

### 3<sup>rd</sup> Generation thinQ!<sup>TM</sup> SiC Schottky Diode

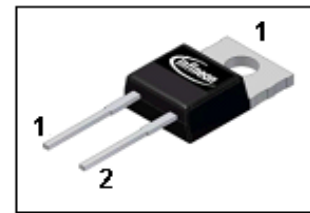
#### Features

- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery / No forward recovery
- Temperature independent switching behavior
- High surge current capability
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Breakdown voltage tested at 20mA<sup>2)</sup>
- Optimized for high temperature operation
- Lowest Figure of Merit  $Q_C/I_F$

#### Product Summary

$V_{DC}$	600	V
$Q_C$	19	nC
$I_F; T_C < 130\text{ °C}$	12	A

#### PG-TO220-2



#### thinQ! 3G Diode designed for fast switching applications like:

- SMPS e.g.; CCM PFC
- Motor Drives; Solar Applications; UPS



Type	Package	Marking	Pin 1	Pin 2
IDH12SG60C	PG-TO220-2	D12G60C	C	A

#### Maximum ratings

Parameter	Symbol	Conditions	Value	Unit
Continuous forward current	$I_F$	$T_C < 130\text{ °C}$	12	A
Surge non-repetitive forward current, sine halfwave	$I_{F,SM}$	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$	59	
		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$	51	
Non-repetitive peak forward current	$I_{F,max}$	$T_C = 25\text{ °C}, t_p = 10\text{ }\mu\text{s}$	430	
$i^2t$ value	$\int i^2 dt$	$T_C = 25\text{ °C}, t_p = 10\text{ ms}$	17	A <sup>2</sup> s
		$T_C = 150\text{ °C}, t_p = 10\text{ ms}$	12	
Repetitive peak reverse voltage	$V_{RRM}$	$T_j = 25\text{ °C}$	600	V
Diode dv/dt ruggedness	dv/dt	$V_R = 0 \dots 480\text{ V}$	50	V/ns
Power dissipation	$P_{tot}$	$T_C = 25\text{ °C}$	125	W
Operating and storage temperature	$T_j, T_{stg}$		-55 ... 175	°C
Soldering temperature, wavesoldering only allowed at leads	$T_{sold}$	1.6mm (0.063 in.) from case for 10s	260	
Mounting torque		M3 and M3.5 screws	60	Ncm

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	$R_{thJC}$		-	-	1.2	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	Thermal resistance, junction- ambient, leaded	-	-	62	

**Electrical characteristics, at  $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified**
**Static characteristics**

DC blocking voltage	$V_{DC}$	$I_R=0.05\text{ mA}$ , $T_j=25\text{ }^\circ\text{C}$	600	-	-	V
Diode forward voltage	$V_F$	$I_F=12\text{ A}$ , $T_j=25\text{ }^\circ\text{C}$	-	1.8	2.1	
		$I_F=12\text{ A}$ , $T_j=150\text{ }^\circ\text{C}$	-	2.2	-	
Reverse current	$I_R$	$V_R=600\text{ V}$ , $T_j=25\text{ }^\circ\text{C}$	-	1	100	$\mu\text{A}$
		$V_R=600\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$	-	4	1000	

**AC characteristics**

Total capacitive charge	$Q_C$	$V_R=400\text{ V}$ , $I_F \leq I_{F,max}$ , $di_F/dt=200\text{ A}/\mu\text{s}$ , $T_j=150\text{ }^\circ\text{C}$	-	19	-	nC
Switching time <sup>3)</sup>	$t_c$		-	-	<10	ns
Total capacitance	C	$V_R=1\text{ V}$ , $f=1\text{ MHz}$	-	310	-	$\mu\text{F}$
		$V_R=300\text{ V}$ , $f=1\text{ MHz}$	-	50	-	
		$V_R=600\text{ V}$ , $f=1\text{ MHz}$	-	50	-	

<sup>1)</sup> J-STD20 and JESD22

<sup>2)</sup> All devices tested under avalanche conditions, for a time periode of 10ms, at 20mA.

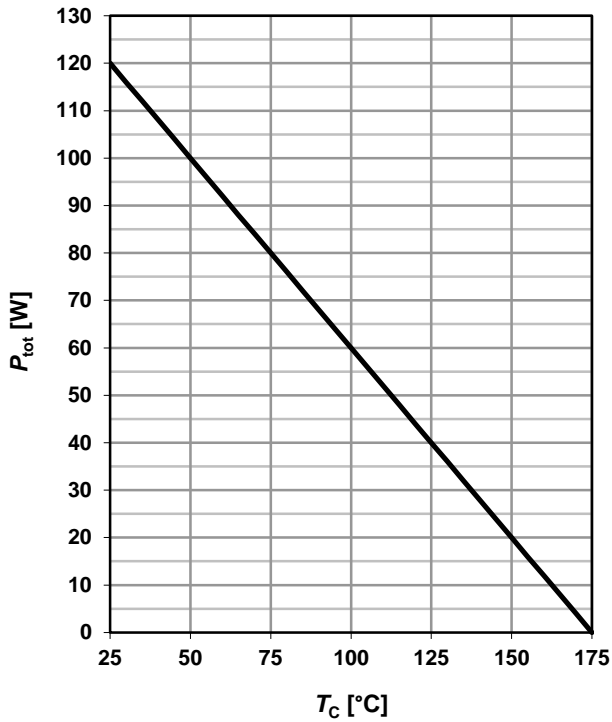
<sup>3)</sup>  $t_c$  is the time constant for the capacitive displacement current waveform (independent from  $T_j$ ,  $I_{LOAD}$  and  $di/dt$ ), different from  $t_{rr}$  which is dependent on  $T_j$ ,  $I_{LOAD}$  and  $di/dt$ . No reverse recovery time constant  $t_{rr}$  due to absence of minority carrier injection.

<sup>4)</sup> Under worst case  $Z_{th}$  conditions.

<sup>5)</sup> Only capacitive charge occuring, guaranteed by design.

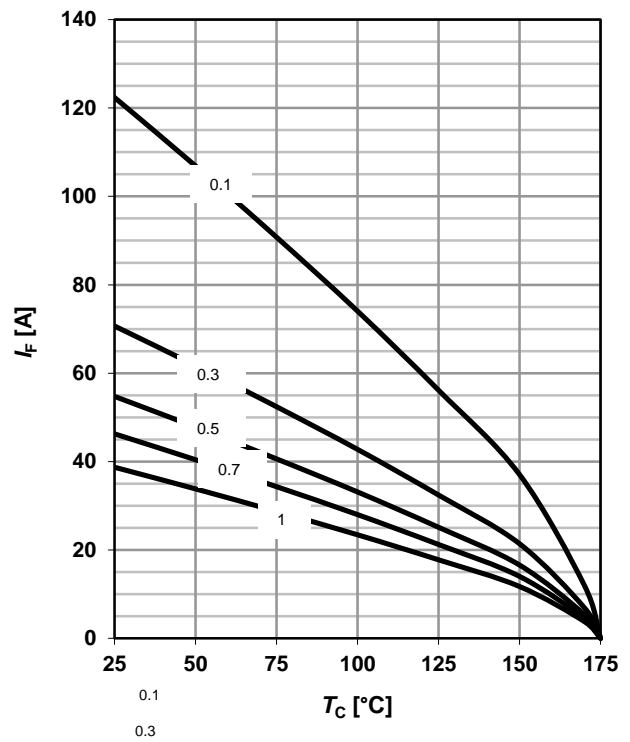
**1 Power dissipation**

$P_{tot}=f(T_C)$ ; parameter:  $R_{thJC(max)}$



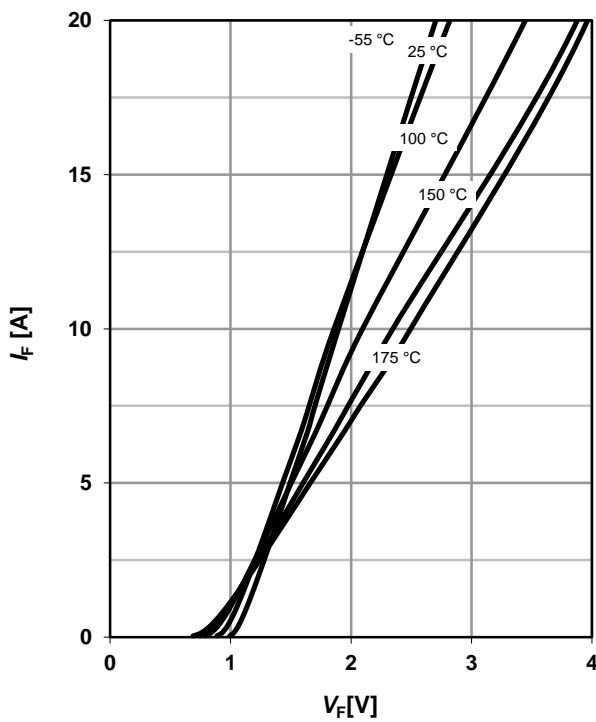
**2 Diode forward current**

$I_F=f(T_C)^4$ ;  $T_j \leq 175\text{ °C}$ ; parameter:  $D = t_p/T$



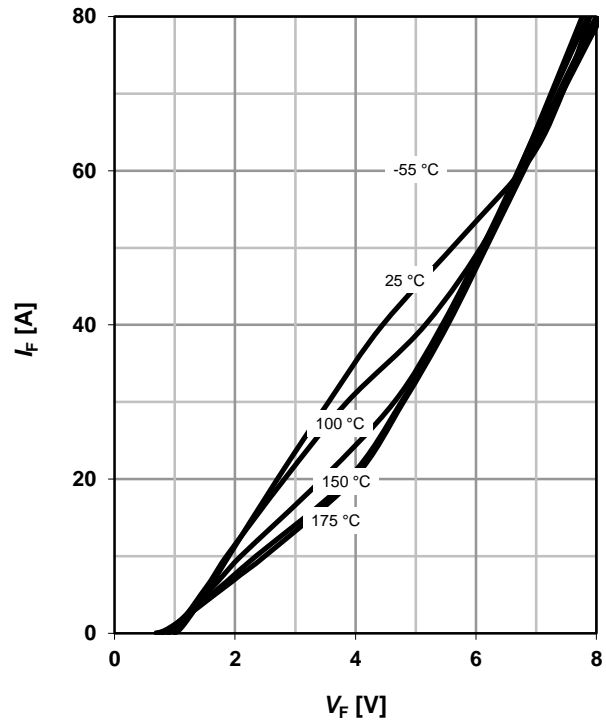
**3 Typ. forward characteristic**

$I_F=f(V_F)$ ;  $t_p=400\text{ }\mu\text{s}$ ; parameter:  $T_j$



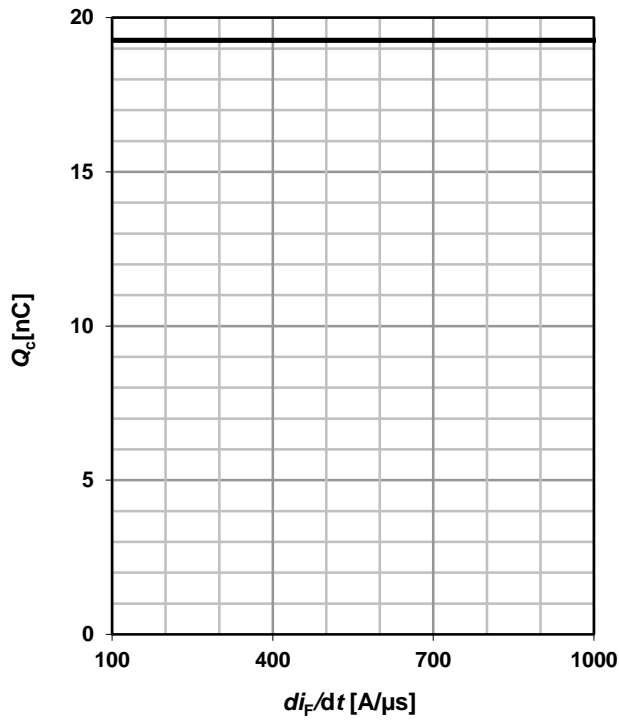
**4 Typ. forward characteristic in surge current mode**

$I_F=f(V_F)$ ;  $t_p=400\text{ }\mu\text{s}$ ; parameter:  $T_j$



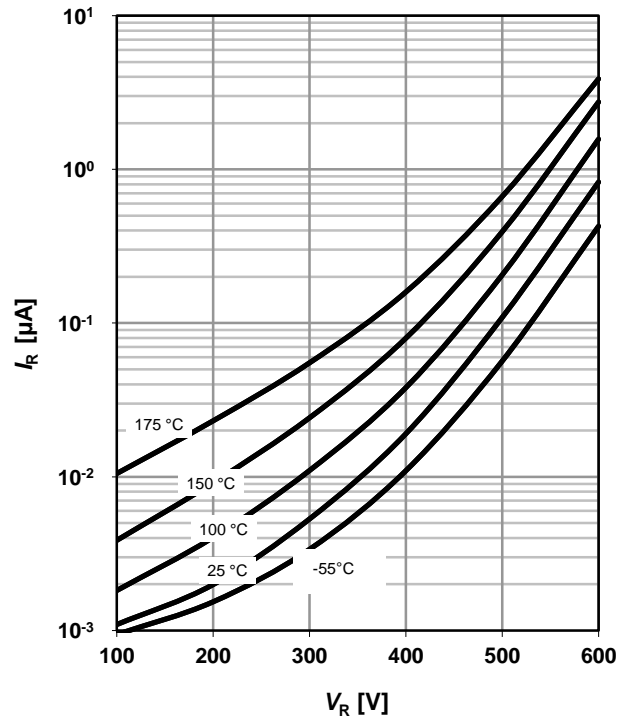
**5 Typ. capacitance charge vs. current slope**

$$Q_C = f(di_F/dt)^5; I_F \leq I_{F,max}$$



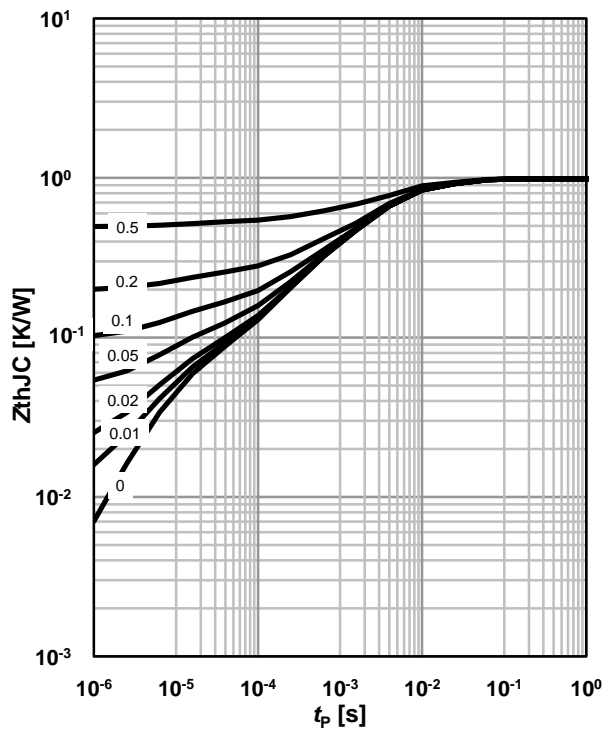
**6 Typ. reverse current vs. reverse voltage**

$$I_R = f(V_R); \text{ parameter: } T_j$$



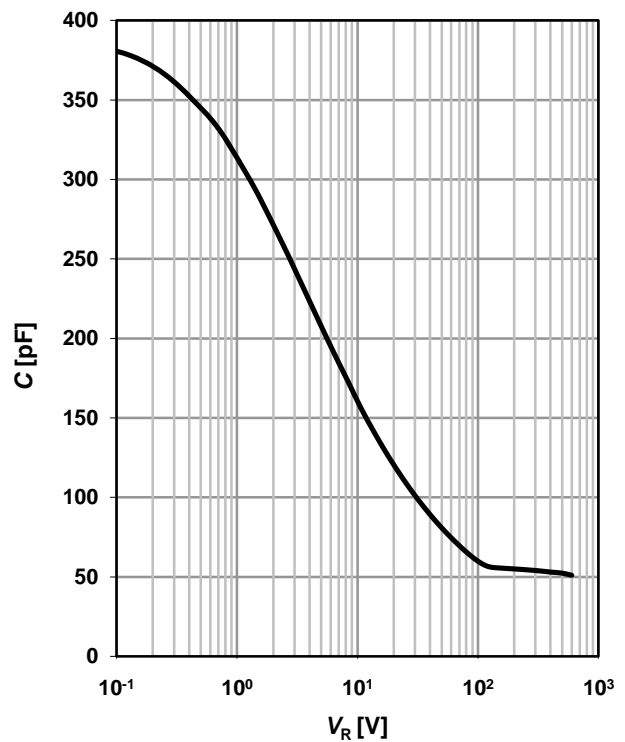
**7 Typ. transient thermal impedance**

$$Z_{thJC} = f(t_p); \text{ parameter: } D = t_p/T$$



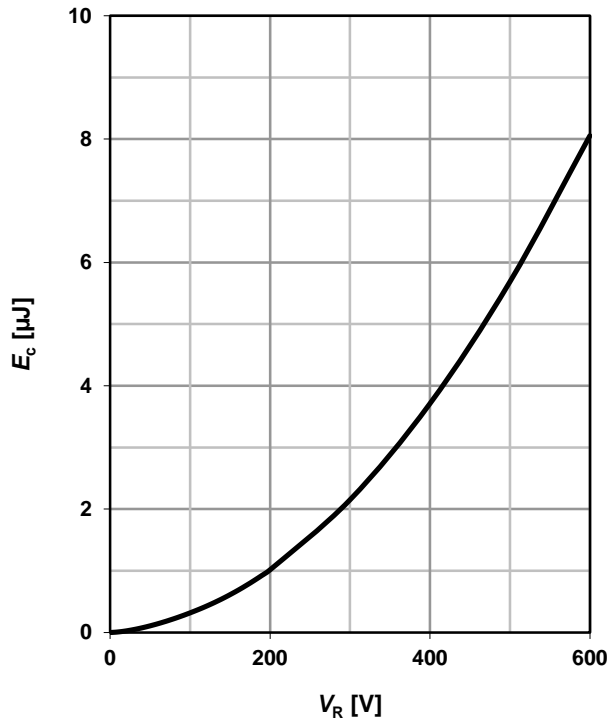
**8 Typ. capacitance vs. reverse voltage**

$$C = f(V_R); T_C = 25 \text{ °C}, f = 1 \text{ MHz}$$

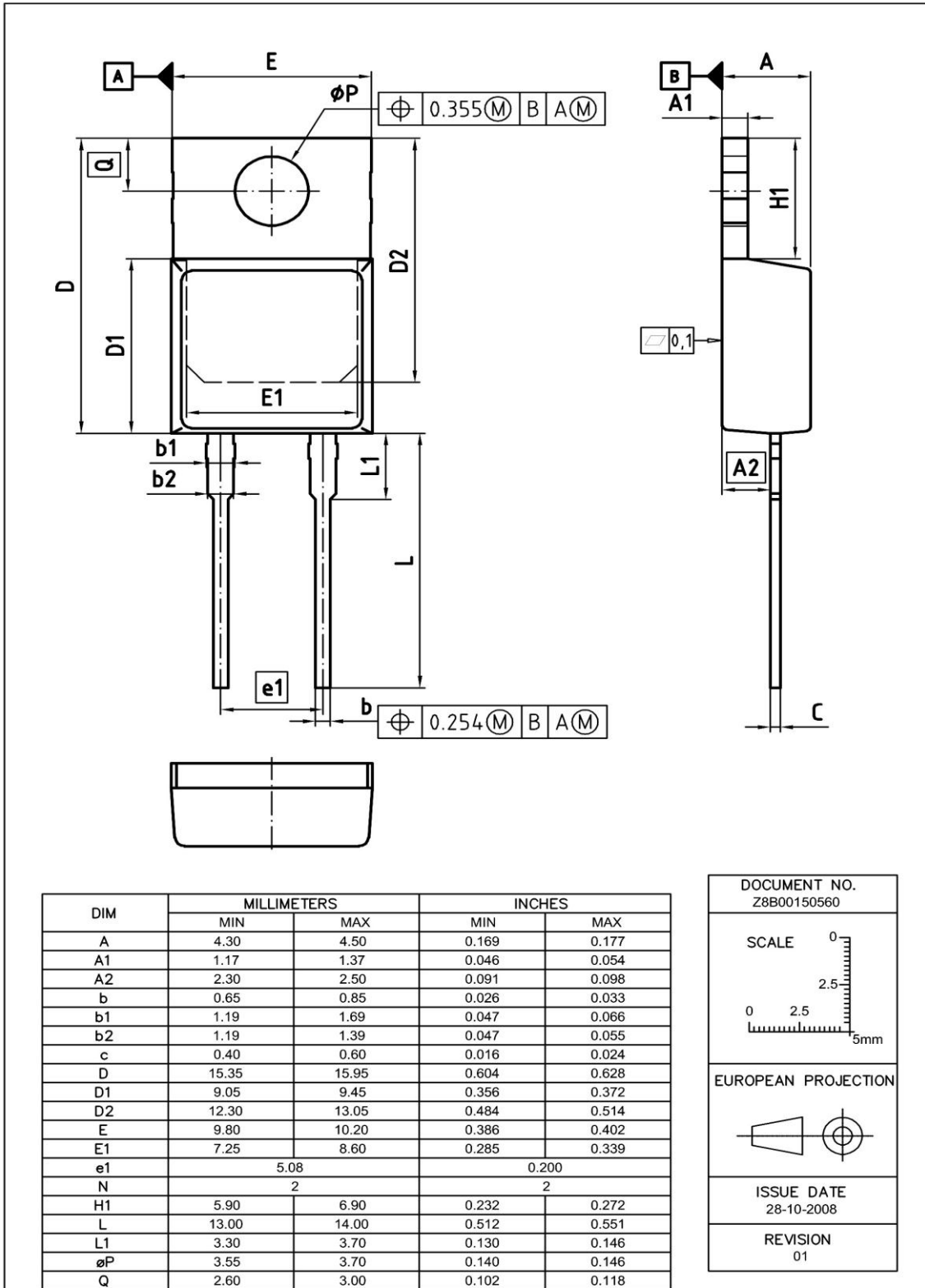


9 Typ. C stored energy

$$E_C = f(V_R)$$



PG-T0220-2: Outline



Dimensions in mm/inches

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