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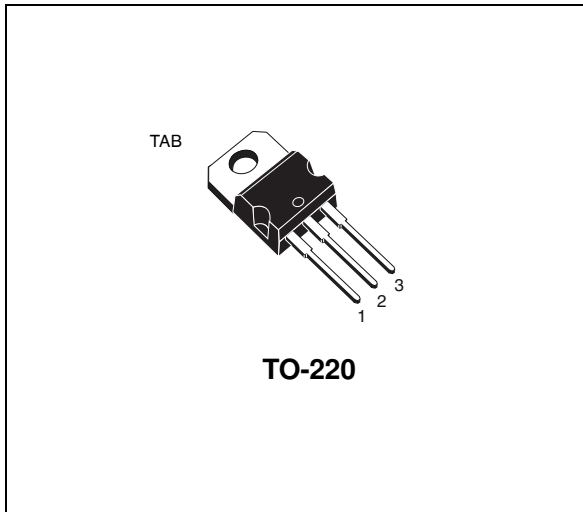
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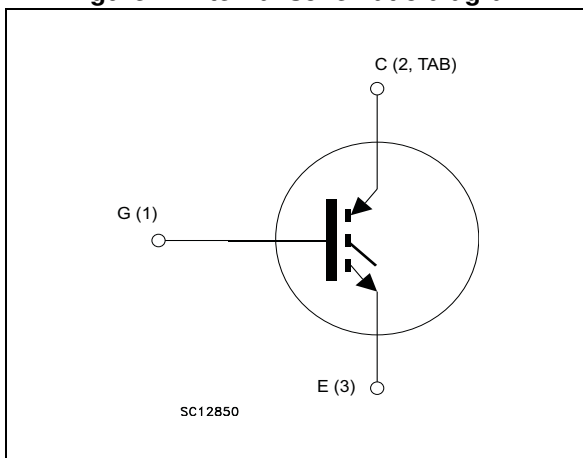


## Trench gate field-stop IGBT, H series 650 V, 30 A high speed

Datasheet - production data



**Figure 1. Internal schematic diagram**



### Features

- High speed switching
- Tight parameters distribution
- Safe paralleling
- Low thermal resistance
- Short-circuit rated

### Applications

- Inverter
- UPS
- PFC

### Description

This device is an IGBT developed using an advanced proprietary trench gate and field stop structure. This IGBT series offers the optimum compromise between conduction and switching losses, maximizing the efficiency of very high frequency converters. Furthermore, a positive  $V_{CE(sat)}$  temperature coefficient and very tight parameter distribution result in easier paralleling operation.

**Table 1. Device summary**

Order codes	Marking	Package	Packaging
STGP30H65F	GP30H65F	TO-220	Tube

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
2.1	Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuits</b> .....	<b>9</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>10</b>
<b>5</b>	<b>Revision history</b> .....	<b>12</b>

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GE} = 0$ )	650	V
$I_C$	Continuous collector current at $T_C = 25\text{ °C}$	60	A
$I_C$	Continuous collector current at $T_C = 100\text{ °C}$	30	A
$I_{CP}^{(1)}$	Pulsed collector current	120	A
$V_{GE}$	Gate-emitter voltage	$\pm 20$	V
$P_{TOT}$	Total dissipation at $T_C = 25\text{ °C}$	260	W
$T_{STG}$	Storage temperature range	- 55 to 150	°C
$T_J$	Operating junction temperature	- 55 to 175	

1. Pulse width limited by maximum junction temperature.

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case	0.58	°C/W
$R_{thJA}$	Thermal resistance junction-ambient	50	°C/W

## 2 Electrical characteristics

$T_J = 25\text{ °C}$  unless otherwise specified.

**Table 4. Static**

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage ( $V_{GE} = 0$ )	$I_C = 2\text{ mA}$	650			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$		2.0	2.4	V
		$V_{GE} = 15\text{ V}, I_C = 30\text{ A}$ $T_J = 175\text{ °C}$		2.4		V
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = V_{GE}, I_C = 1\text{ mA}$	5.0	6.0	7.0	V
$I_{CES}$	Collector cut-off current ( $V_{GE} = 0$ )	$V_{CE} = 650\text{ V}$			25	$\mu\text{A}$
$I_{GES}$	Gate-emitter leakage current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20\text{ V}$			250	nA

**Table 5. Dynamic**

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GE} = 0$	-	3600	-	pF
$C_{oes}$	Output capacitance			130		pF
$C_{res}$	Reverse transfer capacitance			65		pF
$Q_g$	Total gate charge	$V_{CC} = 400\text{ V}, I_C = 30\text{ A},$ $V_{GE} = 15\text{ V}$ (see <a href="#">Figure 20: Gate charge test circuit</a> )	-	105	-	nC
$Q_{ge}$	Gate-emitter charge			30		nC
$Q_{gc}$	Gate-collector charge			35		nC

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$	-	50	-	ns
$t_r$	Current rise time			15		ns
$(di/dt)_{on}$	Turn-on current slope			1600		A/ $\mu$ s
$t_{d(on)}$	Turn-on delay time	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_J = 175\text{ }^\circ\text{C}$	-	47	-	ns
$t_r$	Current rise time			17		ns
$(di/dt)_{on}$	Turn-on current slope			1400		A/ $\mu$ s
$t_r(V_{off})$	Off voltage rise time	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$	-	20	-	ns
$t_{d(off)}$	Turn-off delay time			160		ns
$t_f$	Current fall time			60		ns
$t_r(V_{off})$	Off voltage rise time	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_J = 175\text{ }^\circ\text{C}$	-	22	-	ns
$t_{d(off)}$	Turn-off delay time			146		ns
$t_f$	Current fall time			88		ns
$t_{sc}$	Short circuit withstand time	$V_{CC} \leq 360\text{ V}$ , $V_{GE} = 15\text{ V}$	3	6	-	$\mu$ s

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$	-	0.35	-	mJ
$E_{off}^{(2)}$	Turn-off switching losses			0.40		mJ
$E_{ts}$	Total switching losses			0.75		mJ
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CE} = 400\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_J = 175\text{ }^\circ\text{C}$	-	0.61	-	mJ
$E_{off}^{(2)}$	Turn-off switching losses			0.84		mJ
$E_{ts}$	Total switching losses			1.45		mJ

1. Energy losses include reverse recovery of the external diode. The diode is the same of the co-packed STGP30H60DF.
2. Turn-off losses include also the tail of the collector current.

## 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics ( $T_J = 25^\circ\text{C}$ )

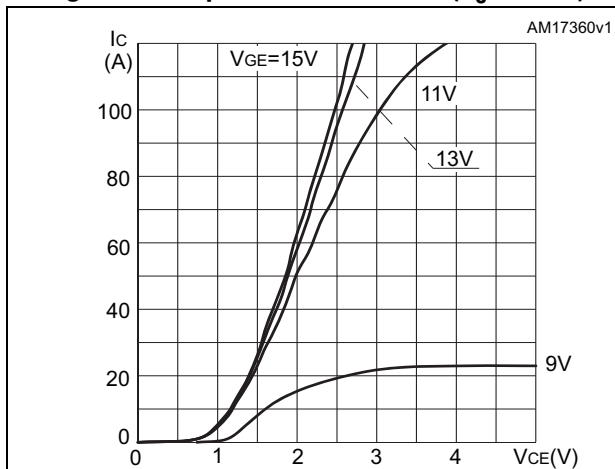


Figure 3. Output characteristics ( $T_J = 175^\circ\text{C}$ )

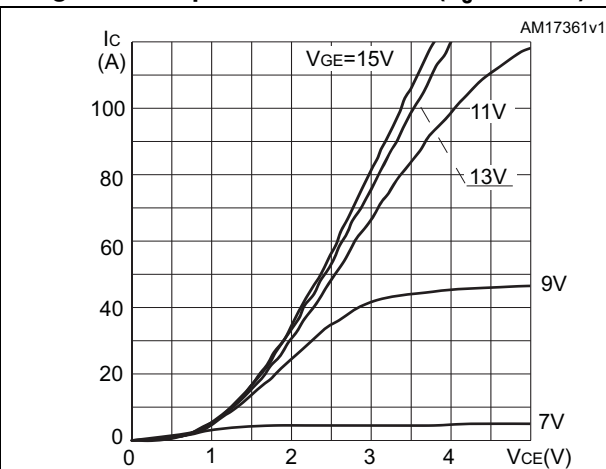


Figure 4. Transfer characteristics

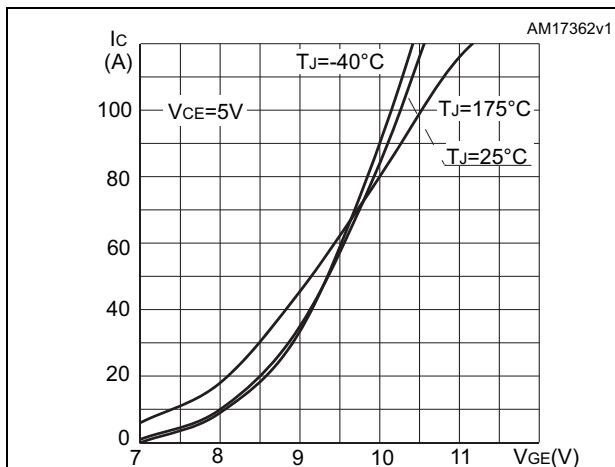


Figure 5. Normalized  $V_{GE(th)}$  vs. junction temperature

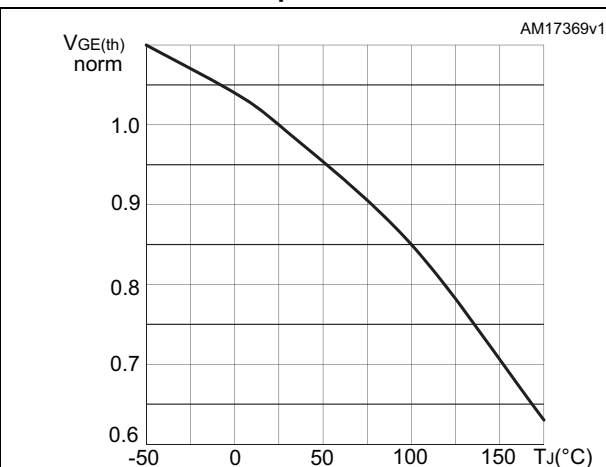


Figure 6. Power dissipation vs. case temperature

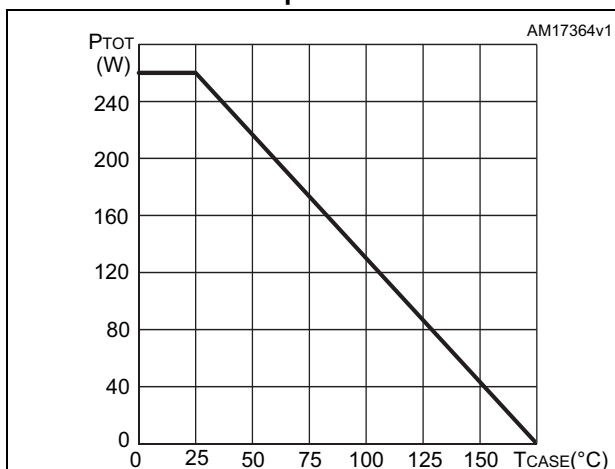


Figure 7. Collector current vs. frequency

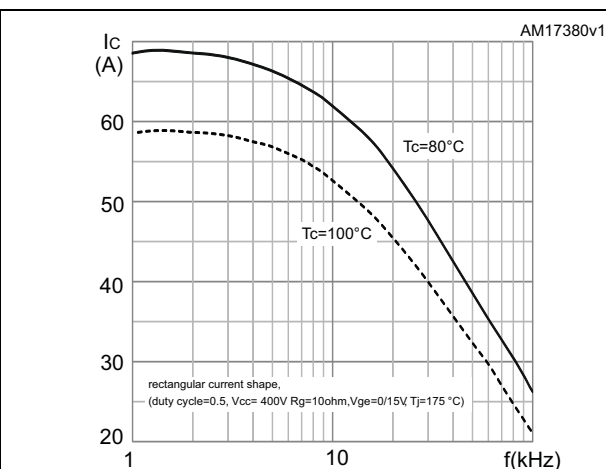


Figure 8.  $V_{CE(sat)}$  vs. junction temperature

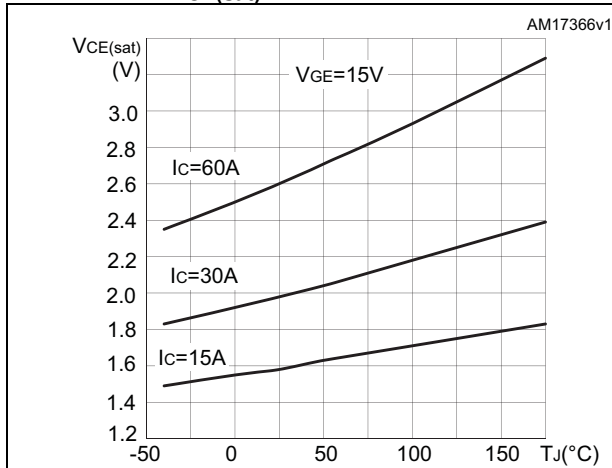


Figure 9.  $V_{CE(sat)}$  vs. collector current

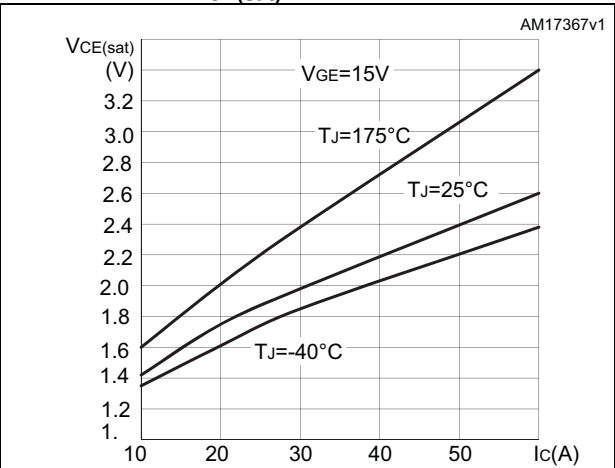


Figure 10. Forward bias safe operating area

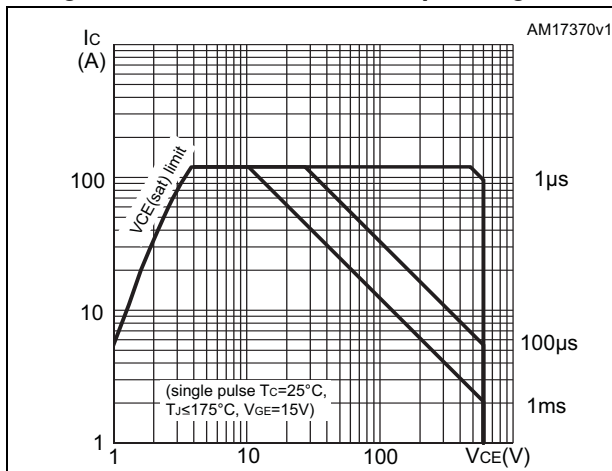


Figure 11. Thermal impedance

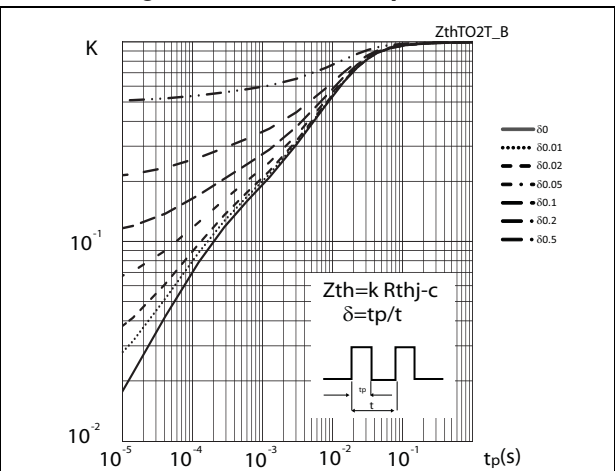


Figure 12. Gate charge vs. gate-emitter voltage

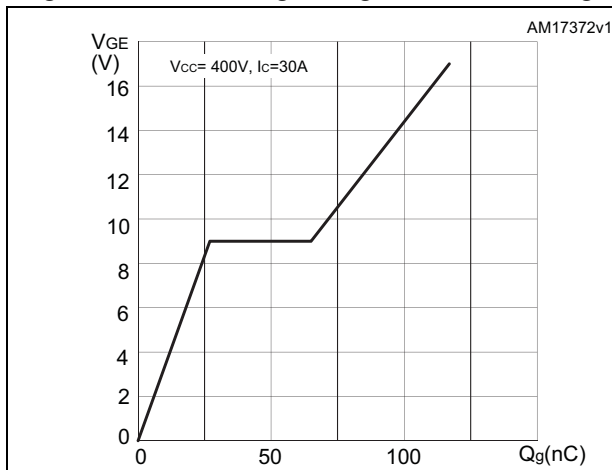


Figure 13. Capacitance variations vs.  $V_{CE}$

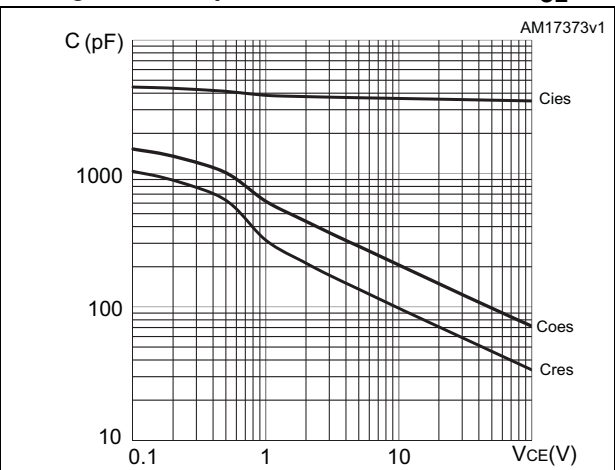




Figure 14. Collector current vs. case temperature

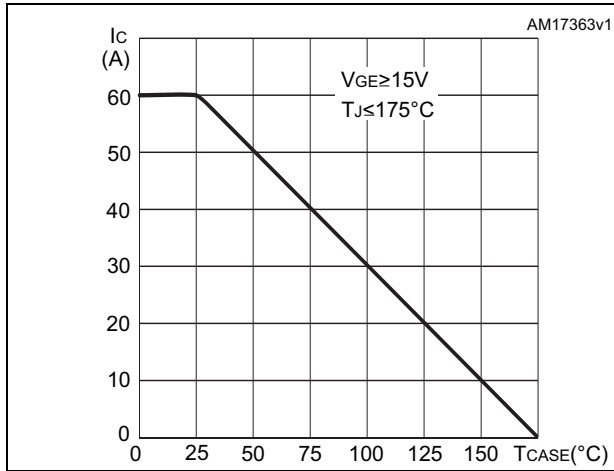


Figure 15. Switching losses vs. gate resistance

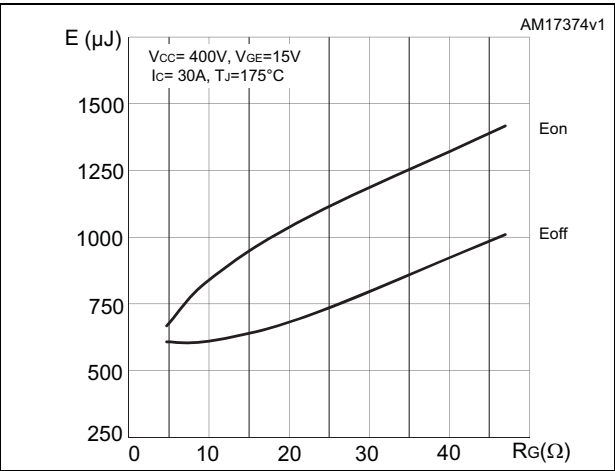


Figure 16. Switching losses vs. collector current

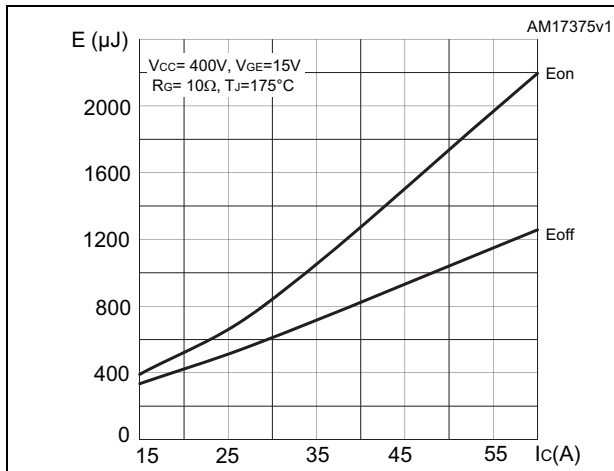


Figure 17. Switching losses vs temperature

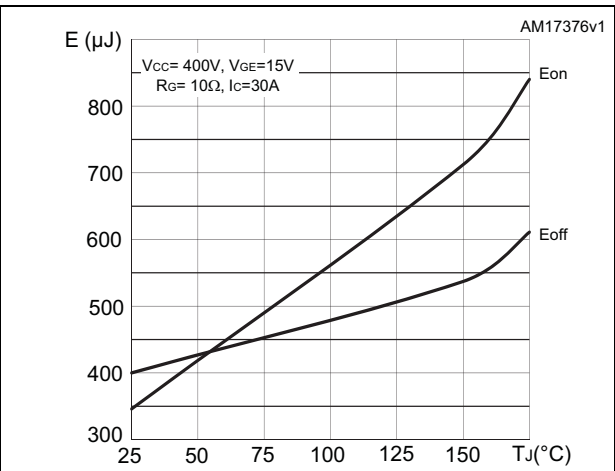
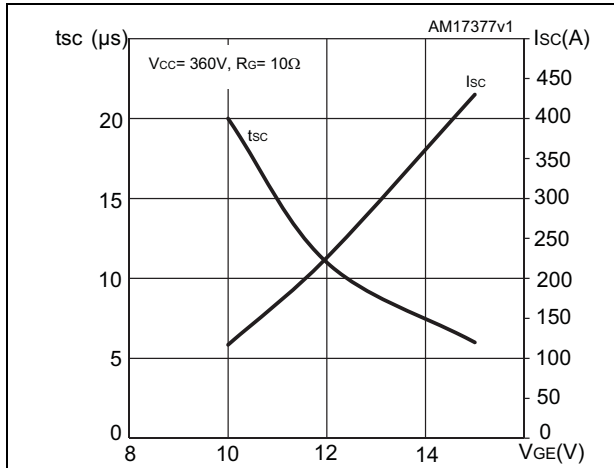


Figure 18. Short circuit time and current vs. VGE





## 4 Package mechanical data

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Figure 22. TO-220 type A drawing

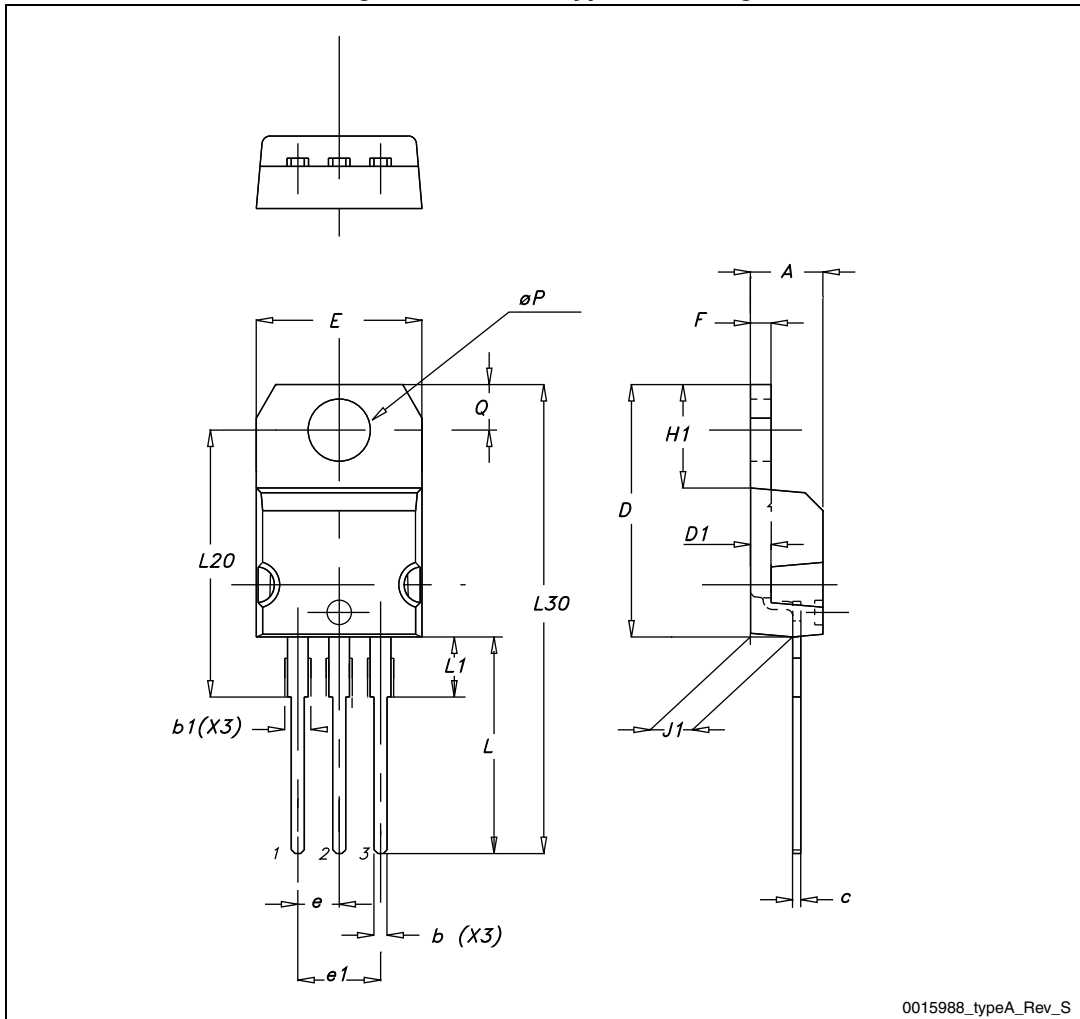


Table 8. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
ØP	3.75		3.85
Q	2.65		2.95

## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
16-Dec-2013	1	Initial release.

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