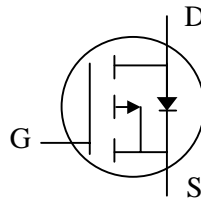




**P-channel Enhancement-mode Power MOSFET**

- 2.5V Gate Drive Capability**
- Simple Drive Requirement**
- Fast Switching Characteristic**
- RoHS-compliant**



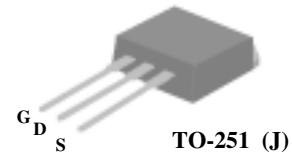
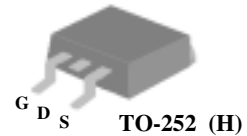
$BV_{DSS}$	-20V
$R_{DS(ON)}$	52mΩ
$I_D$	-18A

**Description**

Advanced Power MOSFETs from APEC provide the designer with the best combination of fast switching, low on-resistance and cost-effectiveness.

The AP20P02GH-3 is in the TO-252 package, which is widely used for commercial and industrial surface-mount applications, and is well suited for low voltage applications such as DC/DC converters.

The AP20P02GJ-3 is in the TO-251 through-hole package which is used where a small PCB footprint or an attached heatsink is required.



**Absolute Maximum Ratings**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	±12	V
$I_D$ at $T_C=25\text{ }^\circ\text{C}$	Continuous Drain Current <sup>3</sup>	-18	A
$I_D$ at $T_C=100\text{ }^\circ\text{C}$	Continuous Drain Current <sup>3</sup>	-14	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	-50	A
$P_D$ at $T_C=25\text{ }^\circ\text{C}$	Total Power Dissipation	31.25	W
	Linear Derating Factor	0.25	W/°C
$T_{STG}$	Storage Temperature Range	-55 to 150	°C
$T_J$	Operating Junction Temperature Range	-55 to 150	°C

**Thermal Data**

Symbol	Parameter	Value	Unit
Rthj-c	Maximum Thermal Resistance, Junction-case	4.0	°C/W
Rthj-a	Maximum Thermal Resistance, Junction-ambient	110	°C/W

**Ordering Information**

**AP20P02GH-3TR**      **RoHS-compliant TO-252, shipped on tape and reel (3000 pcs/reel)**

**AP20P02GJ-3TB**      **RoHS-compliant TO-251, shipped in tubes**



**Electrical Specifications at  $T_j=25^\circ\text{C}$  (unless otherwise specified)**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20	-	-	V
$\Delta BV_{DSS} / \Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=-1\text{mA}$	-	-0.03	-	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-4.5V, I_D=-8A$	-	-	52	m $\Omega$
		$V_{GS}=-2.5V, I_D=-5A$	-	-	85	m $\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.5	-	-	V
$g_{fs}$	Forward Transconductance	$V_{DS}=-10V, I_D=-8A$	-	15	-	S
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-20V, V_{GS}=0V$	-	-	-1	$\mu A$
	Drain-Source Leakage Current ( $T_j=125^\circ\text{C}$ )	$V_{DS}=-16V, V_{GS}=0V$	-	-	-25	$\mu A$
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 25V, V_{DS}=0V$	-	-	$\pm 100$	nA
$Q_g$	Total Gate Charge <sup>2</sup>	$I_D=-8A$	-	13.5	-	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=-16V$	-	2.1	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=-4.5V$	-	1.6	-	nC
$t_{d(on)}$	Turn-on Delay Time <sup>2</sup>	$V_{DS}=-10V$	-	12	-	ns
$t_r$	Rise Time	$I_D=-8A$	-	20	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=-4.5V$	-	45	-	ns
$t_f$	Fall Time	$R_D=1.25\Omega$	-	27	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	1050	-	pF
$C_{oss}$	Output Capacitance	$V_{DS}=-16V$	-	410	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	110	-	pF

**Source-Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$I_S$	Continuous Source Current ( Body Diode )	$V_D=V_G=0V, V_S=-1.2V$	-	-	-10	A
$I_{SM}$	Pulsed Source Current ( Body Diode ) <sup>1</sup>		-	-	-50	A
$V_{SD}$	Forward On Voltage <sup>2</sup>	$T_j=25^\circ\text{C}, I_S=-10A, V_{GS}=0V$	-	-	-1.2	V

**Notes:**

1. Pulse width limited by safe operating area
2. Pulse test - pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

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

USE OF THIS PRODUCT AS A CRITICAL COMPONENT IN LIFE SUPPORT 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.



Typical Electrical Characteristics

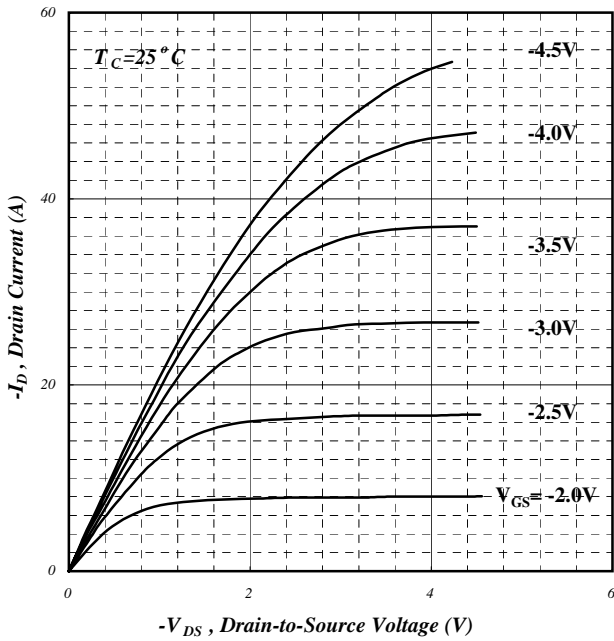


Fig 1. Typical Output Characteristics

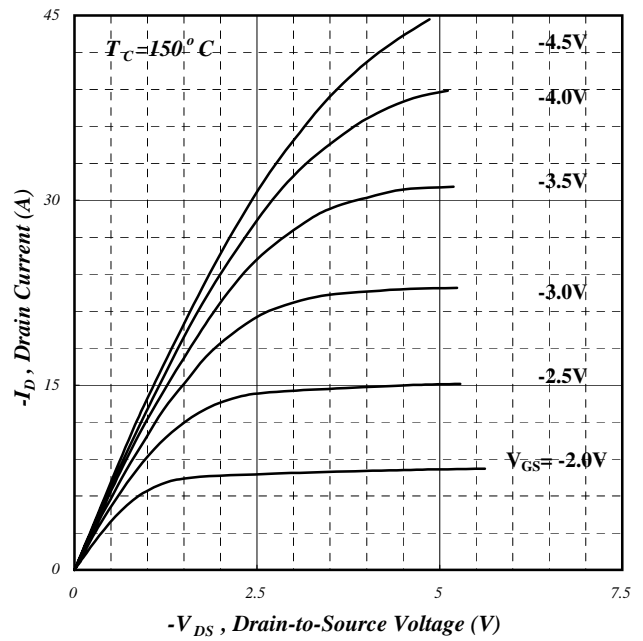


Fig 2. Typical Output Characteristics

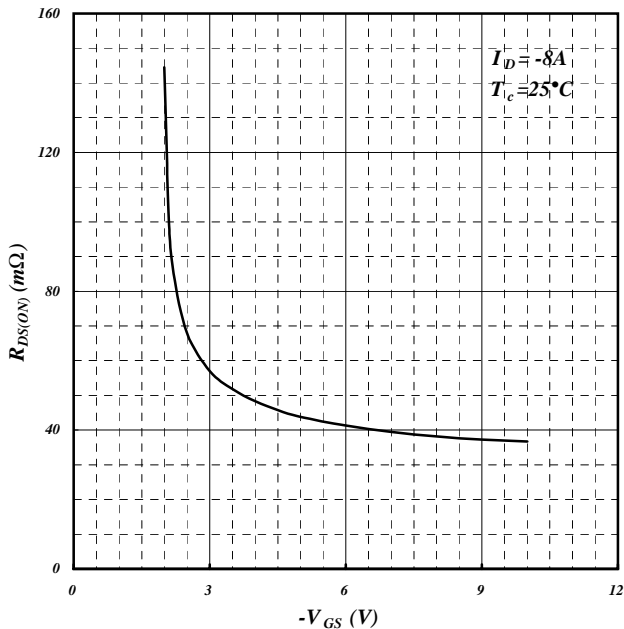


Fig 3. On-Resistance v.s. Gate Voltage

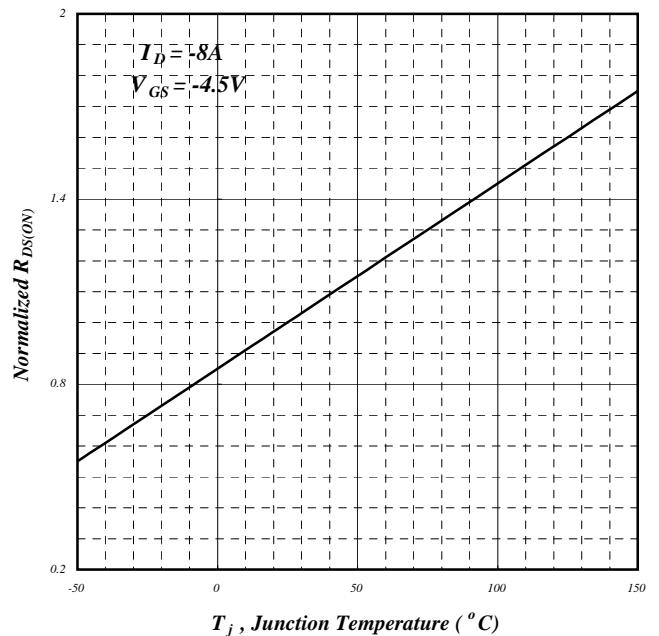


Fig 4. Normalized On-Resistance vs. Junction Temperature



Typical Electrical Characteristics

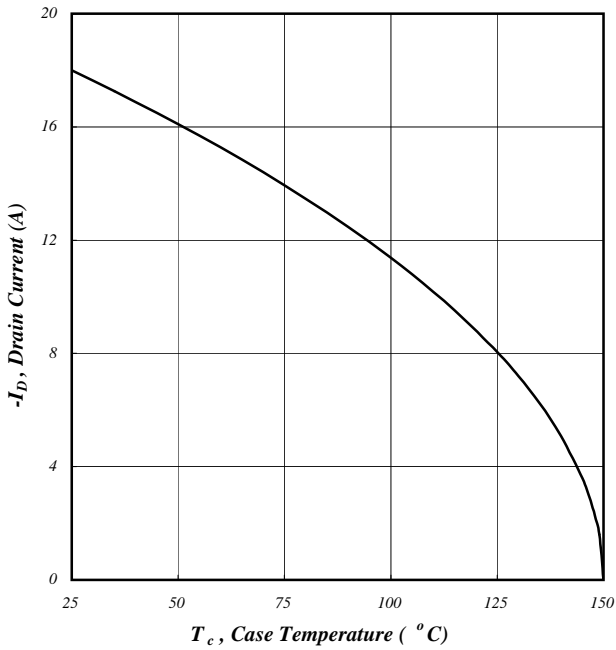


Fig 5. Maximum Drain Current v.s. Case Temperature

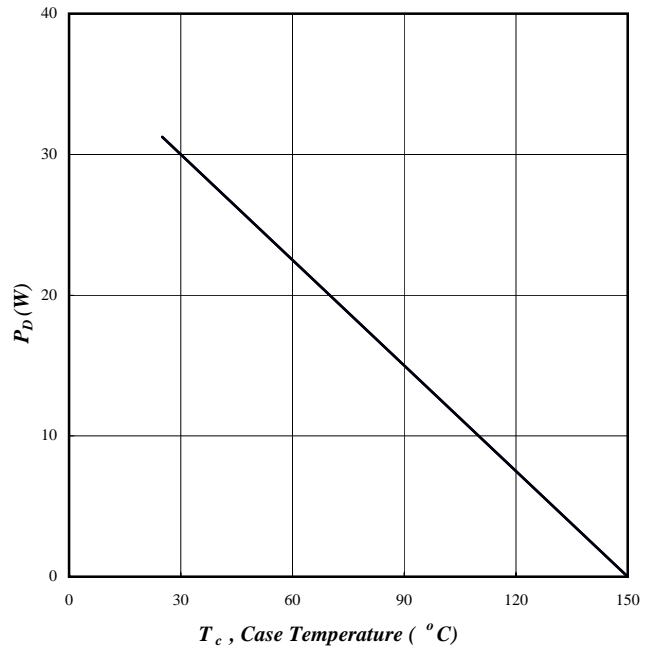


Fig 6. Typical Power Dissipation

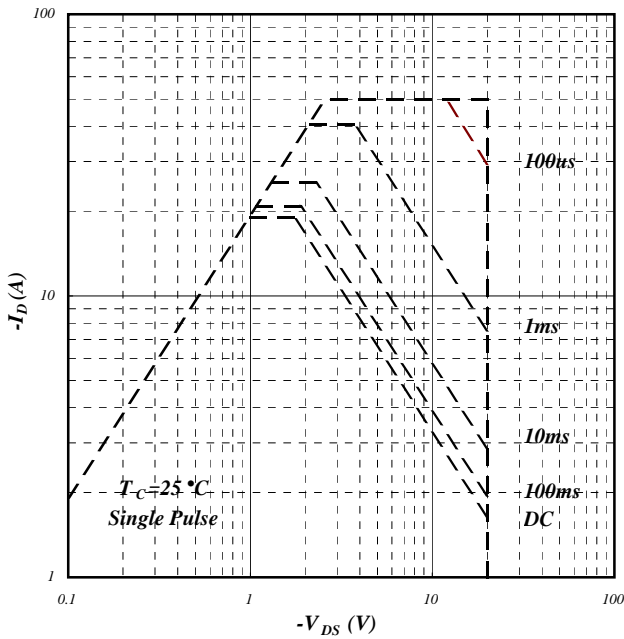


Fig 7. Maximum Safe Operating Area

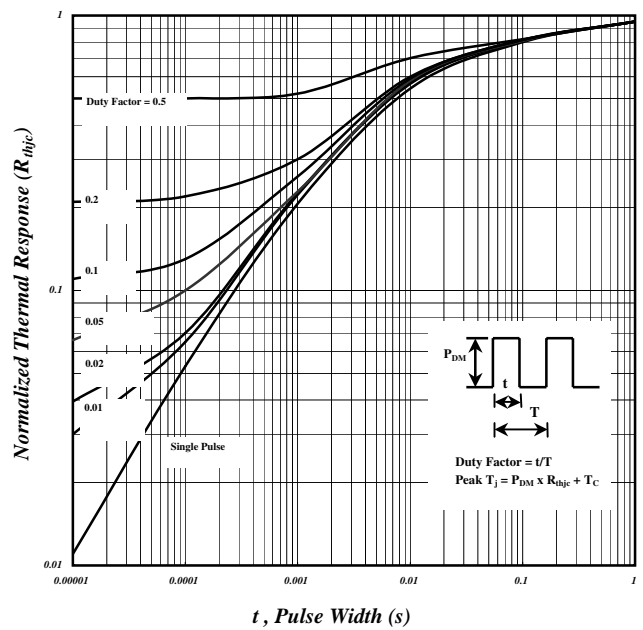


Fig 8. Effective Transient Thermal Impedance



Typical Electrical Characteristics

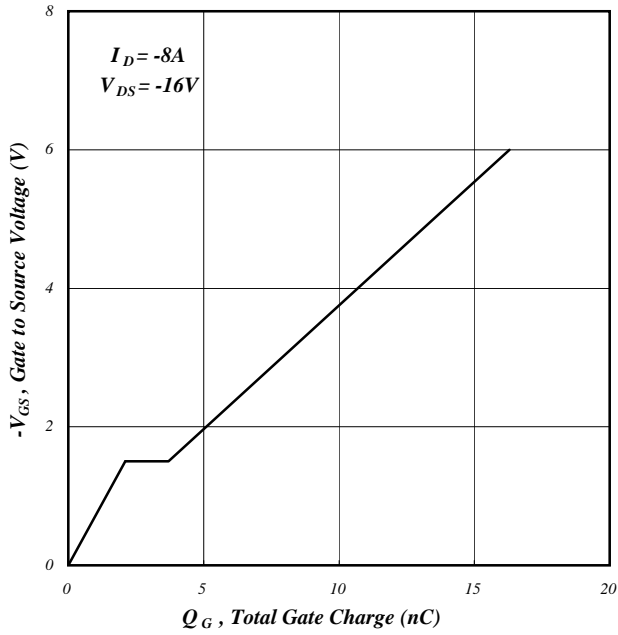


Fig 9. Gate Charge Characteristics

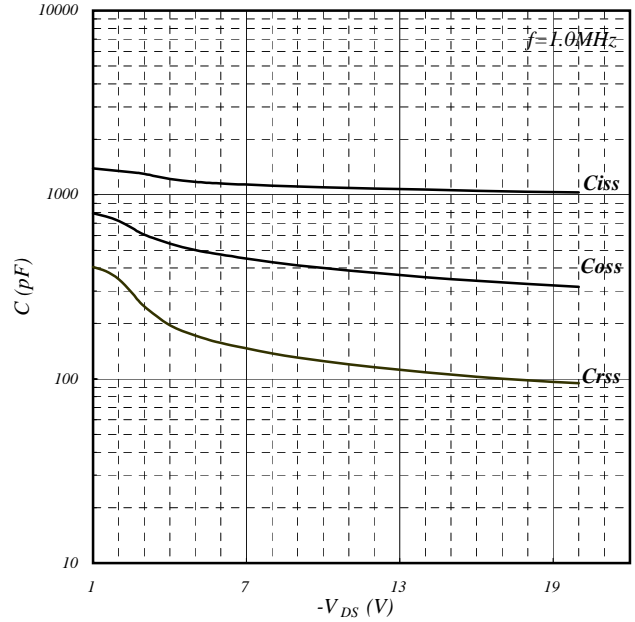


Fig 10. Typical Capacitance Characteristics

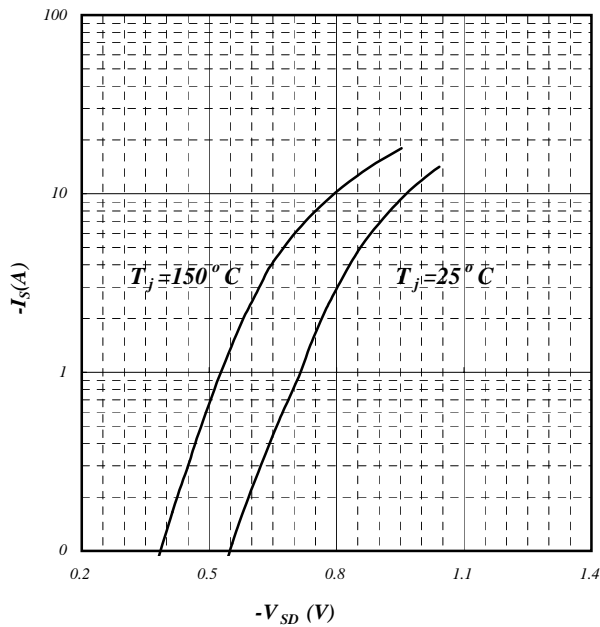


Fig 11. Forward Characteristic of  
Reverse Diode

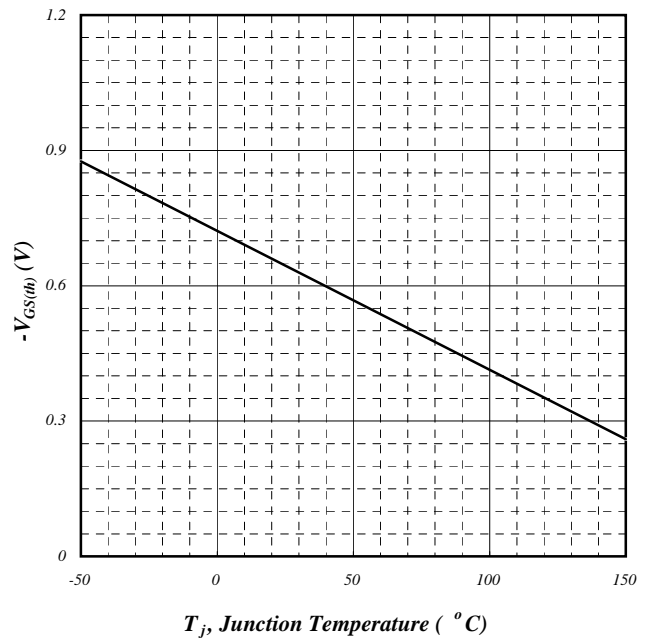


Fig 12. Gate Threshold Voltage v.s.  
Junction Temperature



Typical Electrical Characteristics (cont.)

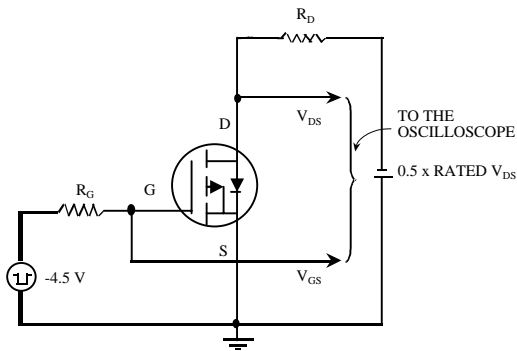


Fig 13. Switching Time Circuit

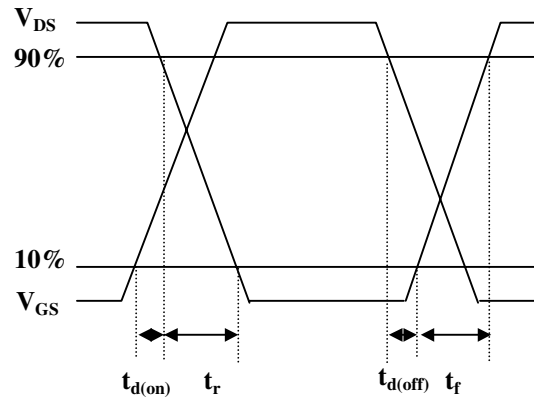


Fig 14. Switching Time Waveform

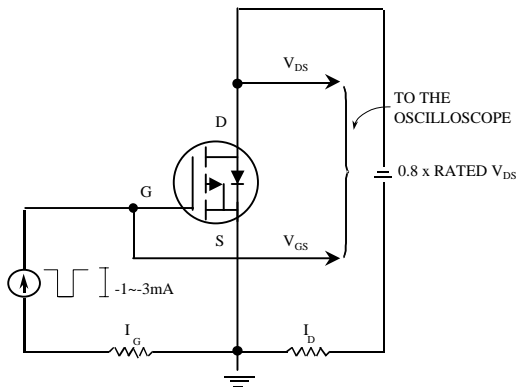


Fig 15. Gate Charge Circuit

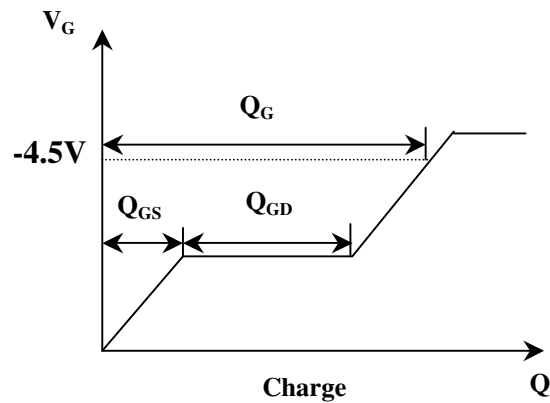
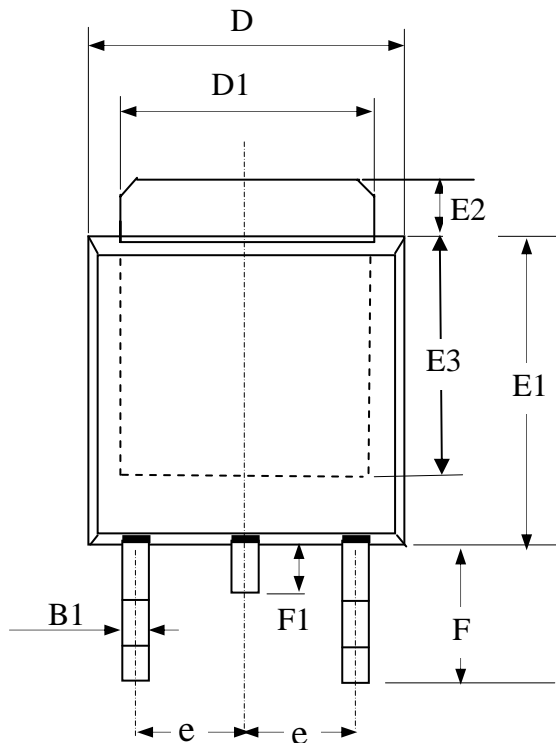


Fig 16. Gate Charge Waveform

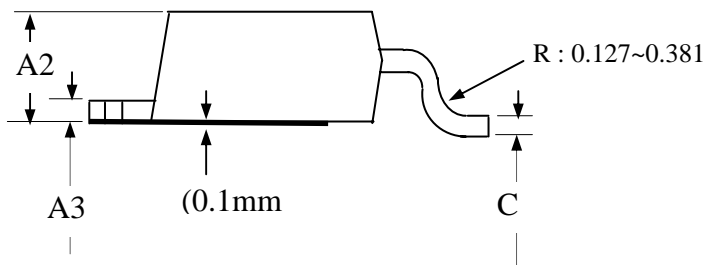


**Package Dimensions: TO-252**



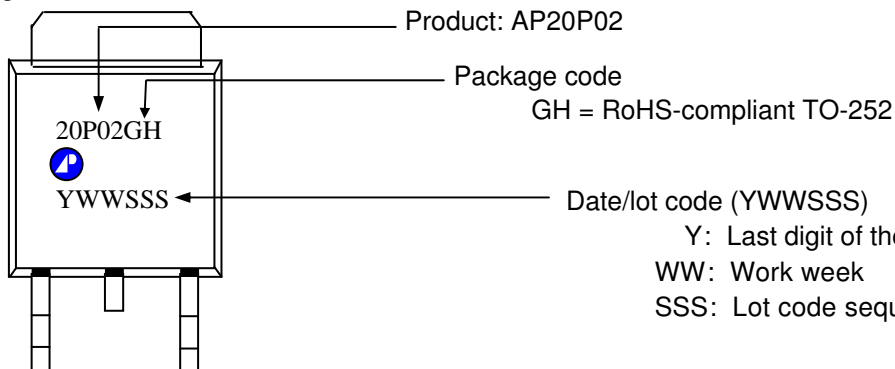
SYMBOLS	Millimeters		
	MIN	NOM	MAX
A2	1.80	2.30	2.80
A3	0.40	0.50	0.60
B1	0.40	0.70	1.00
D	6.00	6.50	7.00
D1	4.80	5.35	5.90
E3	3.50	4.00	4.50
F	2.20	2.63	3.05
F1	0.50	0.85	1.20
E1	5.10	5.70	6.30
E2	0.50	1.10	1.80
e	--	2.30	--
C	0.35	0.50	0.65

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.



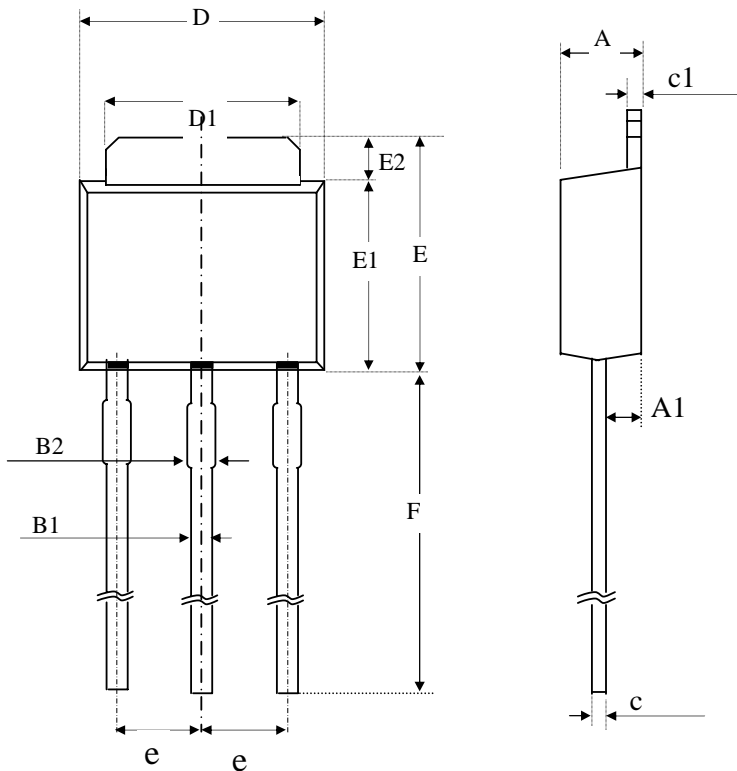
**Marking Information**

Laser Marking





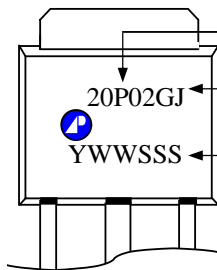
**Package Dimensions: TO-251**



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.90	1.20	1.50
B1	0.40	0.60	0.80
B2	0.60	0.85	1.05
c	0.40	0.50	0.60
c1	0.40	0.50	0.60
D	6.40	6.60	6.80
D1	4.80	5.20	5.50
E	6.70	7.00	7.30
E1	5.40	5.60	5.80
E2	1.30	1.50	1.70
e	----	2.30	----
F	7.00	8.30	9.60

1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

**Marking Information**



Product: AP20P02  
 Package Code  
 GJ = RoHS-compliant TO-251  
 Date Code (YWWSSS)  
 Y : Last digit of the year  
 WW : Work week  
 SSS : Lot code sequence