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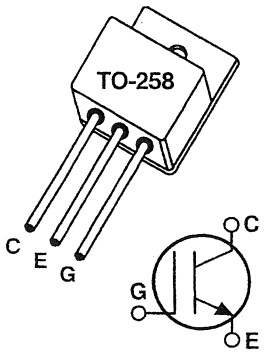
APT33GF120HR

1200V 38A

Fast IGBT



The Fast IGBT is a new generation of high voltage power IGBTs. Using Non-Punch Through Technology the Fast IGBT offers superior ruggedness, fast switching speed and low Collector-Emitter On voltage.

- **Low Forward Voltage Drop**
- **Low Tail Current**
- **Avalanche Rated**
- **Hermetic Package**
- **High Freq. Switching to 20KHz**
- **Ultra Low Leakage Current**
- **RBSOA and SCSOA Rated**

MAXIMUM RATINGS All Ratings: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT33GF120HR	UNIT
V_{CES}	Collector-Emitter Voltage	1200	Volts
V_{CGR}	Collector-Gate Voltage (R_{GE} = 20KΩ)	1200	
V_{GE}	Gate-Emitter Voltage	±20	
I_{C1}	Continuous Collector Current @ T_C = 25°C	38	Amps
I_{C2}	Continuous Collector Current @ T_C = 90°C	33	
I_{CM}	Pulsed Collector Current ① @ T_C = 25°C	76	
I_{LM}	RBSOA Clamped Inductive Load Current @ R_g = 11Ω T_C = 125°C	66	
E_{AS}	Single Pulse Avalanche Energy ②	65	mJ
P_D	Total Power Dissipation	205	Watts
T_J,T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	°C
T_L	Max. Lead Temp. for Soldering: 0.063" from Case for 10 Sec.	300	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{CES}	Collector-Emitter Breakdown Voltage (V_{GE} = 0V, I_C = 0.8mA)	1200			Volts
$V_{GE(TH)}$	Gate Threshold Voltage (V_{CE} = V_{GE}, I_C = 700μA, T_j = 25°C)	4.5	5.5	6.5	
$V_{CE(ON)}$	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = I_{C2}, T_j = 25°C)		2.7	3.2	
	Collector-Emitter On Voltage (V_{GE} = 15V, I_C = I_{C2}, T_j = 125°C)		3.3	3.9	
I_{CES}	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 25°C)			0.8	mA
	Collector Cut-off Current (V_{CE} = V_{CES}, V_{GE} = 0V, T_j = 125°C)			5.0	
I_{GES}	Gate-Emitter Leakage Current (V_{GE} = ±20V, V_{CE} = 0V)			±100	nA

CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

APT Website - http://www.advancedpower.com

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050-5974 Rev - 6-2000

DYNAMIC CHARACTERISTICS

APT33GF120HR

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{ies}	Input Capacitance	**Capacitance** V_{GE} = 0V, V_{CE} = 25V, f = 1 MHz		1850		pF
C_{oes}	Output Capacitance			200		
C_{res}	Reverse Transfer Capacitance			110		
Q_g	Total Gate Charge ③	**Gate Charge** V_{GE} = 15V, V_{CC} = 0.5V_{CES}, I_C = I_{C2}		165		nC
Q_{ge}	Gate-Emitter Charge			20		
Q_{gc}	Gate-Collector ("Miller") Charge			100		
$t_d(on)$	Turn-on Delay Time	**Resistive Switching (25°C)** V_{GE} = 15V, V_{CC} = 0.8V_{CES}, I_C = I_{C2}, R_G = 10Ω		30		ns
t_r	Rise Time			140		
$t_d(off)$	Turn-off Delay Time			150		
t_f	Fall Time			200		
$t_d(on)$	Turn-on Delay Time	**Inductive Switching (150°C)** V_{CLAMP}(Peak) = 0.66V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 10Ω, T_J = +150°C		28		ns
t_r	Rise Time			60		
$t_d(off)$	Turn-off Delay Time			280		
t_f	Fall Time			30		
E_{on}	Turn-on Switching Energy			3.0		mJ
E_{off}	Turn-off Switching Energy			3.0		
E_{ts}	Total Switching Losses			6.0		
$t_d(on)$	Turn-on Delay Time	**Inductive Switching (25°C)** V_{CLAMP}(Peak) = 0.66V_{CES}, V_{GE} = 15V, I_C = I_{C2}, R_G = 10Ω, T_J = +25°C		28		ns
t_r	Rise Time			70		
$t_d(off)$	Turn-off Delay Time			250		
t_f	Fall Time			25		
E_{ts}	Total Switching Losses			5.0		mJ
gfe	Forward Transconductance	V_{CE} = 20V, I_C = I_{C2}	8.5	20		S

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\Theta JC}$	Junction to Case			0.61	°C/W
$R_{\Theta JA}$	Junction to Ambient			40	

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

② I_C = I_{C2}, R_{GE} = 25Ω, L = 119μH, T_j = 25°C

③ See MIL-STD-750 Method 3471

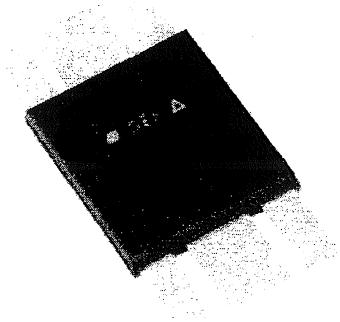
DEI Directed Energy, Inc.
An IXYS Company

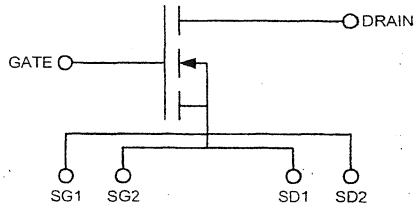
DE475-102N21A
RF Power MOSFET

- N-Channel Enhancement Mode
- Low Q_g and R_g
- High dv/dt
- Nanosecond Switching
- 30MHz Maximum Frequency

V_{DSS} = 1000 V
I_{D25} = 24 A
$R_{DS(on)}$ = 0.41 Ω
P_{DC} = 1500W

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	1000	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 1 MΩ	1000	V
V_{GS}	Continuous	±20	V
V_{GSM}	Transient	±30	V
I_{D25}	T_c = 25°C	24	A
I_{DM}	T_c = 25°C, pulse width limited by T_{JM}	144	A
I_{AR}	T_c = 25°C	21	A
E_{AR}	T_c = 25°C	30	mJ
dv/dt	$I_S \le I_{DM}$, di/dt ≤ 100A/μs, $V_{DD} \le V_{DSS}$, $T_j \le 150°C$, R_G = 0.2Ω	5	V/ns
	I_S = 0	>200	V/ns
P_{DC}		1500	W
P_{DHS}	T_c = 25°C Derate 4.0W/°C above 25°C	600	W
P_{DAMB}	T_c = 25°C	4.5	W
R_{thJC}		0.10	C/W
R_{thJHS}		0.2	C/W





Symbol	Test Conditions T_J = 25°C unless otherwise specified	Characteristic Values min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 3 ma	1000			V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 4 ma	2.5		5.5	V
I_{GSS}	V_{GS} = ±20 V_{DC}, V_{DS} = 0			±100	nA
I_{DSS}	V_{DS} = 0.8 V_{DSS} T_J = 25°C V_{GS} = 0 T_J = 125°C			50 1	μA mA
$R_{DS(on)}$	V_{GS} = 15 V, $I_D = 0.5I_{D25}$ Pulse test, t ≤ 300μS, duty cycle d ≤ 2%			0.41	Ω
g_{fs}	V_{DS} = 15 V, $I_D = 0.5I_{D25}$, pulse test		27		S
T_J		-55		+175	°C
T_{JM}			175		°C
T_{stg}		-55		+175	°C
T_L	1.6mm (0.063 in) from case for 10 s		300		°C
Weight			3		g

Features

- Isolated Substrate
  - high isolation voltage (>2500V)
  - excellent thermal transfer
  - Increased temperature and power cycling capability
- IXYS advanced low Q_g process
- Low gate charge and capacitances
  - easier to drive
  - faster switching
- Low $R_{DS(on)}$
- Very low insertion inductance (<2nH)
- No beryllium oxide (BeO) or other hazardous materials

Advantages

- Optimized for RF and high speed switching at frequencies to 30MHz
- Easy to mount—no insulators needed
- High power density