U401-VB Datasheet

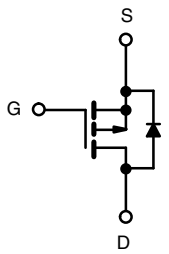
P-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	- 60
$R_{DS(on)}$ (Ω) at V_{GS} = - 10 V	0.0135
$R_{DS(on)}$ (Ω) at V_{GS} = - 4.5 V	0.017
I_D (A)	- 50
Configuration	Single

FEATURES

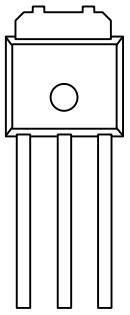
- Trench Power MOSFET
- Package with Low Thermal Resistance
- 100 % R_g and UIS Tested

RoHS COMPLIANT
HALOGEN FREE



P-Channel MOSFET

TO-251



Drain Connected to Drain-Tab

Top View

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	
Continuous Drain Current[a]	T_C = 25 °C	I_D	- 50	A
	T_C = 125 °C		- 38	
Continuous Source Current (Diode Conduction)[a]		I_S	- 50	
Pulsed Drain Current[b]		I_{DM}	- 200	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	- 52	
Single Pulse Avalanche Energy		E_{AS}	135	mJ
Maximum Power Dissipation[b]	T_C = 25 °C	P_D	136	W
	T_C = 125 °C		45	
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}	50	°C/W
Junction-to-Case (Drain)		R_{thJC}	1.1	

Notes

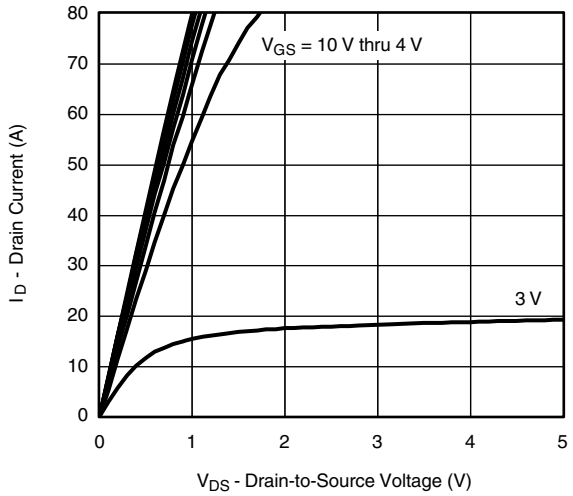
a. Package limited.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
c. When mounted on 1" square PCB (FR-4 material).

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 V, I_D = - 250 µA		- 60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA		- 1.5	-	- 2.5	
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V	V_{DS} = - 60 V	-	-	- 1	µA
		V_{GS} = 0 V	V_{DS} = - 60 V, T_J = 125 °C	-	-	- 50	
		V_{GS} = 0 V	V_{DS} = - 60 V, T_J = 175 °C	-	-	- 150	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = - 10 V	V_{DS} ≥ - 5 V	- 50	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V	I_D = - 17 A	-	0.0135	-	Ω
		V_{GS} = - 10 V	I_D = - 50 A, T_J = 125 °C	-	0.026	-	
		V_{GS} = - 10 V	I_D = - 50 A, T_J = 175 °C	-	0.032	-	
		V_{GS} = - 4.5 V	I_D = - 14 A	-	0.017	-	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 15 V, I_D = - 17 A		-	50	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = - 25 V, f = 1 MHz	-	4730	5910	pF
Output Capacitance	C_{oss}			-	485	606	
Reverse Transfer Capacitance	C_{rss}			-	330	410	
Total Gate Charge[c]	Q_g	V_{GS} = - 10 V	V_{DS} = - 30 V, I_D = - 50 A	-	98	150	nC
Gate-Source Charge[c]	Q_{gs}			-	15	23	
Gate-Drain Charge[c]	Q_{gd}			-	21	32	
Gate Resistance	R_g	f = 1 MHz		1.47	2.9	4.42	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = - 30 V, R_L = 0.6 Ω I_D ≅ - 50 A, V_{GEN} = - 10 V, R_g = 6.0 Ω		-	15	18	ns
Rise Time[c]	t_r			-	12	16	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	112	125	
Fall Time[c]	t_f			-	39	48	
Source-Drain Diode Ratings and Characteristics[b]							
Pulsed Current[a]	I_{SM}			-	-	- 200	A
Forward Voltage	V_{SD}	I_F = - 50 A, V_{GS} = 0 V		-	- 0.8	- 1.5	V

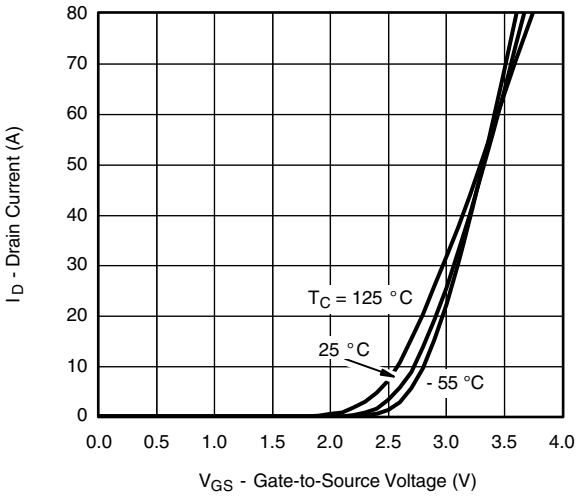
Notes

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

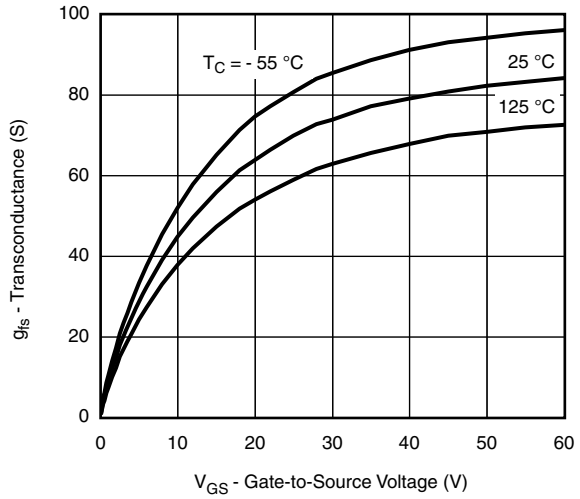
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



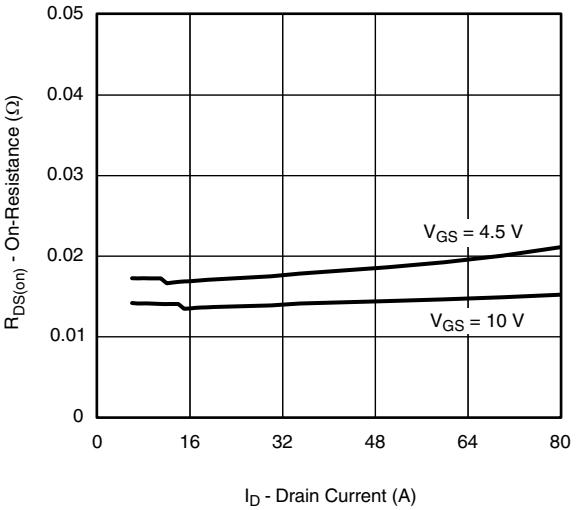
Output Characteristics



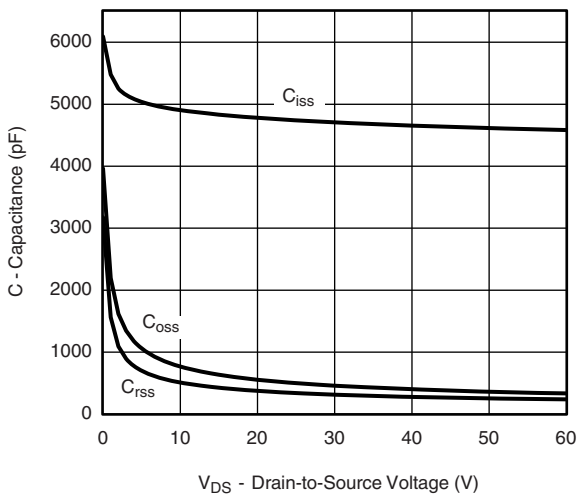
Transfer Characteristics



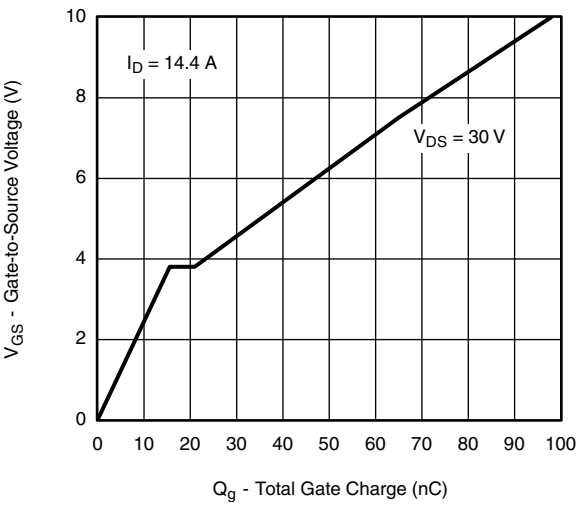
Transconductance



On-Resistance vs. Drain Current

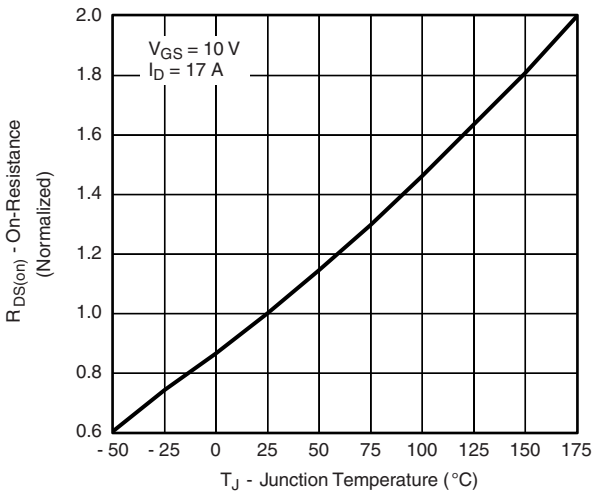


Capacitance

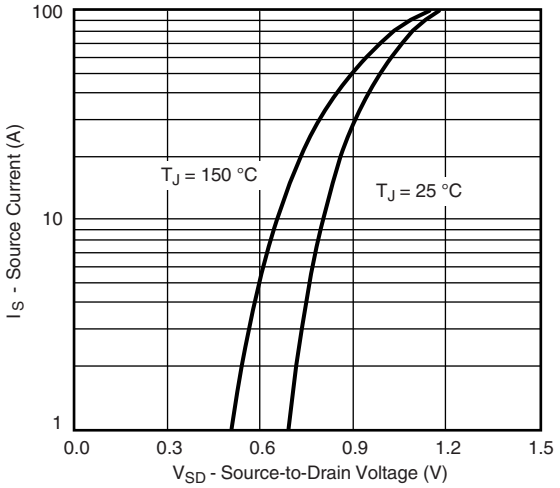


Gate Charge

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

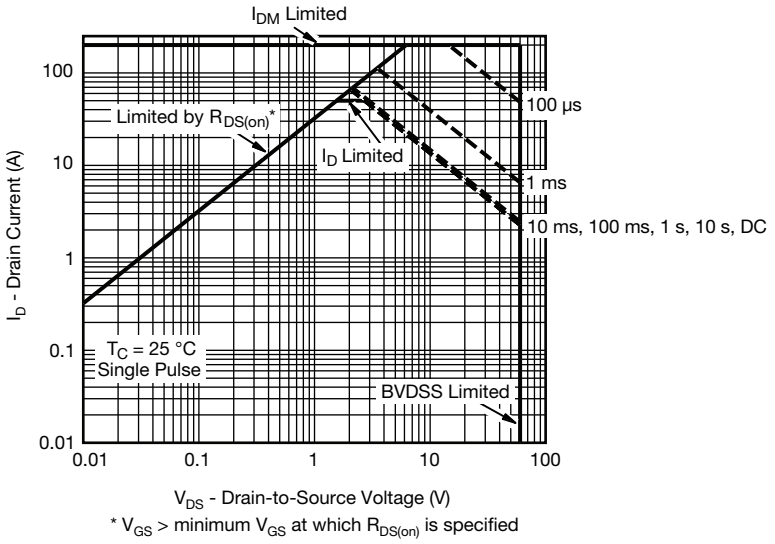


On-Resistance vs. Junction Temperature



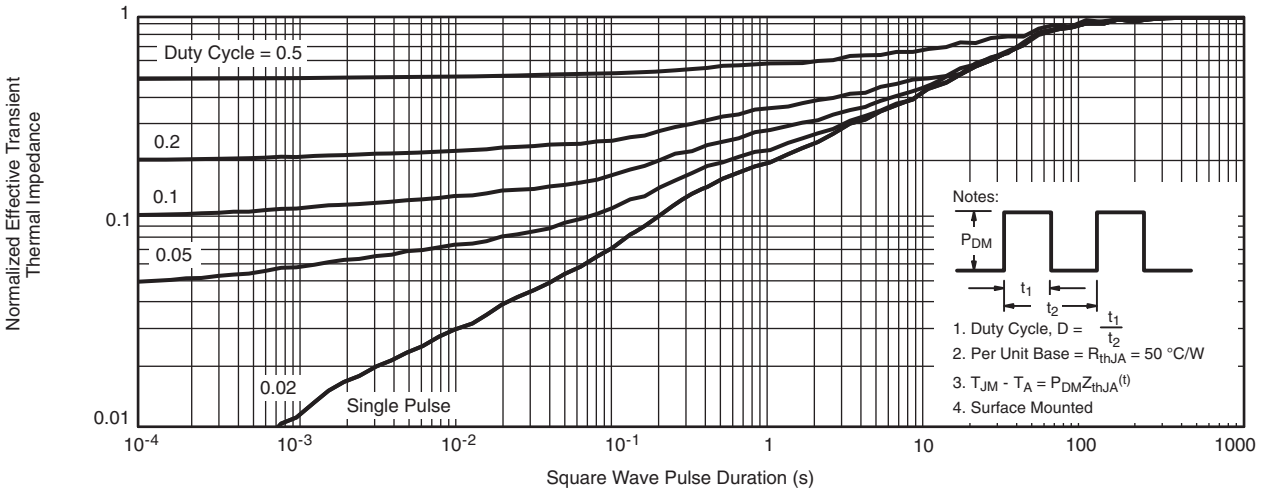
Source Drain Diode Forward Voltage

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

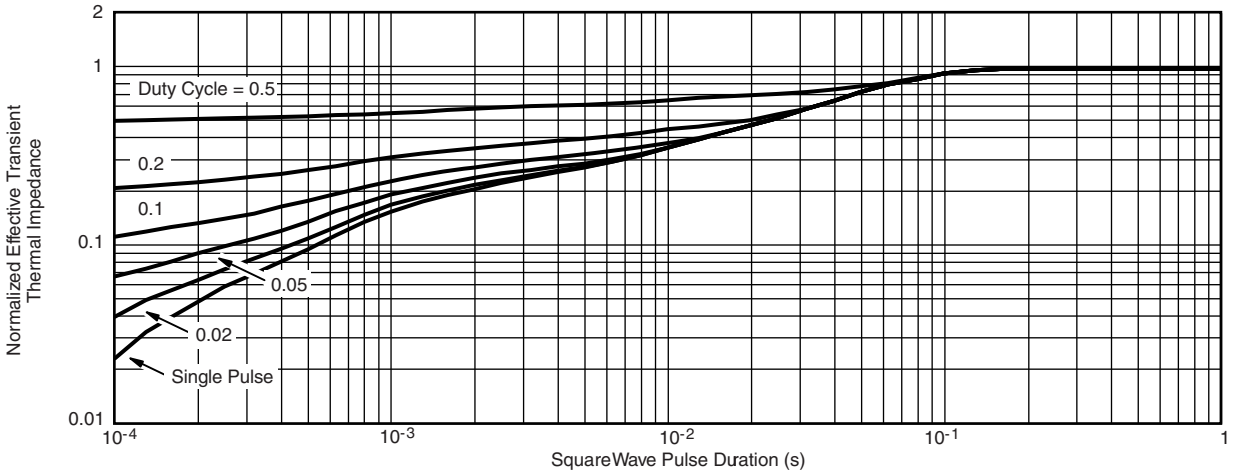


Safe Operating Area

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



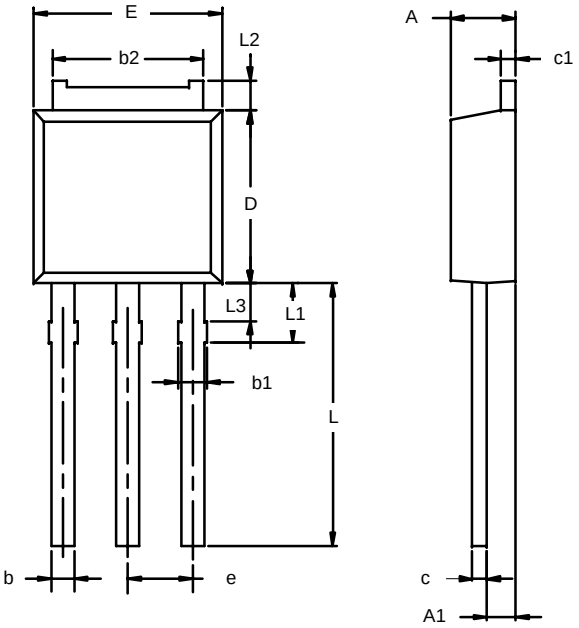
Normalized Thermal Transient Impedance, Junction-to-Case

Note

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

TO-251AA



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	3.89	9.53	0.153	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060

Note: Dimension L3 is for reference only.

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