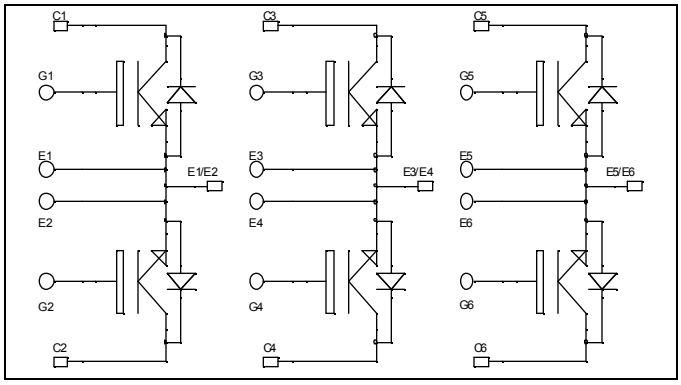
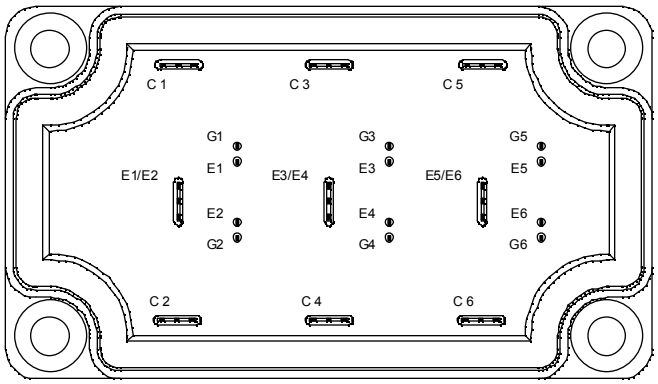
APTGU40TDU120P

Triple Dual Common Source PT IGBT Power Module

V_{CES} = 1200V
I_C = 40A @ Tc = 80°C





Application

- AC Switches
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- Power MOS 7® Punch Through (PT) IGBT
  - Low conduction loss
  - Ultra fast tail current shutoff
  - Low gate charge
  - Switching frequency capability in the 200kHz range
  - Soft recovery parallel diodes
  - Low diode VF
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a dual common source of three times the current capability

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CES}	Collector - Emitter Breakdown Voltage		1200	V
I_C	Continuous Collector Current	T_c = 25°C	64	A
		T_c = 80°C	40	
I_{CM}	Pulsed Collector Current	T_c = 25°C	160	
V_{GE}	Gate – Emitter Voltage		±20	V
P_D	Maximum Power Dissipation	T_c = 25°C	277	W
SSOA	Switching Safe Operating Area	T_j = 150°C	170A @ 960V	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed.

All ratings @ T_j = 25°C unless otherwise specified

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
BV_{CES}	Collector - Emitter Breakdown Voltage	V_{GE} = 0V, I_C = 500µA		1200			V
I_{CES}	Zero Gate Voltage Collector Current	V_{GE} = 0V V_{CE} = 1200V	T_j = 25°C			500	µA
			T_j = 125°C			2500	
$V_{CE(on)}$	Collector Emitter on Voltage	V_{GE} =15V I_C = 40A	T_j = 25°C		3.3	3.9	V
			T_j = 125°C		3.0		
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE} = V_{CE}, I_C = 1mA		3		6	V
I_{GES}	Gate – Emitter Leakage Current	V_{GE} = ±20V, V_{CE} = 0V				±100	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{ies}	Input Capacitance	V_{GE} = 0V V_{CE} = 25V f = 1MHz		3935		pF
C_{oes}	Output Capacitance			300		
C_{res}	Reverse Transfer Capacitance			55		
Q_g	Total gate Charge	V_{GE} = 15V V_{Bus} = 300V I_C = 40A		185		nC
Q_{ge}	Gate – Emitter Charge			25		
Q_{gc}	Gate – Collector Charge			80		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) V_{GE} = 15V V_{Bus} = 600V I_C = 40A R_G = 5Ω		18		ns
T_r	Rise Time			29		
$T_{d(off)}$	Turn-off Delay Time			102		
T_f	Fall Time			38		
E_{on1}	Turn-on Switching Energy			900		µJ
E_{on2}	Turn-on Switching Energy ❶			1869		
E_{off}	Turn-off Switching Energy ❷			904		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C) V_{GE} = 15V V_{Bus} = 600V I_C = 40A R_G = 5Ω		18		ns
T_r	Rise Time			29		
$T_{d(off)}$	Turn-off Delay Time			151		
T_f	Fall Time			79		
E_{on1}	Turn-on Switching Energy			900		µJ
E_{on2}	Turn-on Switching Energy ❶			3078		
E_{off}	Turn-off Switching Energy ❷			2254		

❶ E_{on2} includes diode reverse recovery
❷ In accordance with JEDEC standard JESD24-1

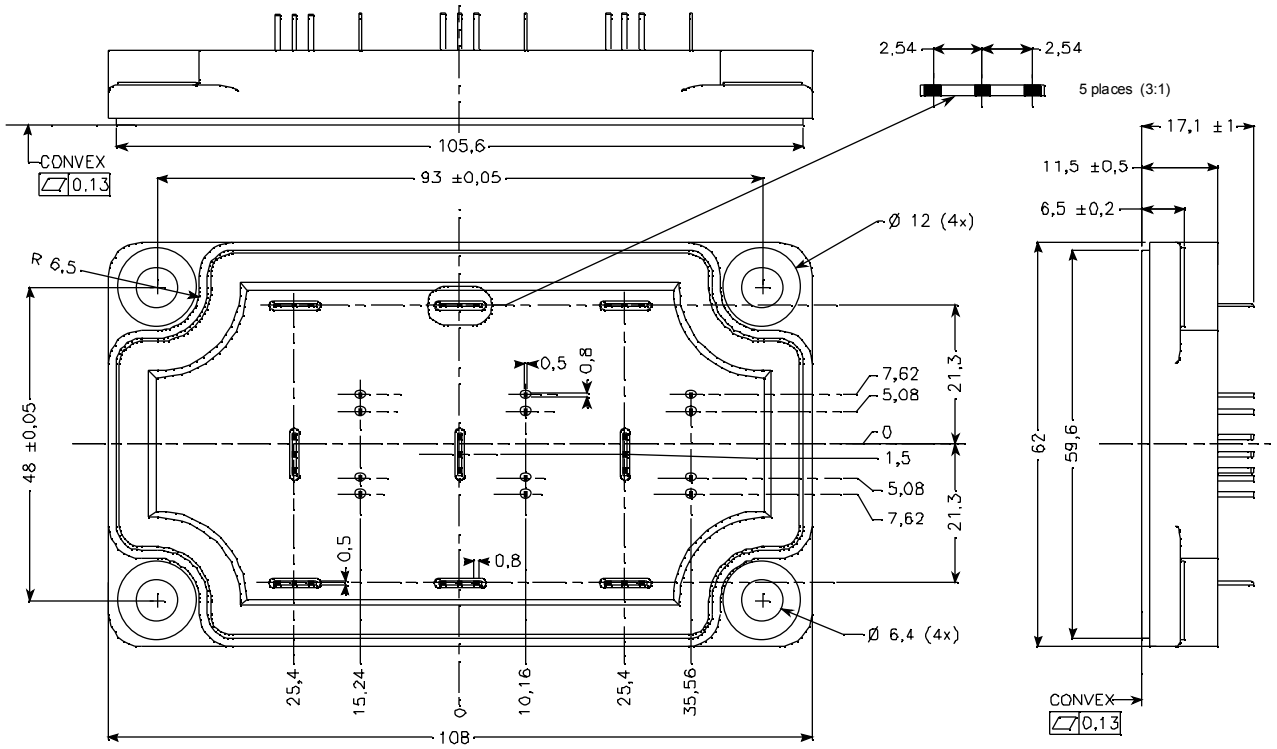
Reverse diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C			250	µA
			T_j = 125°C			500	
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	Tc = 80°C		25		A
V_F	Diode Forward Voltage	I_F = 25A V_{GE} = 0V	T_j = 25°C		2.3	2.8	V
			T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 25A V_R = 600V di/dt =800A/µs	T_j = 125°C		0.13		µs
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		2.3		µC
			T_j = 125°C		6		

Thermal and package characteristics

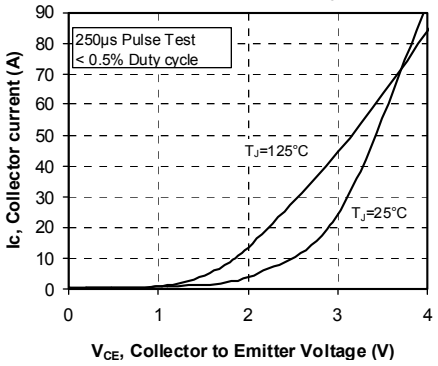
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case		IGBT			0.45	°C/W
			Diode			1	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
Wt	Package Weight					250	g

Package outline

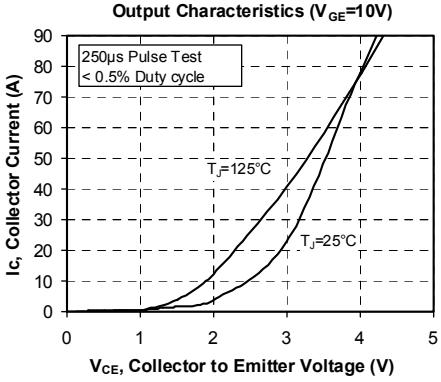


Typical Performance Curve

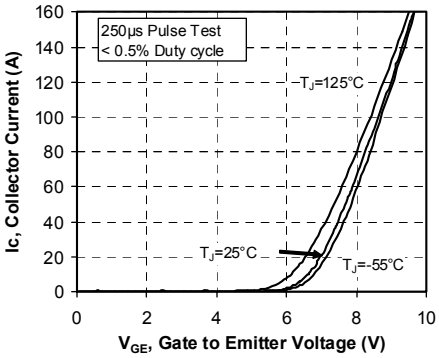
Output characteristics (V_{GE}=15V)



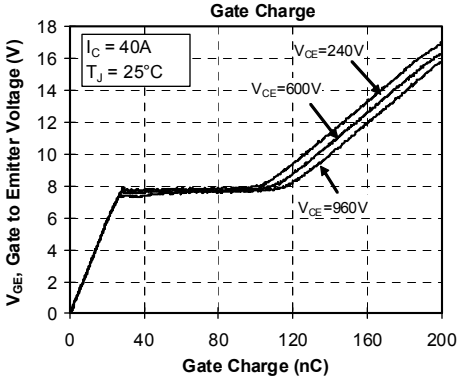
Output Characteristics (V_{GE}=10V)



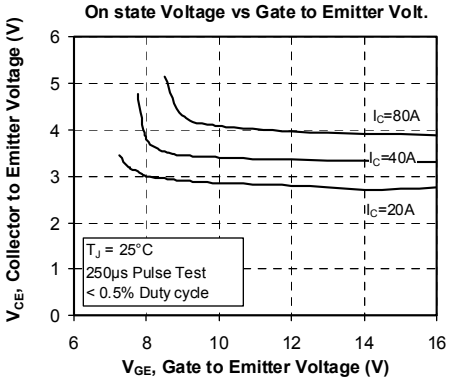
Transfer Characteristics



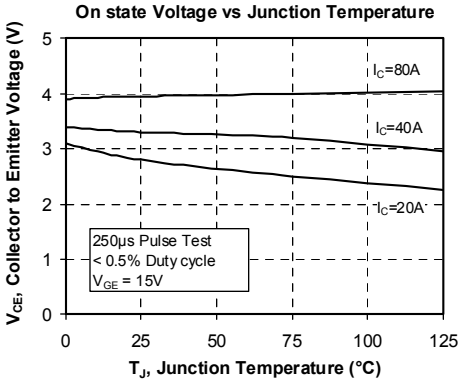
Gate Charge



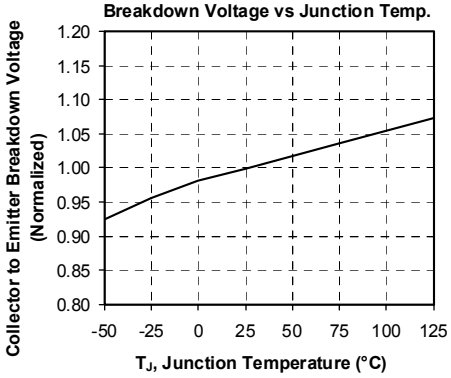
On state Voltage vs Gate to Emitter Volt.



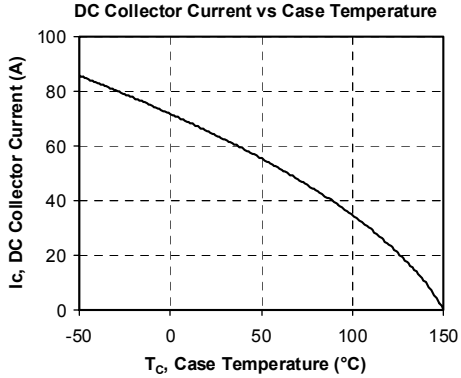
On state Voltage vs Junction Temperature



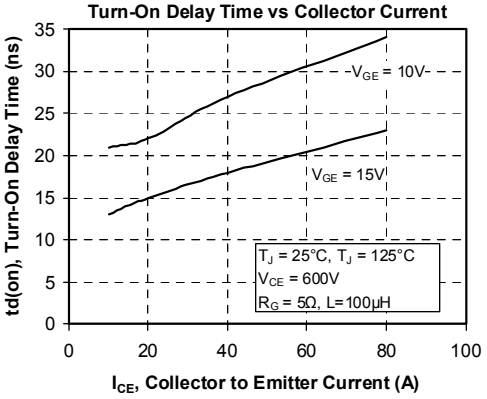
Breakdown Voltage vs Junction Temp.



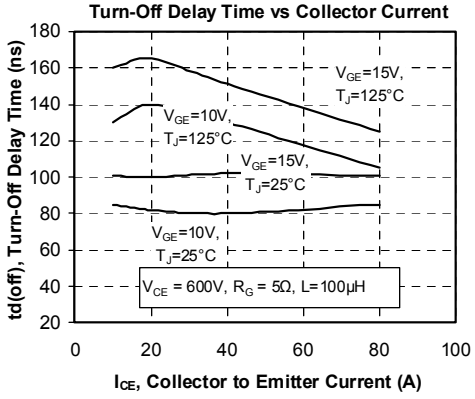
DC Collector Current vs Case Temperature



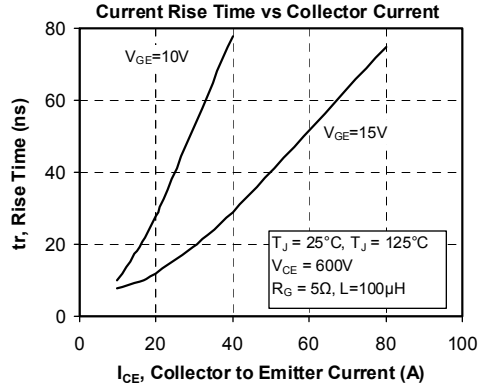
Turn-On Delay Time vs Collector Current



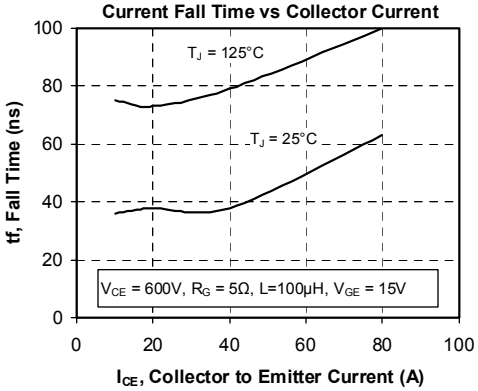
Turn-Off Delay Time vs Collector Current



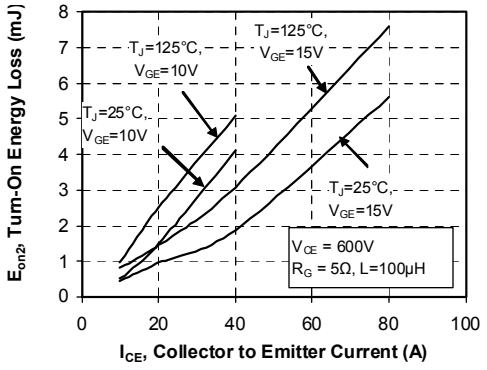
Current Rise Time vs Collector Current



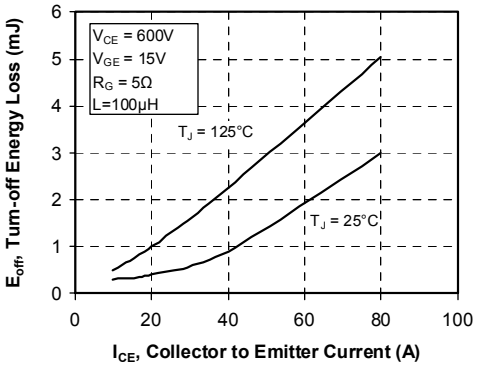
Current Fall Time vs Collector Current



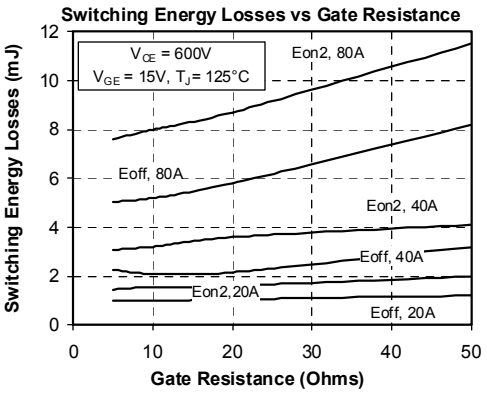
Turn-On Energy Loss vs Collector Current



Turn-Off Energy Loss vs Collector Current



Switching Energy Losses vs Gate Resistance



Switching Energy Losses vs Junction Temp.