



**Advanced Power  
Electronics Corp.**

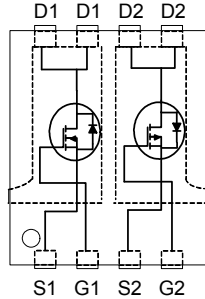
**AP3CA010MT**

**Halogen-Free Product**

*N AND P-CHANNEL ENHANCEMENT*

*MODE POWER MOSFET*

- ▼ Simple Drive Requirement
- ▼ Low Gate Charge
- ▼ Fast Switching Performance
- ▼ RoHS Compliant & Halogen-Free

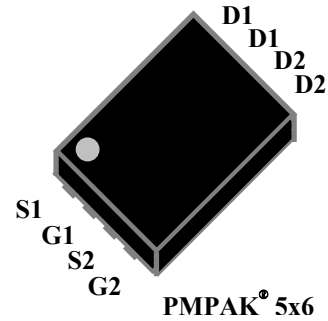


N-CH	$BV_{DSS}$	30V
	$R_{DS(ON)}$	9.6m $\Omega$
	$I_D^3$	15A
P-CH	$BV_{DSS}$	-30V
	$R_{DS(ON)}$	19m $\Omega$
	$I_D^3$	-11A

## Description

AP3CA010 series are from Advanced Power innovated design and silicon process technology to achieve the lowest possible on-resistance and fast switching performance. It provides the designer with an extreme efficient device for use in a wide range of power applications.

The PMPAK<sup>®</sup> 5x6 package is special for voltage conversion application using standard infrared reflow technique with the backside heat sink to achieve the good thermal performance.



## Absolute Maximum Ratings@T<sub>j</sub>=25°C(unless otherwise specified)

Symbol	Parameter	Rating		Units
		N-channel	P-channel	
$V_{DS}$	Drain-Source Voltage	30	-30	V
$V_{GS}$	Gate-Source Voltage	+20	+20	V
$I_D@T_A=25^\circ C$	Drain Current, $V_{GS} @ 10V^3$	15	-11	A
$I_D@T_A=70^\circ C$	Drain Current, $V_{GS} @ 10V^3$	12	-9	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	40	-30	A
$P_D@T_A=25^\circ C$	Total Power Dissipation	3.57		W
$T_{STG}$	Storage Temperature Range	-55 to 150		°C
$T_J$	Operating Junction Temperature Range	-55 to 150		°C

## Thermal Data

Symbol	Parameter	Rating		Units
		N-channel	P-channel	
Rthj-c	Maximum Thermal Resistance, Junction-case	5	5	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient <sup>3</sup>	35	35	°C/W



# AP3CA010MT

## N-CH Electrical Characteristics @ $T_j=25^\circ\text{C}$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=9A$	-	-	9.6	m $\Omega$
		$V_{GS}=4.5V, I_D=5A$	-	-	14.5	m $\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.3	-	2.3	V
$g_{fs}$	Forward Transconductance	$V_{DS}=5V, I_D=9A$	-	35	-	S
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=24V, V_{GS}=0V$	-	-	10	$\mu A$
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 0.1$	$\mu A$
$Q_g$	Total Gate Charge	$I_D=9A$	-	20	32	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=15V$	-	4	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=10V$	-	4	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=15V$	-	9	-	ns
$t_r$	Rise Time	$I_D=1A$	-	8	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega$	-	23	-	ns
$t_f$	Fall Time	$V_{GS}=10V$	-	6	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	1000	1600	pF
$C_{oss}$	Output Capacitance	$V_{DS}=25V$	-	120	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	100	-	pF
$R_g$	Gate Resistance	$f=1.0\text{MHz}$	-	1.8	3.6	$\Omega$

## Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{SD}$	Forward On Voltage <sup>2</sup>	$I_S=2.9A, V_{GS}=0V$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_S=9A, V_{GS}=0V$	-	10	-	ns
$Q_{rr}$	Reverse Recovery Charge	$dI/dt=100A/\mu s$	-	3.5	-	nC

**P-CH Electrical Characteristics@T<sub>j</sub>=25°C(unless otherwise specified)**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-30	-	-	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-10V, I_D=-7A$	-	-	19	mΩ
		$V_{GS}=-4.5V, I_D=-4A$	-	-	32	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.3	-	-2.3	V
$g_{fs}$	Forward Transconductance	$V_{DS}=-5V, I_D=-7A$	-	18	-	S
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-24V, V_{GS}=0V$	-	-	-10	μA
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 0.1$	μA
$Q_g$	Total Gate Charge	$I_D=-7A$	-	30	48	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=-15V$	-	6	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=-10V$	-	5	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=-15V$	-	12	-	ns
$t_r$	Rise Time	$I_D=-1A$	-	10	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega$	-	65	-	ns
$t_f$	Fall Time	$V_{GS}=-10V$	-	33	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	1680	2688	pF
$C_{oss}$	Output Capacitance	$V_{DS}=-25V$	-	210	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0MHz$	-	160	-	pF
$R_g$	Gate Resistance	$f=1.0MHz$	-	11	22	Ω

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{SD}$	Forward On Voltage <sup>2</sup>	$I_S=-2.9A, V_{GS}=0V$	-	-	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_S=-7A, V_{GS}=0V$	-	14	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt=-100A/\mu s$	-	6	-	nC

**Notes:**

- 1.Pulse width limited by Max. junction temperature.
- 2.Pulse test
- 3.Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board,  $t \leq 10sec$  ; 85°C/W at steady state.

THIS PRODUCT IS SENSITIVE TO ELECTROSTATIC DISCHARGE, PLEASE HANDLE WITH CAUTION.

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT, AUTOMOTIVE OR OTHER SIMILAR SYSTEMS IS NOT AUTHORIZED. APEC DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

APEC RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN.



## N-Channel

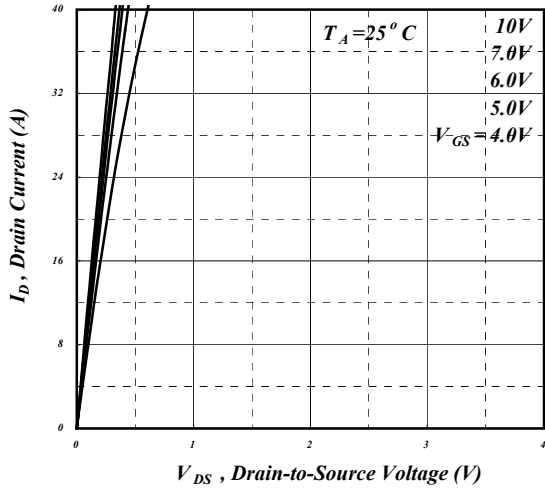


Fig 1. Typical Output Characteristics

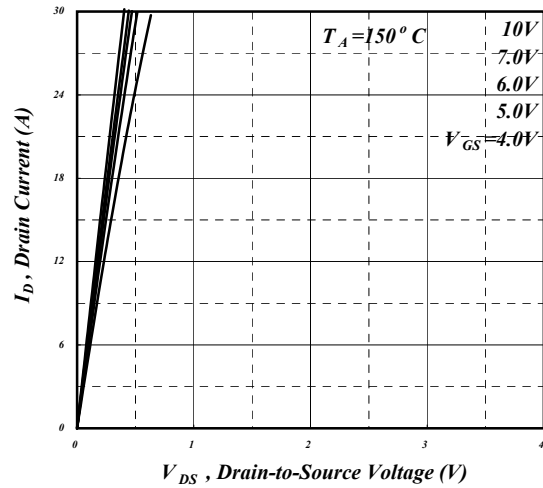


Fig 2. Typical Output Characteristics

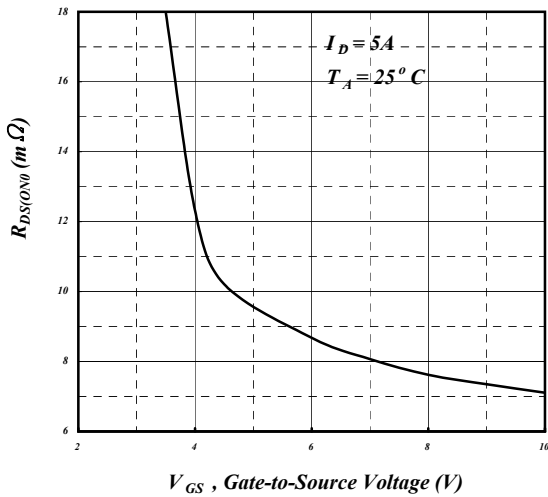


Fig 3. On-Resistance v.s. Gate Voltage

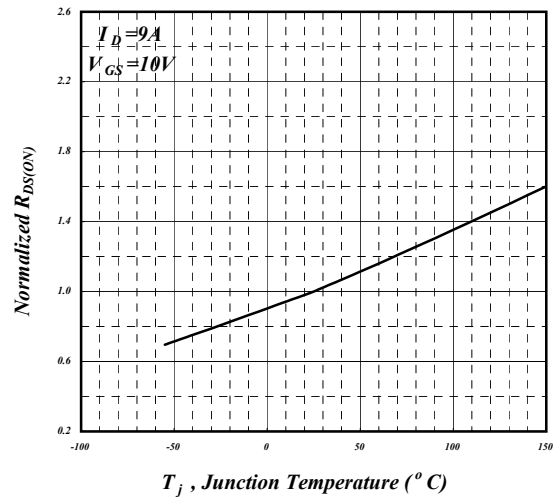


Fig 4. Normalized On-Resistance v.s. Junction Temperature

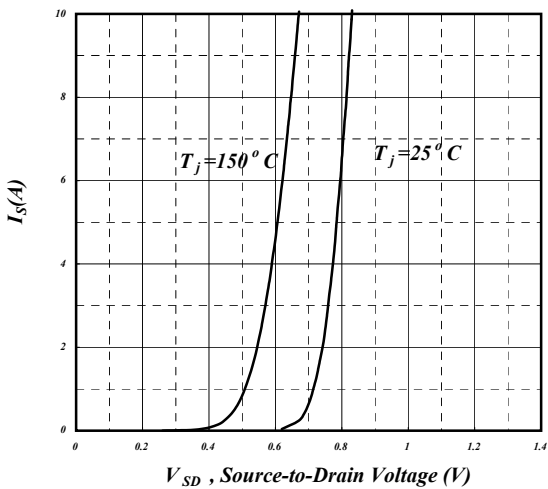


Fig 5. Forward Characteristic of Reverse Diode

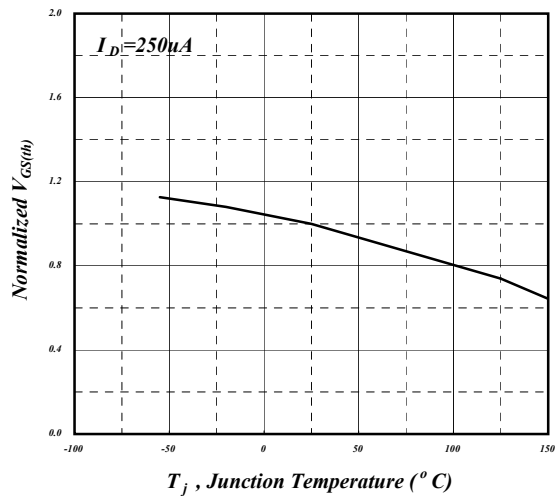


Fig 6. Gate Threshold Voltage v.s. Junction Temperature



N-Channel

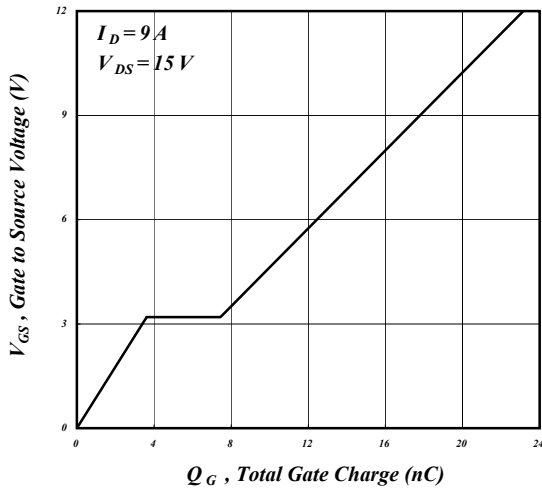


Fig 7. Gate Charge Characteristics

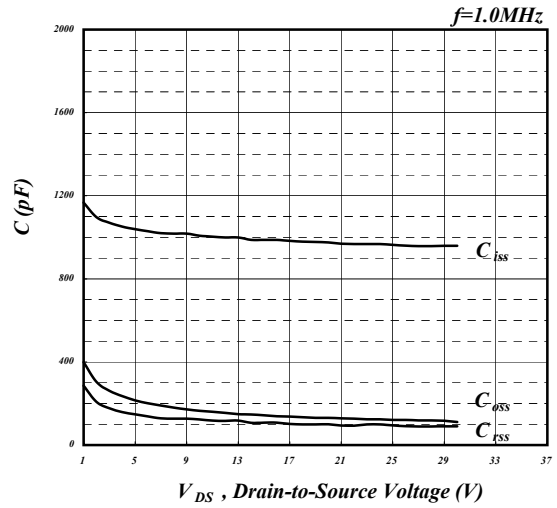


Fig 8. Typical Capacitance Characteristics

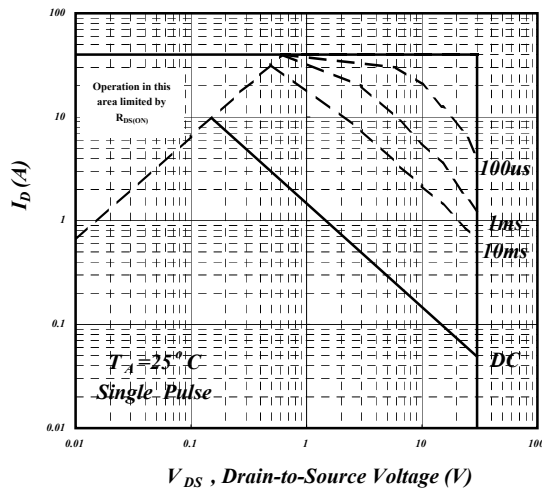


Fig 9. Maximum Safe Operating Area

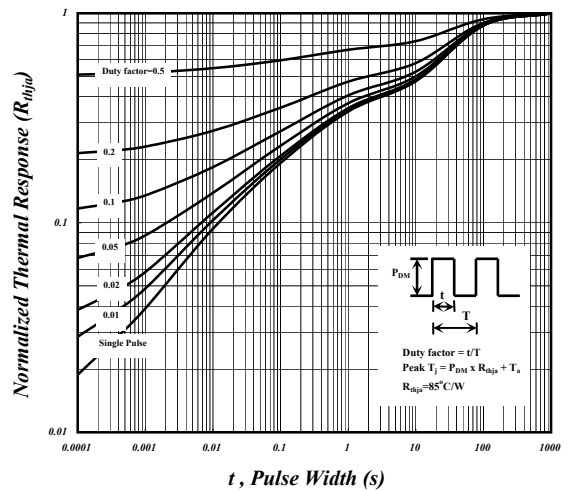


Fig 10. Effective Transient Thermal Impedance

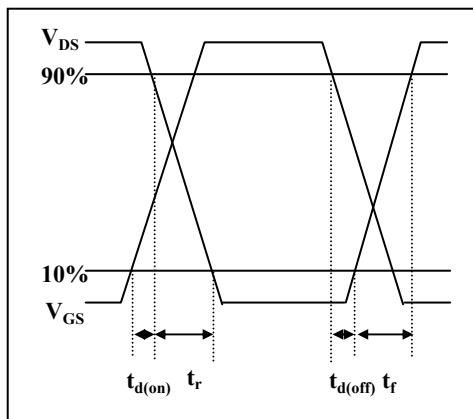


Fig 11. Switching Time Waveform

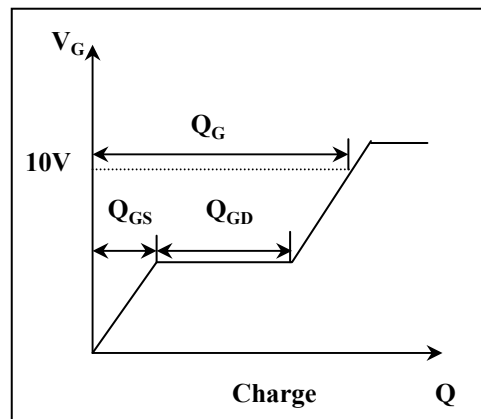


Fig 12. Gate Charge Waveform



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## N-Channel

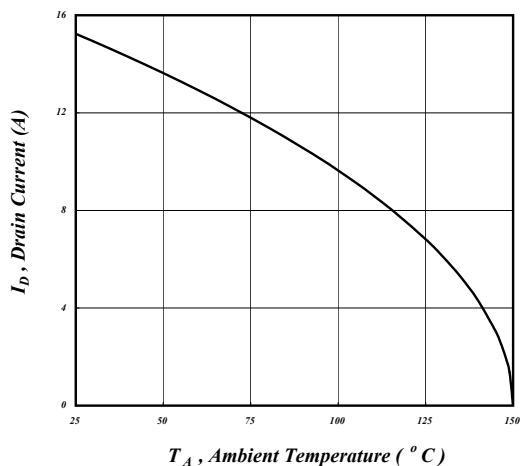


Fig 13. Drain Current v.s. Ambient Temperature

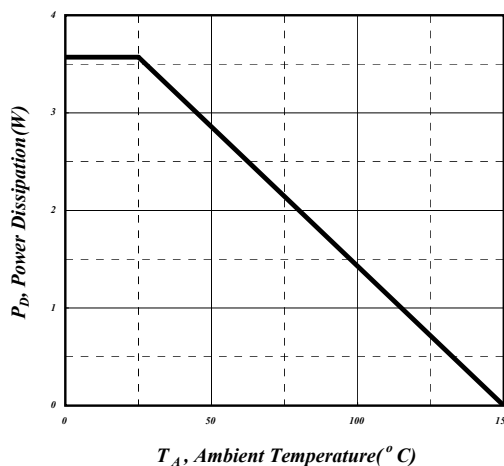


Fig 14. Total Power Dissipation

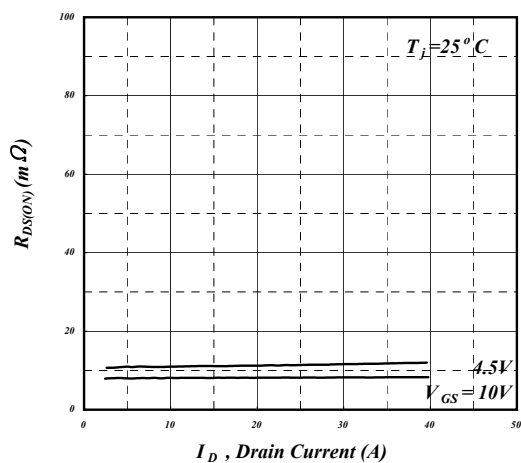


Fig 15. Typ. Drain-Source on State Resistance

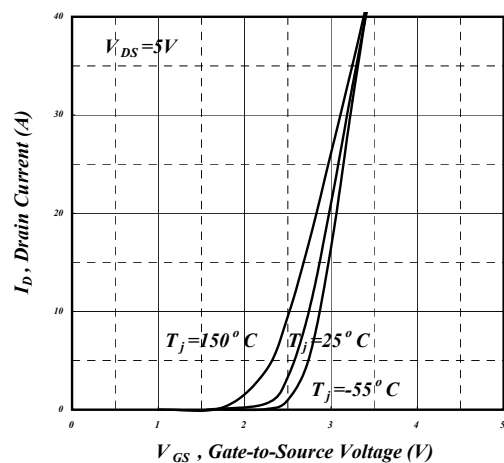


Fig 16. Transfer Characteristics



P-Channel

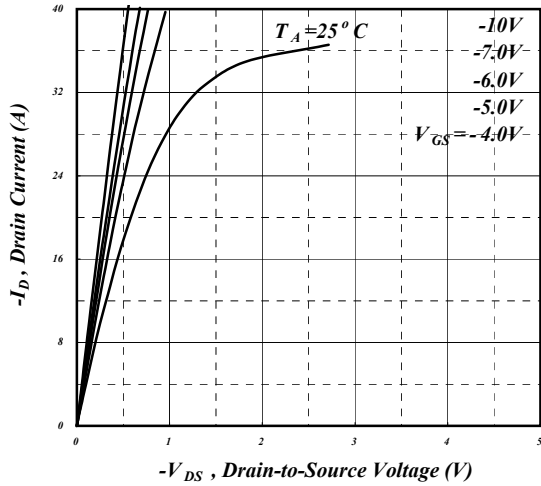


Fig 1. Typical Output Characteristics

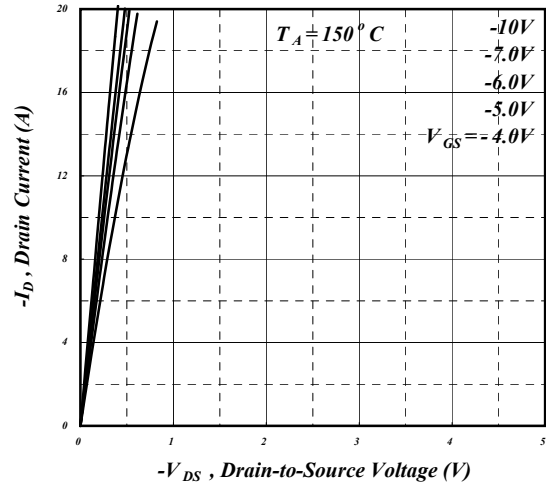


Fig 2. Typical Output Characteristics

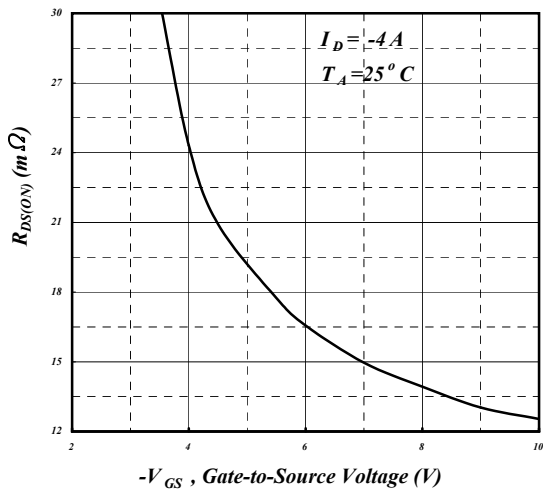


Fig 3. On-Resistance v.s. Gate Voltage

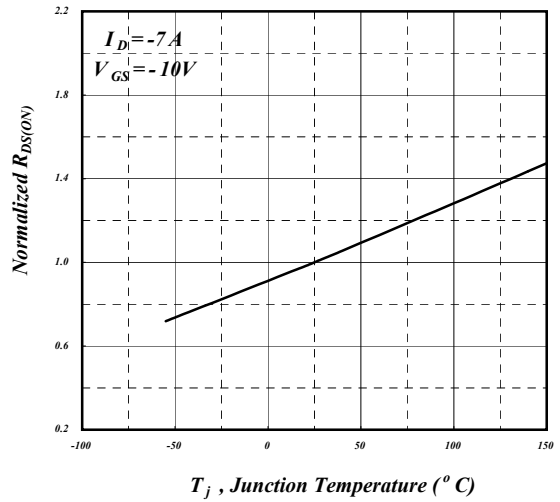


Fig 4. Normalized On-Resistance v.s. Junction Temperature

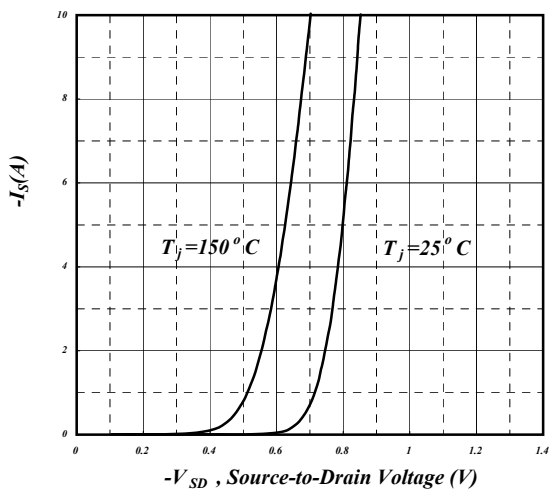


Fig 5. Forward Characteristic of Reverse Diode

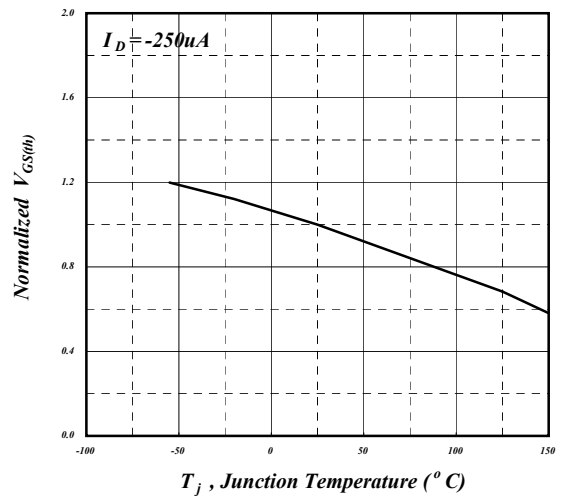


Fig 6. Gate Threshold Voltage v.s. Junction Temperature



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## P-Channel

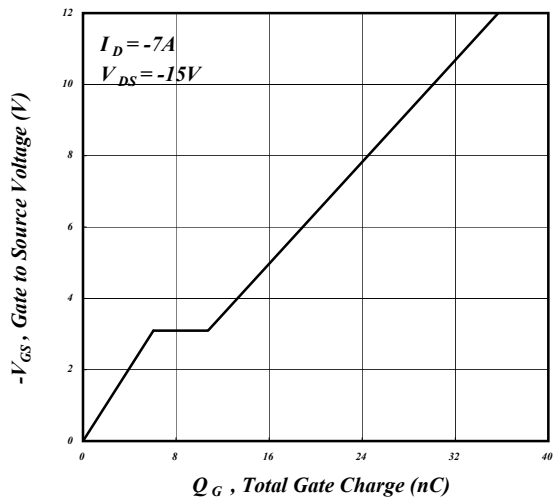


Fig 7. Gate Charge Characteristics

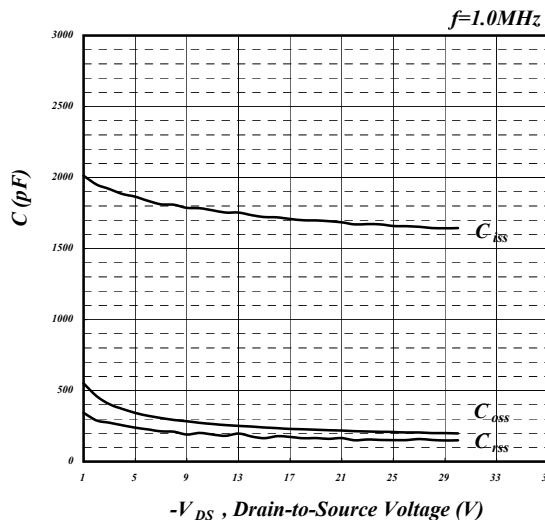


Fig 8. Typical Capacitance Characteristics

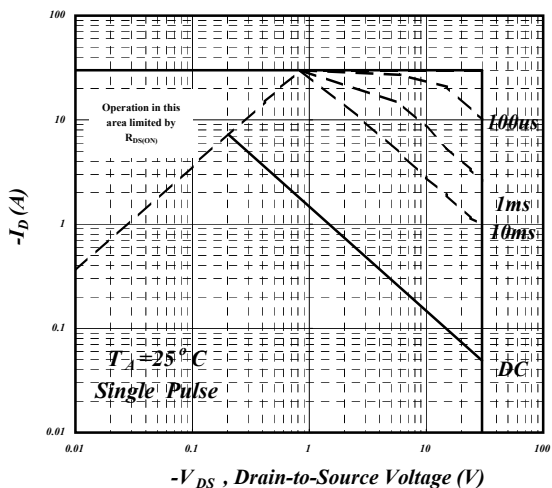


Fig 9. Maximum Safe Operating Area

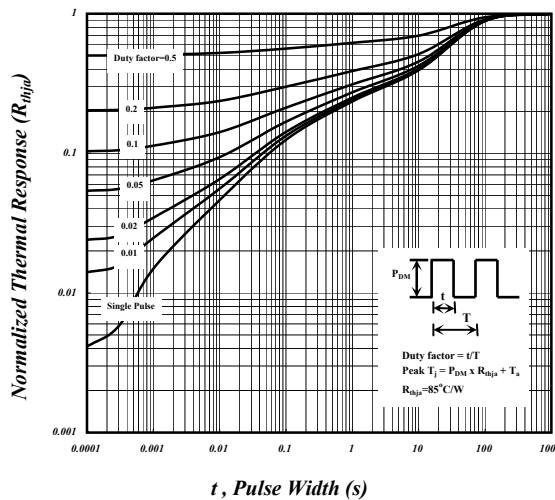


Fig 10. Effective Transient Thermal Impedance

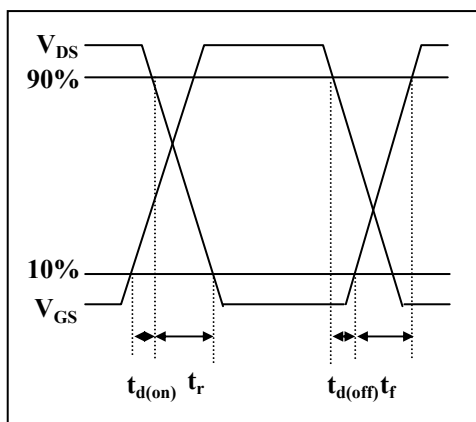


Fig 11. Switching Time Waveform

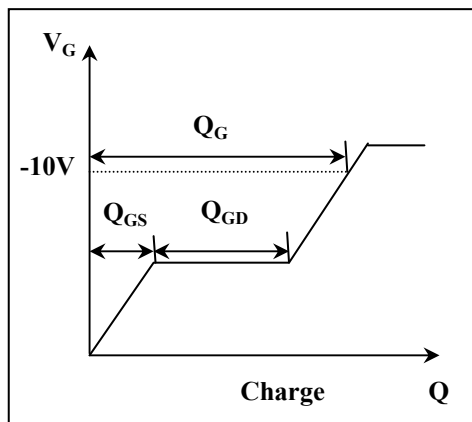


Fig 12. Gate Charge Waveform





P-Channel

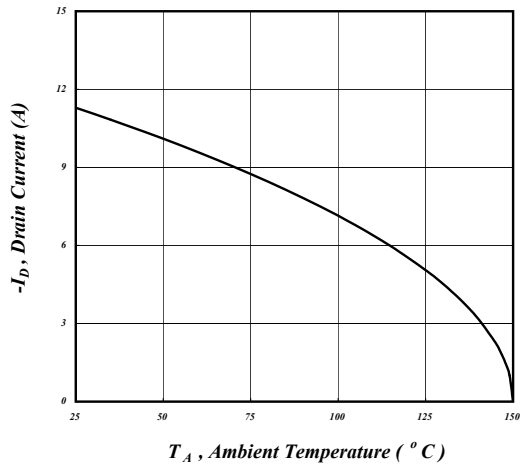


Fig 13. Drain Current v.s. Ambient Temperature

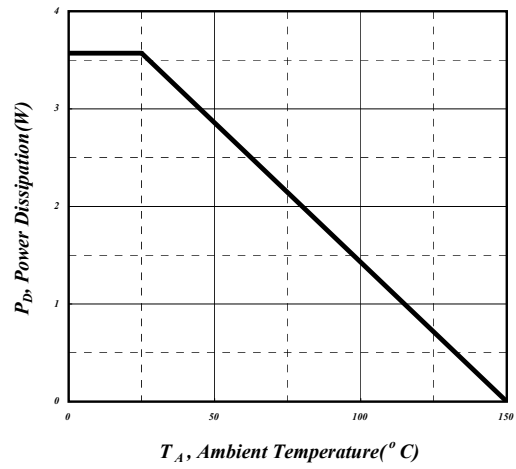


Fig 14. Total Power Dissipation

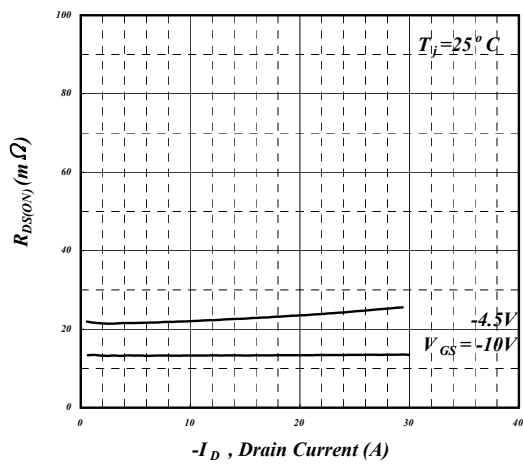


Fig 15. Typ. Drain-Source on State Resistance

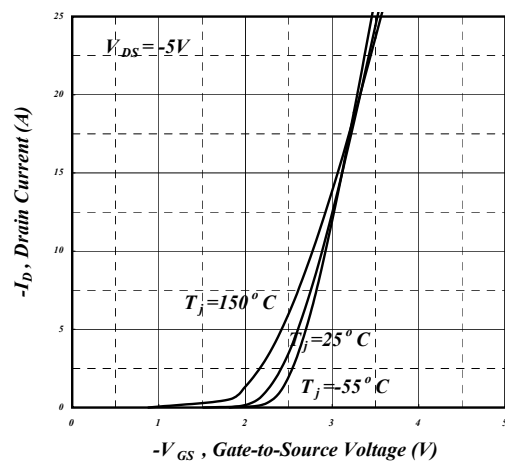


Fig 16. Transfer Characteristics



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## MARKING INFORMATION

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