

# Static Characteristics

$T_J = 25^\circ\text{C}$  unless otherwise specified

APT4M120K

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{BR(DSS)}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	1200			V
$\Delta V_{BR(DSS)}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to $25^\circ\text{C}, I_D = 250\mu A$		1.41		V/ $^\circ\text{C}$
$R_{DS(on)}$	Drain-Source On Resistance <sup>③</sup>	$V_{GS} = 10V, I_D = 2A$		3.12	3.8	$\Omega$
$V_{GS(th)}$	Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 0.5mA$	3	4	5	V
$\Delta V_{GS(th)}/\Delta T_J$	Threshold Voltage Temperature Coefficient			-10		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 1200V, T_J = 25^\circ\text{C}$ $V_{GS} = 0V, T_J = 125^\circ\text{C}$			100	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS} = \pm 30V$			500	nA

# Dynamic Characteristics

$T_J = 25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$g_{fs}$	Forward Transconductance	$V_{DS} = 50V, I_D = 2A$		4.5		S
$C_{iss}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1MHz$		1385		pF
$C_{rss}$	Reverse Transfer Capacitance			17		
$C_{oss}$	Output Capacitance			100		
$C_{o(cr)}^{④}$	Effective Output Capacitance, Charge Related	$V_{GS} = 0V, V_{DS} = 0V \text{ to } 800V$		40		
$C_{o(er)}^{⑤}$	Effective Output Capacitance, Energy Related			20		
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ to } 10V, I_D = 2A,$ $V_{DS} = 600V$		43		nC
$Q_{gs}$	Gate-Source Charge			7		
$Q_{gd}$	Gate-Drain Charge			20		
$t_{d(on)}$	Turn-On Delay Time	<b>Resistive Switching</b> $V_{DD} = 800V, I_D = 2A$ $R_G = 4.7\Omega^{⑥}, V_{GG} = 15V$		7.4		ns
$t_r$	Current Rise Time			4.4		
$t_{d(off)}$	Turn-Off Delay Time			24		
$t_f$	Current Fall Time			6.9		

# Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$I_S$	Continuous Source Current (Body Diode)	MOSFET symbol showing the integral reverse p-n junction diode (body diode)			5	A
$I_{SM}$	Pulsed Source Current (Body Diode) <sup>①</sup>				15	
$V_{SD}$	Diode Forward Voltage	$I_{SD} = 2A, T_J = 25^\circ\text{C}, V_{GS} = 0V$			1.3	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 2A, V_{DD} = 100V^{②}$ $di_{SD}/dt = 100A/\mu s, T_J = 25^\circ\text{C}$		1150		ns
$Q_{rr}$	Reverse Recovery Charge			16		$\mu C$
$dv/dt$	Peak Recovery $dv/dt$	$I_{SD} \leq 2A, di/dt \leq 1000A/\mu s, V_{DD} = 800V,$ $T_J = 125^\circ\text{C}$			10	V/ns

① Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.

② Starting at  $T_J = 25^\circ\text{C}, L = 155.0mH, R_G = 25\Omega, I_{AS} = 2A$ .

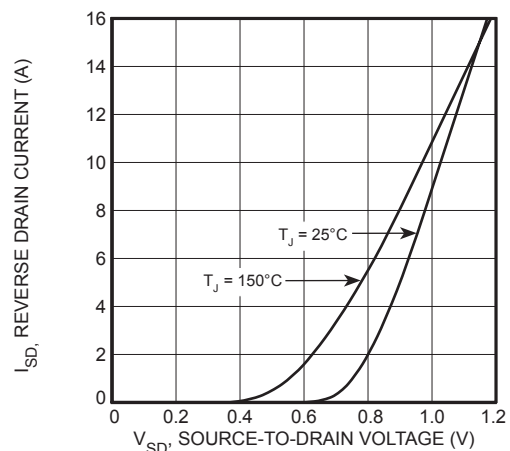
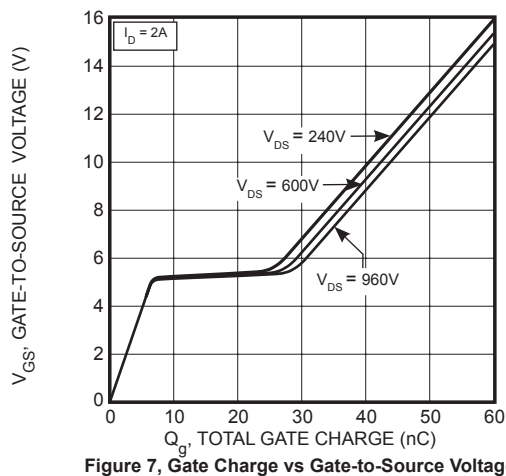
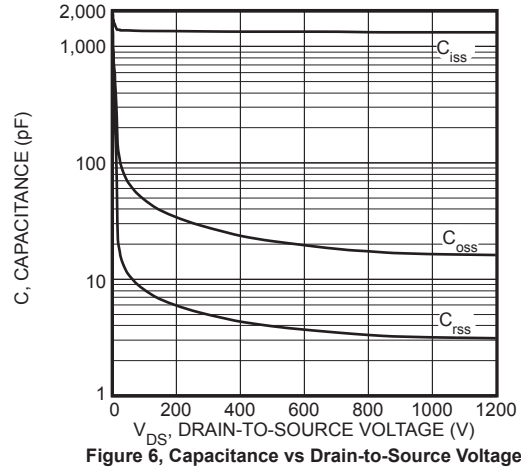
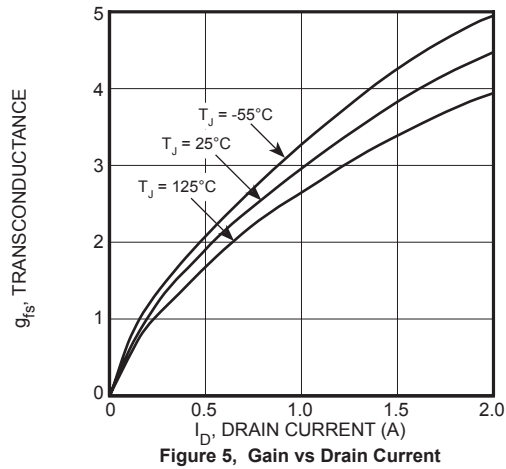
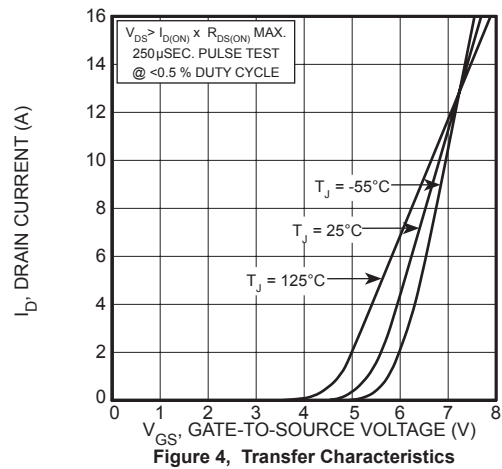
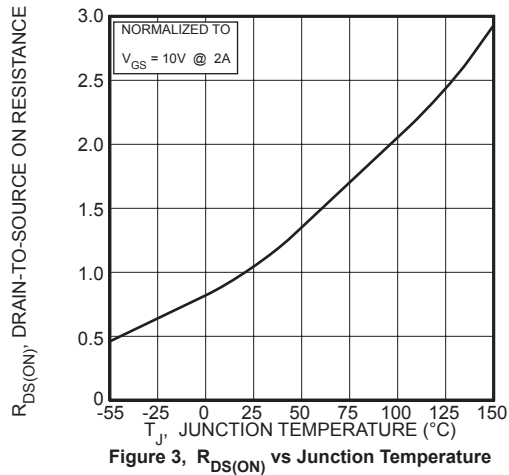
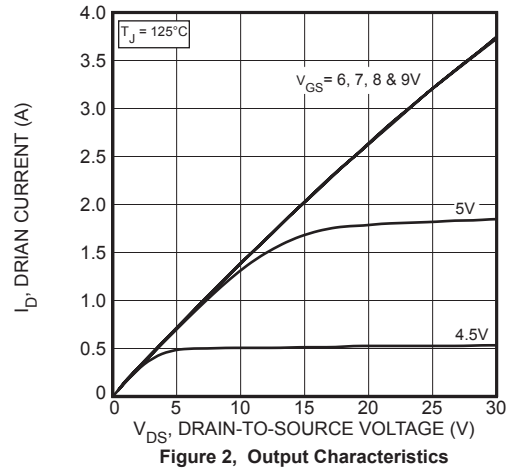
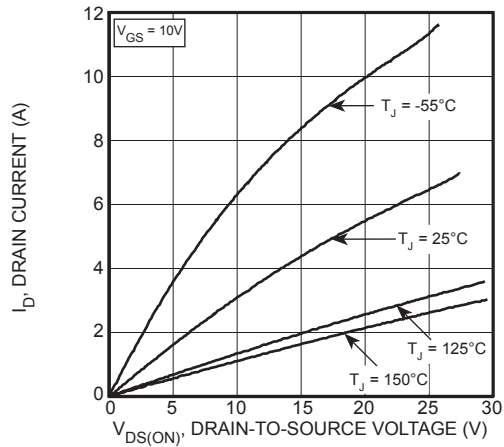
③ Pulse test: Pulse Width < 380 $\mu s$ , duty cycle < 2%.

④  $C_{o(cr)}$  is defined as a fixed capacitance with the same stored charge as  $C_{OSS}$  with  $V_{DS} = 67\%$  of  $V_{(BR)DSS}$ .

⑤  $C_{o(er)}$  is defined as a fixed capacitance with the same stored energy as  $C_{OSS}$  with  $V_{DS} = 67\%$  of  $V_{(BR)DSS}$ . To calculate  $C_{o(er)}$  for any value of  $V_{DS}$  less than  $V_{(BR)DSS}$ , use this equation:  $C_{o(er)} = -6.30E-8/V_{DS}^2 + 7.65E-9/V_{DS} + 1.09E-11$ .

⑥  $R_G$  is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

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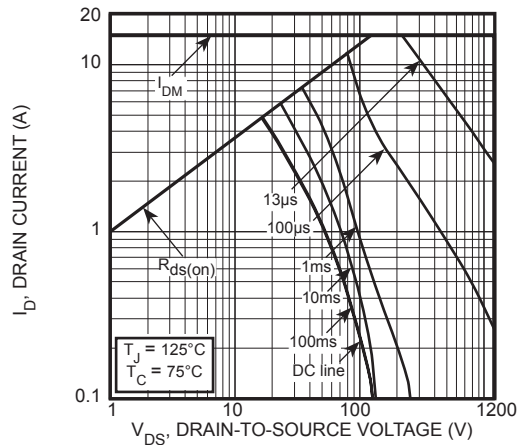


Figure 9, Forward Safe Operating Area

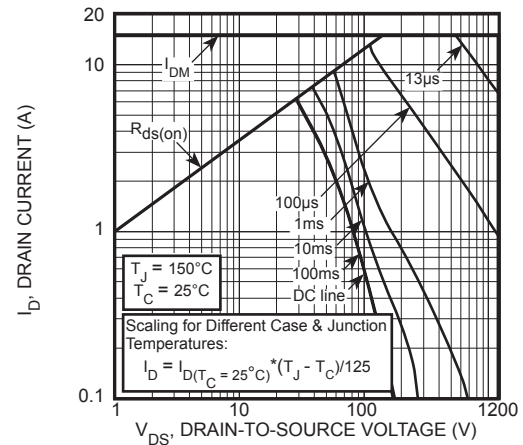


Figure 10, Maximum Forward Safe Operating Area

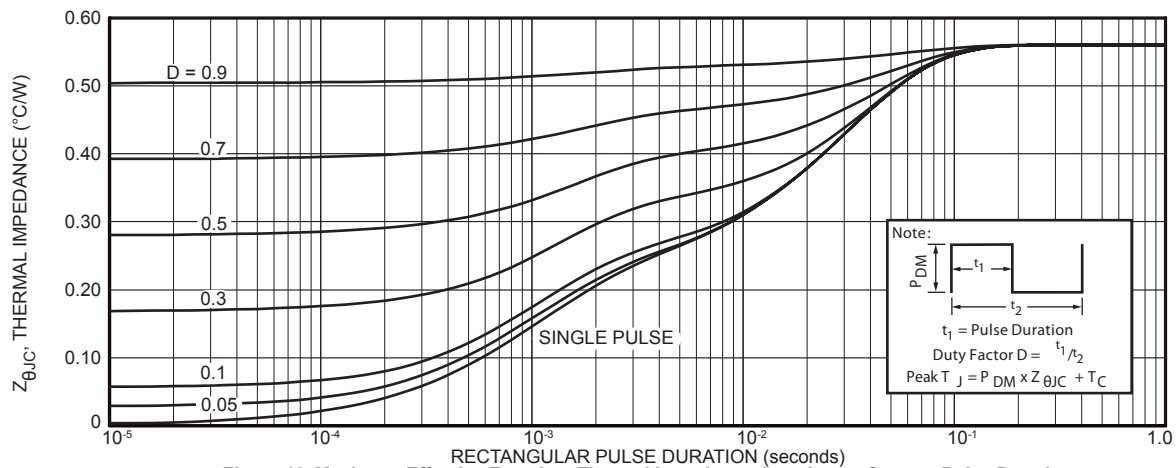
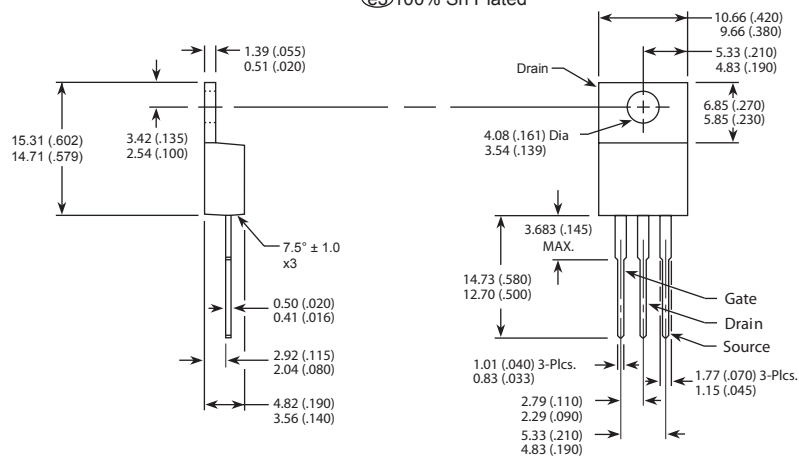


Figure 11. Maximum Effective Transient Thermal Impedance Junction-to-Case vs Pulse Duration

## TO-220 (K) Package Outline

Ⓢ100% Sn Plated



Dimensions in Millimeters and (Inches)

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