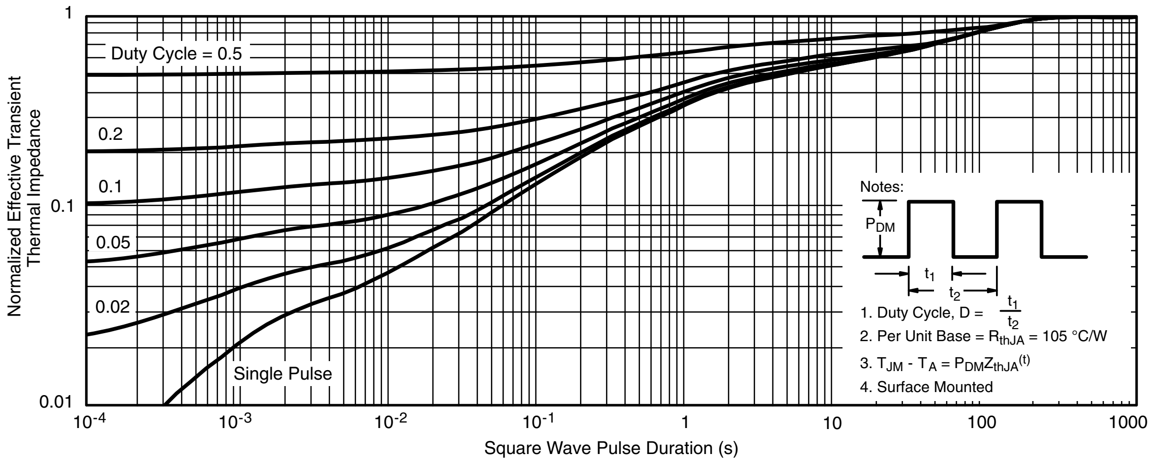


Safe Operating Area

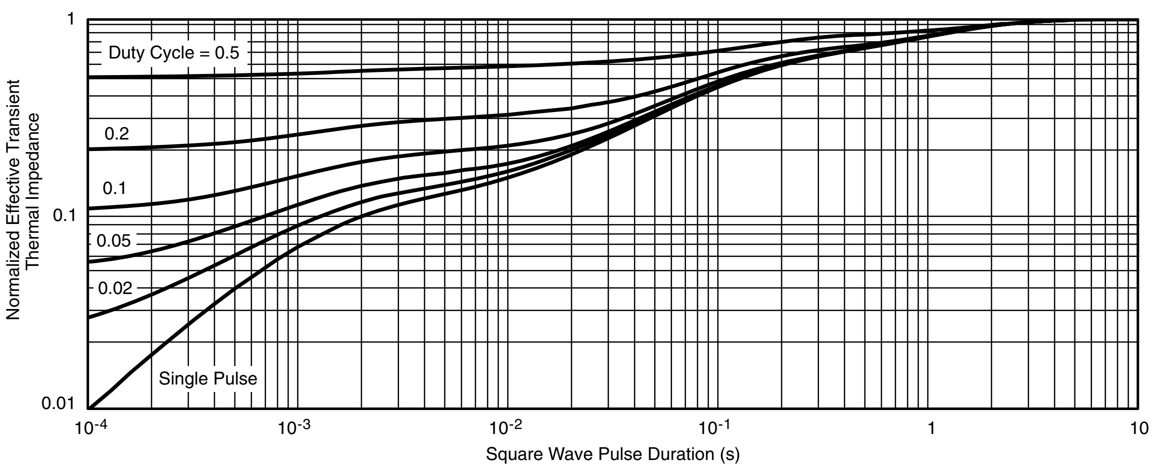
Note

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

P-CHANNEL THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

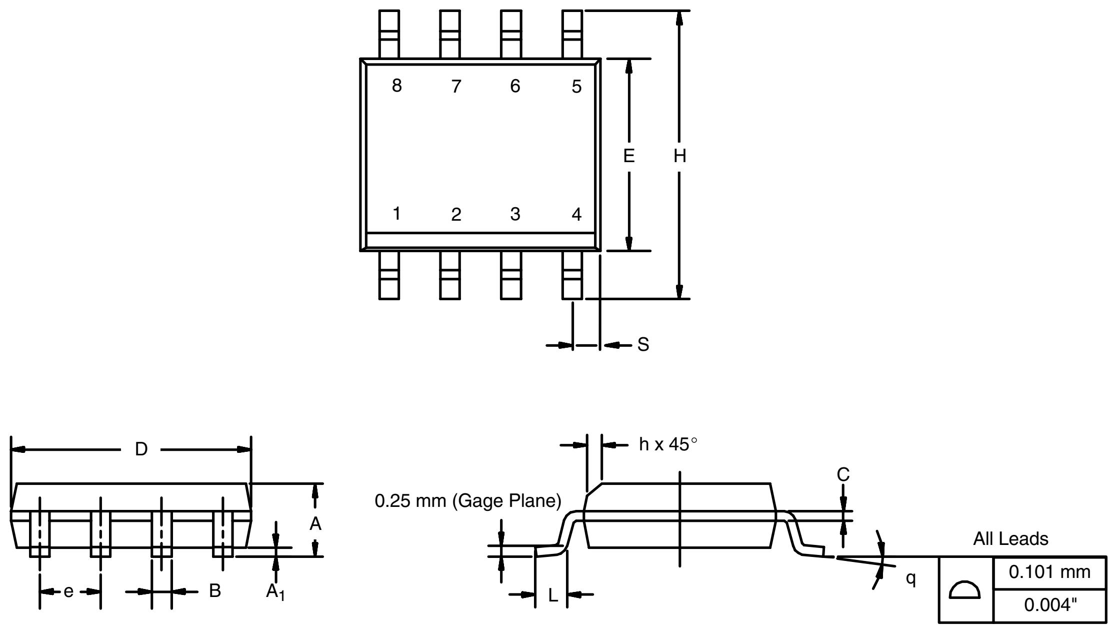
Note

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °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.

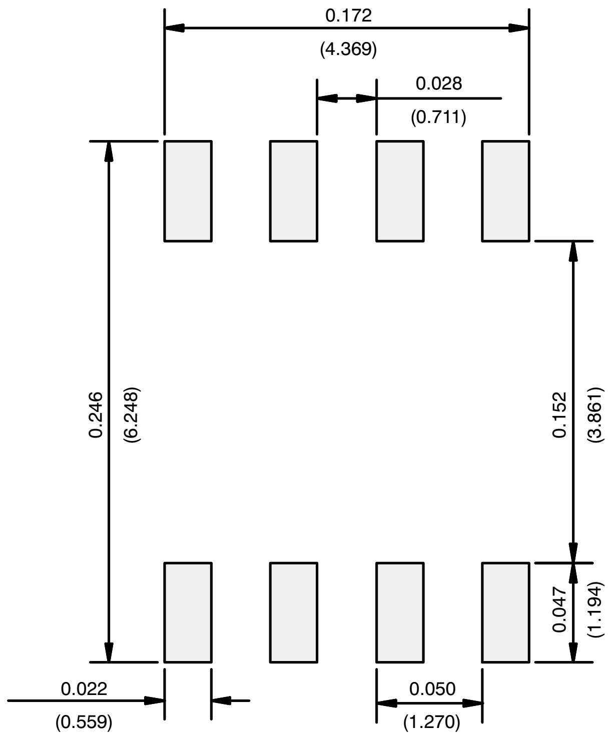
SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A_1	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06 DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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