

# Power bipolar transistors

## Selection guide



December 2005

[www.st.com/bipolar](http://www.st.com/bipolar)



T0-2

NPN

HD1530

HD1750

\* Pre-prod

Pack



SOT

The STMicro

France  
Swed

Order c

# Electronic light ballast design-in guidelines<sup>▲</sup>

Part number	V <sub>CEO</sub> [V]	V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	Package	Compact fluorescent lamps	Halogen lamps transformer	Industrial lamp ballasts		
								Push pull	Half bridge	
									Voltage feed	Current feed
STX93003	-400	-500	-1	1.5	TO-92	Up to 9W/15W*				
STL71	400	700	0.6	0.95	TO-92	Up to 9W/11W*				
STL72	400	700	1	1	TO-92	Up to 11W/15W*				
STL73	400	700	1.5	1.1	TO-92	Up to 13W/18W*				
STX13003	400	700	1	1.5	TO-92	Up to 13W/18W*				
STX83003	400	700	1	1.5	TO-92	Up to 9W/15W*				
STX13005	400	700	3	2.8	TO-92	Up to 15W/20W*				
BULT116D	200	400	5	45	SOT-32	Up to 23W◇				
ST93003	-400	-500	-1.5	40	SOT-32	Up to 13W/20W*				
ST13003	400	700	1.5	40	SOT-32	Up to 13W/20W*				
ST83003	400	700	1.5	40	SOT-32	Up to 13W/20W*				
BULT118	400	700	2	45	SOT-32	Up to 23W			Up to 28W	
BULK128D-B	400	700	4	55	SOT-82	Up to 27W			Up to 40W/58W*	
STD13003-1	400	700	1.5	20	IPAK	Up to 13W/18W*				
BULD118D-1	400	700	2	20	IPAK	Up to 20W			Up to 20W	
STB13005-1	400	700	4	75	I <sup>2</sup> PAK				Up to 40W/72W*	
BULB39DT4	450	850	4	70	D <sup>2</sup> PAK		Up to 50W			
BULB49DT4	450	850	5	80	D <sup>2</sup> PAK		Up to 75W			
BUL116D	200	400	5	60	TO-220	Up to 27W◇				
BUL85D	250	500	8	80	TO-220		Up to 100W◇			
BUL118	400	700	3	60	TO-220	Up to 27W			Up to 28W/40W	
BUL128	400	700	4	70	TO-220	Up to 32W			Up to 40W/72W*	
BUL128D-B	400	700	4	70	TO-220	Up to 27W			Up to 40W/72W*	
ST13005	400	700	4	75	TO-220	Up to 27W			Up to 40W/72W*	
ST13007	400	700	8	80	TO-220				Up to 120W	
ST13007D	400	700	8	80	TO-220		Up to 120W			
BUL654	400	700	12	80	TO-220		Up to 250W			
ST13009	400	700	12	100	TO-220		Up to 250W			
BUL138	400	800	5	80	TO-220				Up to 80W/120W*	Up to 4 x 32W◇
BUL59	400	850	8	90	TO-220		Up to 105W			
BUL903ED*	400	900	5	70	TO-220			Up to 4 x 32W◇		
BUL742A	400	950	4	70	TO-220			Up to 4 x 32W◇		Up to 4 x 32W
BUL742C	400	1050	4	70	TO-220			Up to 4 x 32W◇		Up to 4 x 32W
BUL38D	450	800	5	80	TO-220		Up to 75W			
BUL58D	450	800	8	85	TO-220		Up to 105W			
BUL98	450	800	12	110	TO-220		Up to 250W			
BUL39D	450	850	4	70	TO-220		Up to 50W			
BUL49D	450	850	5	80	TO-220		Up to 75W			
BUL510	450	1000	10	100	TO-220		Up to 150W			
BUL1101E	450	1100	3	35	TO-220			Up to 2 x 32W◇		Up to 2 x 32W△
BUL1102E	450	1100	4	70	TO-220			Up to 3 x 32W◇		Up to 4 x 32W△
BUL303	550	1100	5	100	TO-220				Up to 4x32W	Up to 4x32W
BUL1203E	550	1200	5	100	TO-220			Up to 4 x 32W△		Up to 4 x 32W△
BUL213	600	1300	3	60	TO-220			Up to 4 x 32W△		Up to 4 x 32W△
BUL1403ED	650	1400	3	80	TO-220			Up to 4 x 32W△		
BUL7216	700	1600	3	80	TO-220			Up to 4x32W△		Up to 4 x 32W◆
ST5027	800	1200	3	90	TO-220				Up to 1x36W	
BUL216	800	1600	4	90	TO-220			Up to 4 x 32W△		
BUL416	800	1600	6	110	TO-220			Up to 6 x 32W△		
BUL810	450	1000	15	125	TO-218		Up to 300W			
BUL3P5	400	500	3	60	TO-220	Up to 30W			Up to 1 x 58W	
BUL3N7	400	700	3	60	TO-220	Up to 30W			Up to 1 x 58W	
BUL804*	450	800	4	70	TO-220				Up to 1 x 40W	

▲ Typical application (220V mains unless otherwise specified)

\* Integrated antisaturation and protection network

• According to tube impedance

◇ 120V AC mains

△ 277V AC mains

◆ 340V AC mains

◇\* As PFC 220V AC mains

Suffix D = Integrated free-wheeling diode

ST preferred products in bold

Devices in green to be used in pairs

## Horizontal deflection transistors for conventional TVs (16kHz)

Part number	V <sub>CB0</sub> [V]	V <sub>CE0</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	Package	Target use
<b>BUL312FP</b>	1150	500	5	36	TO-220FP	Up to 21-inches
<b>ST1802FH</b>	1500	600	10	40	TO-220FH	Up to 21-inches
<b>ST1802FX</b>	1500	600	10	60	ISOWATT218FX	Up to 29-inches
<b>ST2009DHI</b>	1500	600	10	55	ISOWATT218	Up to 29-inches
<b>ST2001FX</b>	1500	600	10	63	ISOWATT218FX	Up to 29-inches
<b>ST2310DHI</b>	1500	600	12	55	ISOWATT218	Large and real flat
<b>MD1803DFH*</b>	1500	700	10	40	TO-220FH	Up to 21-inches
<b>MD1803DFX*</b>	1500	700	10	57	ISOWATT218FX	Up to 29-inches
<b>MD2310FX*</b>	1500	700	14	62	ISOWATT218FX	Large and real flat
<b>ST2317DFX</b>	1700	600	12	70	ISOWATT218FX	Large and real flat

\* Pre-production    The suffix Dxx indicates built-in free-wheeling diode    ST preferred products in bold    Blue shaded areas indicate darlington

## Horizontal deflection transistors for high-definition TVs (≥32kHz)

Part number	V <sub>CB0</sub> [V]	V <sub>CE0</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	Package	Target use
<b>HD1520FX</b>	1500	700	15	64	ISOWATT218FX	High-definition/super-slim crt
<b>HD1530FX*</b>	1500	700	26	70	ISOWATT218FX	High-definition/super-slim crt
<b>HD1530JL*</b>	1500	700	26	200	TO-264	High-definition/super-slim crt
<b>HD1750FX</b>	1700	800	24	75	ISOWATT218FX	High-definition/super-slim crt
<b>HD1750JL</b>	1700	800	24	200	TO-264	High-definition/super-slim crt
<b>BUH2M20AP</b>	2000	1200	0.03	40	TO-220	Dynamic focus

\* Pre-production    ST preferred products in bold

## Horizontal deflection transistors for monitors

Part number	V <sub>CB0</sub> [V]	V <sub>CE0</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	Package	Target use
<b>ST2001FX</b>	1500	600	10	63	ISOWATT218FX	15-inches
<b>ST2310FX</b>	1500	600	12	65	ISOWATT218FX	17-inches / 70 kHz
<b>HD1520FX</b>	1500	700	15	64	ISOWATT218FX	17-inches / 95 kHz
<b>HD1530FX*</b>	1500	700	26	70	ISOWATT218FX	19-inches
<b>HD1530JL*</b>	1500	700	26	200	TO-264	21-inches
<b>HD1750FX</b>	1700	800	24	75	ISOWATT218FX	19-inches
<b>HD1750JL</b>	1700	800	24	200	TO-264	21-inches

\* Pre-production    ST preferred products in bold

## High-voltage transistors for SMPS in TV chassis

Part number	V <sub>CB0</sub> [V]	V <sub>CE0</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	Package	Target use
<b>ST8812FP</b>	1150	600	7	36	TO-220FP	Up to 21-inches
<b>ST1802FH</b>	1500	600	10	40	TO-220FH	Up to 21-inches
<b>ST1802FX</b>	1500	600	10	60	ISOWATT218FX	Up to 21-inches
<b>ST2111FX</b>	1500	700	12	65	ISOWATT218FX	Up to 29-inches

ST preferred products in bold

## Dynamic focus

Part number	V <sub>CB0</sub> [V]	V <sub>CE0</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	Package	Target use
<b>BUH2M20AP</b>	2000	1200	0.03	40	TO-220	Dynamic focus

ST preferred products in bold

## SOT-223/SOT23-6L/SOT-89

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
	<b>STN749*</b>	25	35	3	1.6	100	300	1	2	0.6	3	300	Consumer
	<b>STT818B**</b>	30	30	3	1.2	100		2.5	3	0.5	2	20	Mobile phone
<b>STF724*</b>	<b>STF826*</b>	30	60	3	1.4	80		1	2	0.7	2	100	Computer
<b>STN724*</b>	<b>STN826*</b>	30	60	3	1.6	80		1	2	0.7	2	100	Consumer
	<b>STN790A*</b>	30	40	3	1.6	100	400	0.5	2	0.7	3	100	Computer
	<b>STN888*</b>	30	45	5	1.6	150	300	0.5	1	0.7	5	2500	Computer
<b>STN851*</b>		60	150	5	1.6	150	350	2	1	0.5	5	200	Lighting
<b>2STN1360*</b>		60	80	3	1.6	160	400	1	2	0.5	3	150	Consumer/Computer
<b>2STF1360*</b>		60	80	3	1.4	160	400	1	2	0.5	3	150	Consumer/Telecom
<b>STN1802*</b>		60	80	3	1.6	100		3	2	0.4	3	150	Computer
<b>STF715*</b>	<b>STF817A*</b>	80	140(-80)	1.5	1.4	40		1	2	0.5	1	100	Consumer/Telecom
<b>STN715*</b>	<b>STN817A*</b>	80	140(-80)	1.5	1.6	40		1	2	0.5	1	100	Computer
<b>STFN42*</b>		400	700	1	1.4	10	30	0.4	4	1	0.5	125	SMPS

\* SOT-223 package \*\* SOT23-6L package \* SOT-89 package ST preferred products in bold

## SOT-82

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
<b>STK13003</b>		400	700	1.5	40	5	25	1	2	1	1	250	Lighting/SMPS
<b>BULK118</b>		400	700	2	45	8		2	5	1.5	2	400	Lighting/SMPS
<b>BULK128</b>		400	700	4	55	14	28	2	5	1.5	2.5	500	Lighting/SMPS
<b>BULK128D-B</b>		400	700	4	55	8	40	2	5	1.5	2.5	500	Lighting/SMPS
<b>BULK38D</b>		450	800	5	60	8		2	5	1.1	3	750	Lighting/SMPS

## T0-39

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
	<b>BSS44</b>	60	65	5	5	40	70	2	2	1	5	500	Gen. purp.
<b>BFX34</b>		60	120	5	5	40	150	2	2	1	5	500	Gen. purp.
	<b>2N5415</b>	200	200	1	10	30	150	0.05	10	2.5	0.05	5	Switching
<b>2N3440</b>		250	300	1	10	40	160	0.02	10	0.5	0.05	4	Switching
	<b>2N5416</b>	300	350	1	10	30	120	0.05	10	2.5	0.05	5	Switching
<b>2N3439</b>		350	450	1	10	40	160	0.02	10	0.5	0.05	4	Switching

ST preferred products in bold

## T0-92

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
<b>2STX1360</b>		60	80	3	1	160	400	1	2	0.5	3	150	Consumer
<b>2STL1360</b>		60	80	3	1.2	160	400	1	2	0.5	3	150	Consumer
	<b>STX790A</b>	30	40	3	0.9	100	400	0.5	2	0.7	3	100	Consumer
<b>STX724</b>	<b>STX826</b>	30	60	3	0.9	80		1	2	0.7	2	100	Consumer
<b>STSA1805</b>		60	150	5	1.1	85		5	2	0.6	5	200	Lighting
<b>STSA851</b>		60	150	5	1.1	150	350	2	1	0.45	5	200	Lighting
<b>STX715</b>	<b>STX817A</b>	80	140(-80)	1.5	0.9	40		1	2	0.5	1	100	Consumer
<b>STX112</b>	<b>STX117</b>	100	100	2	0.8	1000		1	4	2.5	2	8	Gen. purp.
	<b>STX93003</b>	400	500	1	1.5	16	32	0.35	5	0.5	0.35	50	Lighting
<b>STBV45</b>		400	600	0.75	0.95	5	20	0.4	5	1.5	0.4	135	Lighting
<b>STBV42</b>		400	700	1	1	5	20	0.8	5	1.5	0.75	250	Lighting
<b>STBV32</b>		400	700	1	1.1	5	25	1	2	1	1	250	Lighting
<b>STX13003</b>		400	700	1	1.5	5	25	1	2	1	1	250	Lighting
<b>STX83003</b>		400	700	1	1.5	16	32	0.35	5	1	0.35	50	Lighting
<b>STX13005</b>		400	700	3	2.8	8	24	2	5	0.6	2	500	Lighting/SMPS
<b>STL71</b>		400	700	0.6	1.1	4	10	0.6	10	1	0.3	60	Lighting
<b>STL72</b>		400	700	1	1.1	5	15	1	10	0.5	0.4	80	Lighting
<b>STL73</b>		400	700	1.5	1.1	4	10	1.5	5	1	1	250	Lighting

Blue shaded areas indicate darlingtontons

## DPAK/IPAK

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
	<b>STD790AT4</b>	30	40	3	15	100	400	0.5	2	0.7	3	100	Computer
	<b>STD888T4</b>	30	45	5	15	150	300	0.5	1	0.7	5	250	Computer
<b>STD724T4</b>	<b>STD826T4</b>	30	60	3	15	50		1	2	0.7	2	100	Consumer
<b>MJD3055T4</b>	<b>MJD2955T4</b>	60	70	10	20	20	100	4	4	1.1	4	400	Gen. purp.
<b>STD1802T4</b>		60	80	3	15	100		3	2	0.4	3	150	Computer
<b>STD1805T4</b>		60	150	5	15	85		5	2	0.06	5	200	Consumer
<b>STD1805-1</b>		60	150	5	15	85		5	2	0.06	5	200	Consumer
<b>MJD31BT4</b>		80	80	3	15	10	50	3	4	1.2	3	375	Gen. purp.
<b>MJD44H11T4</b>	<b>MJD45H11T4</b>	80	80	8	16	40		4	1	1	8	400	Gen. purp.
<b>MJD112T4</b>	<b>MJD117T4</b>	100	100	2	20	1000	12000	2	3	2	2	8	Gen. purp.
<b>MJD31CT4</b>	<b>MJD32CT4</b>	100	100	3	15	10	50	3	4	1.2	3	375	Gen. purp.
<b>MJD122-1</b>	<b>MJD127-1</b>	100	100	5	20	1000	12000	4	4	2	4	16	Gen. purp.
<b>MJD122T4</b>	<b>MJD127T4</b>	100	100	5	20	1000	12000	4	4	2	4	16	Gen. purp.
<b>BULD116D-1</b>		200	400	5	20	8	20	5	5	1.2	5	1	Lighting/SMPS
<b>MJD47T4</b>		250	350	1	15	30	150	0.3	10	1	1	200	Switching
<b>MJD340T4</b>	<b>MJD350T4</b>	300	300	0.5	15	30	240	0.05	10				Switching
<b>MJD49T4</b>		350	450	1	15	30	150	0.3	10	1	1	200	Switching
<b>MJD50T4</b>		400	500	1	15	30	150	0.3	10	1	1	200	Switching
	<b>STD93003T4</b>	400	500	1.5	20	16	32	0.35	5	0.5	0.35	50	Lighting
<b>STD13003-1</b>		400	700	1.5	20	5	25	1	2	1	1	250	Lighting/SMPS
<b>STD83003T4</b>		400	700	1.5	20	16	32	0.35	5	1	0.35	50	Lighting/SMPS
<b>BULD118D-1</b>		400	700	2	20	8		2	5	1.5	2	400	Lighting
<b>BUXD87T4</b>		450	1000	0.5	20	12		0.04	5	1	0.2	20	SMPS
<b>STD616A-1</b>		450	1000	1.6	20	4		1.6	5	0.5	0.8	250	SMPS
<b>STD616AT4</b>		450	1000	1.6	20	4		1.6	5	0.5	0.8	250	SMPS
<b>BULD1101ET4</b>		450	1100	3	35	6	18	2	5	1	1	200	Lighting

Suffix "T4" = DPAK package in tape & reel Suffix "-1" = IPAK package in tubes ST preferred products in bold  
Blue shaded areas indicate darlingtontons

## T0-218/SOT-93/T0-247

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
	<b>TIP145</b>	60	60	10	125	1000		5	4	3	10	40	Gen. purp.
<b>TIP3055</b>	<b>TIP2955</b>	60	70	15	90	20		4	4	1.1	4	400	Gen. purp.
<b>BUW48</b>		60	120	30	150					1.4	40	4000	Gen. purp.
<b>SGSD100</b>	<b>SGSD200</b>	80	80	25	130	300		20	3	1.75	10	40	Gen. purp.
<b>BUW49</b>		80	160	30	150					1.2	30	3000	Gen. purp.
<b>TIP142</b>	<b>TIP147</b>	100	100	10	125	1000		5	4	2	5	10	Gen. purp.
<b>BDW83C</b>	<b>BDW84C</b>	100	100	15	130	750	20000	6	3	2.5	6	12	Gen. purp.
<b>TIP35C</b>	<b>TIP36C</b>	100	100	25	125	15	75	15	4	1.8	15	1500	Gen. purp.
<b>TIP33C</b>	<b>TIP34C</b>	100	140	10	80	20	100	3	4	1	3	300	Gen. purp.
<b>BUT70W*</b>		125	200	40	200					0.9	70	7000	Switching
<b>BUTW92*</b>		250	500	60	180	9		60	3	1	60	15000	Switching
<b>BU941ZP</b>		350	350	15	155	300		5	10	1.8	10	250	Electr. ignition
<b>BU931P</b>		400	500	15	135	300		5	10	1.8	10	250	Electr. ignition
<b>BU941P</b>		400	500	15	155	300		5	10	1.8	10	250	Electr. ignition
<b>BUF410A</b>		450	1000	15	125					0.5#	10	2000	SMPS
<b>BUL810</b>		450	1000	15	125	10	40	5	5	1.5	8	1600	Lighting/SMPS
<b>BUV48A</b>		450	1000	15	125					1.5	10	2000	SMPS/industr.
<b>BUX98APW*</b>		450	1000	24	200					1.2	16	3200	SMPS/industr.
<b>BUF420AW*</b>		450	1000	30	200					0.5#	20	2000	SMPS/industr.
<b>BUV48C</b>		700	1200	15	125					1.5	6	1500	SMPS/industr.
<b>BU508A</b>		700	1500	8	125					1	4.5	2000	CTVs
<b>BUW1015*</b>		700	1500	14	160	7	14	10	5	1.5	10	2000	CTVs/monitors
<b>BUW1215*</b>		700	1500	16	200	7		12	5	1.5	12	2400	CTVs/monitors

\* T0-247 # Typical ST preferred products in bold Blue shaded areas indicate darlingtontons

# SOT-32/T0-126

Device Type		V <sub>CEO</sub> [V]	V <sub>CB0</sub> V <sub>VCEs</sub> V <sub>CEV</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>c</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>c</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
2SD882	2SB772	30	60	3	12.5	100	300	0.1	2	0.4	1	50	Gen. purp.
	BD434	22	22	4	36	50		2	1	0.5	2	200	Gen. purp.
	MJE210	25	40	5	15	45	180	2	1	1.8	5	1000	Gen. purp.
BD435	BD436	32	32	4	36	50		2	1	0.5	2	200	Gen. purp.
MJE521		40	40	4	40	40		1	1				Gen. purp.
BD135	BD136	45	45	1.5	12.5	40	250	0.15	2	0.5	0.5	50	Gen. purp.
BD135-16	BD136-16	45	45	1.5	12.5	100	250	0.15	2	0.5	0.5	50	Gen. purp.
BD437	BD438	45	45	4	36	40		2	1	0.6	2	200	Gen. purp.
	BD138	60	60	1.5	12.5	40	250	0.15	2	0.5	0.5	50	Gen. purp.
BD235	BD236	60	60	2	25	25		1	2	0.6	1	100	Gen. purp.
BD439	BD440	60	60	4	36	25		2	1	0.8	2	200	Gen. purp.
2N5191		60	60	4	40	25	100	1.5	2	1.4	4	1000	Gen. purp.
BD677	BD678	60	60	4	40	750		1.5	3	2.5	1.5	30	Gen. purp.
BD677A	BD678A	60	60	4	40	750		2	3	2.8	2	40	Gen. purp.
BD139	BD140	80	80	1.5	12.5	40	250	0.15	2	0.5	0.5	50	Gen. purp.
BD139-10	BD140-10	80	80	1.5	12.5	63	160	0.15	2	0.5	0.5	50	Gen. purp.
BD139-16	BD140-16	80	80	1.5	12.5	100	250	0.15	2	0.5	0.5	50	Gen. purp.
BD179		80	80	3	30	40		0.15	2	0.8	1	100	Gen. purp.
BD441	BD442	80	80	4	36	15		2	1	0.8	2	200	Gen. purp.
2N5192	2N5195	80	80	4	40	20	80	1.5	2	1.4	4	1000	Gen. purp.
2N6039	2N6036	80	80	4	40	750	15000	2	3	2	2	8	Gen. purp.
BD679	BD680	80	80	4	40	750		1.5	3	2.5	1.5	30	Gen. purp.
BD679A	BD680A	80	80	4	40	750		2	3	2.8	2	40	Gen. purp.
MJE802		80	80	4	40	750		1.5	3	3	4	40	Gen. purp.
BD237	BD238	80	100	2	25	25		1	2	0.6	1	100	Gen. purp.
MJE182	MJE172	80	100	3	12.5	12		1.5	1	0.9	1.5	150	Gen. purp.
BD681	BD682	100	100	4	40	750		1.5	3	2.5	1.5	30	Gen. purp.
BULT116D		200	400	5	45	8	20	5	5	1.2	5	1000	Lighting/SMPS
MJE3440		250	350	0.3	15	50	200	0.02	10	0.5	0.05	4	Switching
MJE340	MJE350	300	300	0.5	20	30	240	0.05	10				Switching
2N5657		350	375	0.5	20	30	250	0.1	10	2.5	0.25	25	Switching
ST600K	ST631K	120	120	1	12.5	50		0.5	5	0.5	0.5	50	Gen. Purp.
	ST93003	400	500	1.5	40	16	32	0.35	5	0.5	0.35	50	Lighting
ST13003		400	700	1.5	40	5	25	1	2	1	1	250	Lighting/SMPS
ST83003		400	700	1.5	40	16	32	0.35	5	1	0.35	50	Lighting/SMPS
BULT118		400	700	2	45	8		2	5	1.5	2	400	Lighting/SMPS
BUX87		450	1000	0.5	40	12		0.04	5	1	0.2	20	SMPS

ST preferred products in bold Blue shaded areas indicate darlington

# ISOWATT218<sup>▲</sup>/ISOWATT218FX<sup>▲</sup>

Device type		V <sub>CEO</sub> [V]	V <sub>CB0</sub> V <sub>VCEs</sub> V <sub>CEV</sub> [V]	I <sub>c</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>c</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>c</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
BU941ZPFI		350	350	15	65	300		5	10	1.8	10	250	Electr. ignition
ST1802FX*		600	1500	10	60	4	9	5	5	1.5	4	1200	CTVs/SMPS
MD1803DFX*		700	1500	10	57	5	8	5	5	5	5	1250	CTVs
ST2001FX*		600	1500	10	63	5	9	6	5	1.5	5	1250	CTVs/monitors
ST2009DHI		600	1500	10	55	5	9	5.5	5	1.5	5	1250	CTVs
ST2310DHI		600	1500	12	55	5.5	8.5	7	5	3	7	1750	CTVs
MD2310FX*		700	1500	14	62	5.5	8.5	7	5	3	7	1750	CTVs/monitors
ST2310DHI		600	1500	12	55	5.5	8.5	7	5	3	7	1750	CTVs
ST2408HI		600	1500	12	55	6	9	8	5	1.5	8	2000	CTVs/monitors
BU812DFI		700	1200	8	50	60	230	5	5	1.6	5	500	CTVs
BU808DFI		700	1400	8	52	60	270	5	5	1.6	5	500	CTVs
ST2111FX*		700	1500	12	65	4.5	9	8	5	3	8	2000	SMPS
HD1520FX*		700	1500	15	64	5.5	9.5	9	5	3	9	1800	CTVs/monitors
HD1530FX*		700	1500	26	70	5.5	9	13	5	2	13	3250	CTVs/monitors
ST2317DFX*		600	1700	12	70	6	10	6	5	5	6	1200	CTVs
HD1750FX*		800	1700	24	75	5.5	9.5	12	5	3	12	3000	CTVs/monitors

▲ UL compliant \* ISOWATT218FX ST preferred products in bold Blue shaded areas indicate darlington

## TO-3

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
2N3771		40	50	30	150	15	60	15	4	2	15	1500	Gen. purp.
2N3772		60	80	20	150	15	60	10	4	1.4	10	1000	Gen. purp.
2N3055	MJ2955	60	100	15	115	20	70	4	4	1.1	4	400	Gen. purp.
MJ3001	MJ2501	80	80	10	150	1000		5	3	2	5	20	Gen. purp.
2N5886	2N5884	80	80	25	200	20	100	10	4	1	15	1500	Gen. purp.
MJ802		90	100	30	200	25	100	7.5	2	0.8	7.5	750	Gen. purp.
2N6059		100	100	12	150	750		6	3	3	12	120	Gen. purp.
MJ4035	MJ4032	100	100	16	150	1000		10	3	4	16	80	Gen. purp.
2N6284	2N6287	100	100	20	160	750	18000	10	3	3	20	200	Gen. purp.
FW26025A1		100	100	20	160	750	18000	10	3	2	10	40	Linear/Switching
BUX10		125	160	25	150	20	60	10	2	1.2	20	2000	Gen. purp.
BUV20		125	160	50	250	20	60	25	2	1.2	50	5000	Gen. purp.
BUT90		125	200	50	250					0.9	70	7000	Switching
BUT100		125	200	50	300					0.9	100	10000	Switching
BUV61		200	300	50	250					1.2	40	5000	Switching
BUR51		200	300	60	350	15		50	4	1	30	2000	Switching
BUX22		250	300	40	350	20	60	10	4	1.5	20	2500	Switching
BUT92		250	350	50	250					1.2	35	3500	Switching
BUR52		250	350	60	350	15		40	4	1	25	2000	Switching
BU931		400	500	15	175	300		5	10	1.8	8	100	Electr. ignition
BU941		400	500	15	180	300		5	10	1.8	10	250	Electr. ignition
2N6547		400	850	15	175	6		10	2	1.5	10	2000	SMPS/industr.
BUX48		400	850	15	175					1.5	10	2000	SMPS/industr.
BUX98		400	850	30	250					1.5	20	4000	SMPS/industr.
BUY69A		400	1000	10	100	15		2.5	10	3.3	8	2500	SMPS/industr.
BUF420M		450	850	30	200					0.5#	20	2000	SMPS/industr.
BUX348		450	850	45	300					0.9	30	6000	SMPS/industr.
BUX48A		450	1000	15	175					1.5	10	2000	SMPS/industr.
BUX98A		450	1000	30	250					1.5	16	3200	SMPS/industr.
BUX48C		700	1200	15	175					1.5	6	1500	SMPS/industr.
BUX98C		700	1200	30	250					1.5	12	3000	SMPS/industr.
BU208A		700	1500	8	150					1	4.5	2000	CTVs

# Typical ST preferred products in bold Blue shaded areas indicate darlingtonts

## TO-220FP<sup>▲</sup>

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
2SD2012		60	60	3	25	100	320	0.5	5	1	2	200	Gen. purp.
BDX53BFP		80	80	8	29	750		3	3	2	3	12	Gen. purp.
BD241BFP	BD242BFP	80	90	3	24	25		1	4	1.2	3	600	Gen. purp.
TIP122FP	TIP127FP	100	100	5	29	1000		3	3	2	3	12	Gen. purp.
BDW93CFP	BDW94CFP	100	100	12	33	750		5	3	2	5	20	Gen. purp.
ST901TFP		350	500	4	35	1500		2	2	2	2	20	Ignition
BUL128FP		400	700	4	31	15		1	5	1.5	2.5	500	Lighting/SMPS
BUL903EDFP		400	900	5	70	25	50	0.5	5	1.2	2	400	Lighting
BUL1102EFP		450	1100	4	30	10	20	2	5	1.5	2	400	Lighting
BUL310FP		500	1000	5	36	10#		3	2.5	1.1	3	600	Lighting
BUL312FP		500	1150	5	36	8	16	3	2.5	1.1	3	600	CTVs
ST8812FP		600	1150	7	36	4.5	9	5	5	1.5	4	1200	SMPS

▲ UL compliant # Typical ST preferred products in bold Blue shaded areas indicate darlingtonts

## TO-220FH<sup>▲</sup>

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
ST1802FH		600	1500	10	40	4	9	5	5	1.5	4	1200	CTVs / SMPS
MD1803DFH		700	1500	10	40	5	8	5	5	5	5	1250	CTVs
BU812DFH		700	1200	8	40	60	230	5	5	1.6	5	500	CTVs
BU808DFH		700	1400	8	42	60	270	5	5	1.6	5	500	CTVs

▲ UL compliant # Typical ST preferred products in bold Blue shaded areas indicate darlingtonts

# TO-220/D<sup>2</sup>PAK

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>Tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
	2N6111	30	40	7	40	30		4	3	1	3	300	Gen. purp.
BD533	BD534	45	45	8	50	25		2	2	0.8	2	200	Gen. purp.
	D45H5	45	45	10	50	40		4	1	1	8	400	Gen. purp.
TIP29A	TIP30A	60	60	1	30	15	75	1	4	0.7	1	125	Gen. purp.
TIP110	TIP115	60	60	2	50	1000		1	4	2.5	2	8	Gen. purp.
TIP31A	TIP32A	60	60	3	40	10	50	3	4	1.2	3	375	Gen. purp.
TIP120	TIP125	60	60	5	65	1000		3	3	2	3	12	Gen. purp.
TIP41A	TIP42A	60	60	6	65	15	75	3	4	1.5	6	600	Gen. purp.
BD535	BD536	60	60	8	50	25		2	2	0.8	2	200	Gen. purp.
	TIP135	60	60	8	70	1000	15000	4	4	2	4	16	Gen. purp.
	TIP105	60	60	8	80	1000	20000	3	4	2	3	6	Gen. purp.
D44H8	D45H8	60	60	10	50	40		4	1	1	8	400	Gen. purp.
BD707	BD708	60	60	12	75	15	150	4	4	1	4	400	Gen. purp.
MJE3055T	MJE2955T	60	70	10	75	20	70	4	4	1.1	4	400	Gen. purp.
2N6487	2N6490	60	70	15	75	20	150	5	4	1.3	5	500	Gen. purp.
TIP121	TIP126	80	80	5	65	1000		3	3	2	3	12	Gen. purp.
BD537	BD538	80	80	8	50	15		2	2	0.8	2	200	Gen. purp.
BDX53B	BDX54B	80	80	8	60	750		3	3	2	3	12	Gen. purp.
D44H11	D45H11	80	80	10	50	40		4	1	1	8	400	Gen. purp.
2N6388		80	80	10	65	1000	20000	5	3	2	5	10	Gen. purp.
	2N6668	80	80	10	65	1000	20000	5	3	2	5	10	Gen. purp.
BDX33B	BDX34B	80	80	10	70	750		3	3	2.5	3	6	Gen. purp.
	BDW94B	80	80	12	80	750	20000	5	3	2	5	20	Gen. purp.
	BD910	80	80	15	90	15	150	5	4	1	5	500	Gen. purp.
BD241B	BD242B	80	90	3	40	25		1	4	1.2	3	600	Gen. purp.
2N6488		80	90	15	75	20	150	5	4	1.3	5	500	Gen. purp.
BUV26		90	180	14	85					1.5	12	1200	Gen. purp.
TIP29C	TIP30C	100	100	1	30	15	75	1	4	0.7	1	125	Gen. purp.
TIP112	TIP117	100	100	2	50	1000		1	4	2.5	2	8	Gen. purp.
TIP31C	TIP32C	100	100	3	40	10	50	3	4	1.2	3	375	Gen. purp.
TIP122	TIP127	100	100	5	65	1000		3	3	2	3	12	Gen. purp.
BD243C	BD244C	100	100	6	65	15		3	4	1.5	6	1000	Gen. purp.
TIP41C	TIP42C	100	100	6	65	15	75	3	4	1.5	6	600	Gen. purp.
BDX53C	BDX54C	100	100	8	60	750		3	3	2	3	12	Gen. purp.
TIP132	TIP137	100	100	8	70	1000	15000	4	4	2	4	16	Gen. purp.
TIP102	TIP107	100	100	8	80	1000	20000	3	4	2	3	6	Gen. purp.
BDX33C	BDX34C	100	100	10	70	750		3	3	2.5	3	6	Gen. purp.
TIP142T	TIP147T	100	100	10	90	1000		5	4	3	10	40	Gen. purp.
BD711		100	100	12	75	15	150	4	4	1	4	400	Gen. purp.
BDW93C	BDW94C	100	100	12	80	750	20000	5	3	2	5	20	Gen. purp.
BD911	BD912	100	100	15	90	15	150	5	4	1	5	500	Gen. purp.
BD239C		100	115	2	30	15		1	4	0.7	1	200	Gen. purp.
BD241C	BD242C	100	115	3	40	25		1	4	1.2	3	600	Gen. purp.
BUV27		120	240	12	85					1.5	8	800	Switching
BU407		150	330	7	60					1	5	500	Monochr. TVs
BU807		150	330	8	60					1.5	5	50	Monochr. TVs
BDX53F	BDX54F	160	160	8	60	500		2	5	2	2	10	Gen. purp.
BUL116D		200	400	5	60	8	20	5	5	1.2	5	1000	Lighting/SMPS
BU406		200	400	7	60					1	5	500	Monochr. TVs
BU806		200	400	8	60					1.5	5	50	Monochr. TVs
BUV28		200	400	12	85					1.5	6	600	Switching
TIP47		250	350	1	40	30	150	1	10	1	1	200	Switching
BUL85D		250	500	8	80	4	10	14	10	1.2	8	1600	Lighting/SMPS
BU941ZT		350	350	15	150	300		5	10	1.8	10	250	Electr. ignition
BUB941ZTT4		350	350	15	150	300		5	10	1.8	10	250	Electr. ignition
ST901T		350	500	4	100	1500		2	2	1.3	2	20	Electr. ignition
	MJE5852	400	450	8	80	15		2	5	2	4	1000	Switching
TIP50		400	500	1	40	30	150	1	10	1	1	200	Switching
BU931T		400	500	10	125	300		5	10	1.6	7	70	Electr. ignition
BU810		400	600	7	75	100		2	2	2.5	4	200	Switching
BUL118D		400	700	3	60	8		2	5	1.5	2	400	Lighting/SMPS
BUL128		400	700	4	70	14	40	2	5	1.5	2.5	500	Lighting/SMPS
BUL128D-B		400	700	4	70	8	40	2	5	1.5	2.5	500	Lighting/SMPS
BULB128D-BT4*		400	700	4	70	8	40	2	5	1.5	2.5	500	Lighting/SMPS

ST preferred products in bold Blue shaded areas indicate darlingtonts



# TO-220/D<sup>2</sup>PAK

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
ST13005		400	700	4	75	8	40	2	5	1	4	1000	Lighting/SMPS
STB13005-1**		400	700	4	75	8	40	2	5	1	4	1000	Lighting/SMPS
ST13007		400	700	8	80	5	30	5	5	2	5	1000	Lighting/SMPS
ST13007D		400	700	8	80	8	25	5	5	1.5	5	1000	Lighting/SMPS
BUL654		400	700	12	80	4		12	5	0.7	7	1400	Lighting/SMPS
MJE13009		400	700	12	100	6	30	8	5	1.5	8	1600	Switching
BUL381D		400	800	5	70	8		2	5	1.1	3	750	Lighting/SMPS
BUL138		400	800	5	80	8	40	2	5	1	4	1000	Lighting/SMPS
BUV46		400	850	5	70					1.5	2.5	500	Switching
MJE13007A		400	850	8	80	6	30	5	5	1.5	5	1000	Switching
BUL59		400	850	8	90	6	30	5	5	1.5	5	1000	Lighting/SMPS
BUL89		400	850	12	110	10	40	5	5	1.5	8	1600	Lighting/SMPS
BUL903ED		400	900	5	70	20		0.5	3	1.2	2	400	Lighting
BUL742A		400	950	4	70	16	40	0.8	3	1.5	3.5	1000	Lighting/SMPS
BUL742C		400	1050	4	70	25	50	0.8	3	1.5	3.5	1000	Lighting/SMPS
BUL38D		450	800	5	80	8		2	5	1.1	3	750	Lighting/SMPS
BUL58D		450	800	8	85	5		5	5	1.5	4	800	Lighting/SMPS
BUL39D		450	850	4	70	4		5	10	1.1	2.5	500	Lighting/SMPS
BULB39DT4*		450	850	4	70	4		5	10	1.1	2.5	500	Lighting/SMPS
BUL49D		450	850	5	80	4	10	7	10	1.2	4	800	Lighting/SMPS
BULB49DT4*		450	850	5	80	4	10	7	10	1.2	4	800	Lighting/SMPS
BUT11A		450	1000	5	83					1.5	2.5	500	SMPS
BUL510		450	1000	10	100	15	45	1	5	1.5	5	1250	Lighting/SMPS
BUL1101E		450	1100	3	70	6	15	2	5	1	1	200	Lighting
BUL1102E		450	1100	4	70	10	20	2	5	1.5	2	400	Lighting
BUL310		500	1000	5	75	10#		3	2.5	1.1	3	600	Lighting/SMPS
BUL1203E		550	1200	5	100	9	28	2	5	1.5	3	1000	Lighting
BUL213		600	1300	3	60	16	36	0.35	3	0.9	1	200	Lighting/SMPS
BUL1403ED		650	1400	3	80	15		0.4	3	2.5	0.5	50	Lighting
BUL1603ED		650	1600	3	80	15	40	0.4	3	1.5	1	250	Lighting
BU505		700	1500	2.5	75					5	2	900	CTVs/lighting
BUL216		800	1600	4	90	12	40	0.4	5	1	1	200	Lighting/SMPS
BUL416		800	1600	6	110	12	40	0.7	5	1.5	2	400	Lighting/SMPS
BUH2M20AP		1200	2000	0.03	40	10		0.01	10	5	0.002	0.4	CTVs
ST13009		400	700	12	100	15	28	5	5	0.85	4	0.8	Switching
	BUL3P5	-400	-500	-3	60	4		-2	-5	-0.5	-1	-0.2	Lighting
BUL3N7		400	700	3	60	4		2	5	0.5	1	0.2	Lighting
BUL804		450	800	4	70	10	20	2	5	1.2	2.5	0.5	Lighting

# Typical bigger \* = D<sup>2</sup>PAK package in tape & reel (suffix "T4") \*\* = I<sup>2</sup>PAK package in tubes (suffix "-1")  
 ST preferred products in bold Blue shaded areas indicate darlington

# ISOTOP<sup>^</sup>

Device type		V <sub>CEO</sub> [V]	V <sub>CBO</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
ESM2012DV		120	150	120	175	1200#		100	5	1.5 <sup>■</sup>	70	0.25	Industrial
BUT30V		125	200	100	250	27#		100	5	1.5	100	10	Industrial
ESM2030DV		300	400	67	150	300#		56	5	1.8 <sup>■</sup>	40	0.4	Industrial
BUT32V		300	400	80	250	16#		40	5	0.9	40	4	Industrial
ESM3030DV		300	400	100	225	300#		85	5	2.2 <sup>■</sup>	85	2.4	Industrial
BUT232V		300	400	140	300	17#		70	5	1.9 <sup>■</sup>	70	7	Industrial
ESM3045DV		450	600	24	125	120#		20	5	2 <sup>■</sup>	20	1.2	Industrial
ESM4045DV		450	600	42	150	220#		35	5	2	35	2	Industrial
ESM5045DV		450	600	60	175	150#		50	5	2 <sup>■</sup>	50	2.8	Industrial
ESM6045DV		450	600	84	250	120#		70	5	2 <sup>■</sup>	70	4	Industrial
BUV298V		450	850	60	250	12#		32	5	2	32	6.4	Industrial
BUV98AV		450	1000	30	150	9#		24	5	1.5	16	3.2	Industrial
BUV98V		450	1000	30	150	9#		24	5	1.5	20	4	Industrial
BUV298AV		450	1000	50	250	12#		32	5	1.2	32	6.4	Industrial
ESM6045AV		450	1000	72	250	150#		60	5	2 <sup>■</sup>	60	2.4	Industrial
BUF460AV		450	1000	80	270	15#		60	5	2	60	12	Industrial

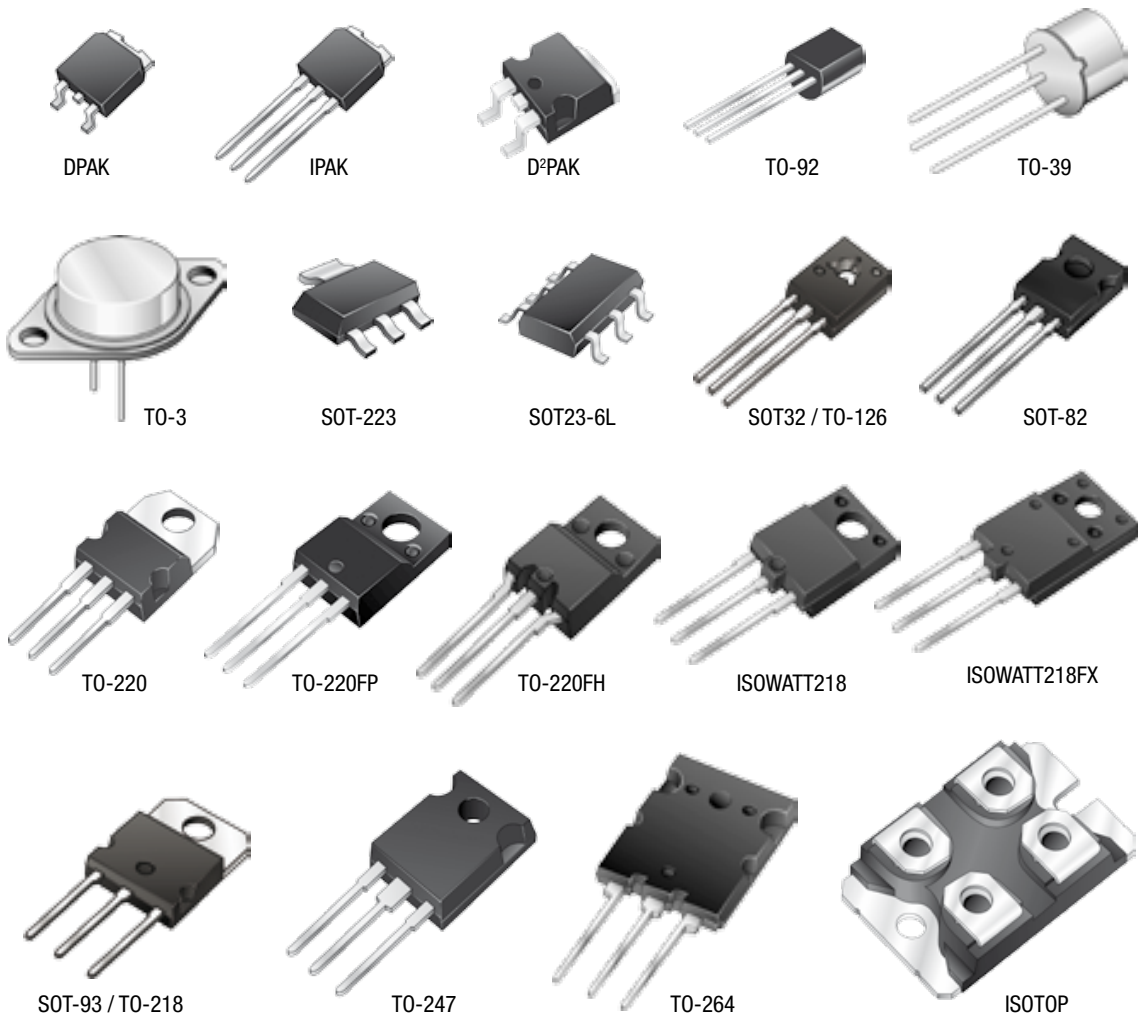
<sup>^</sup> UL compliant # Typical <sup>■</sup> = 100°C ST preferred products in bold Blue shaded areas indicate darlington

# T0-264

Device type		V <sub>CEO</sub> [V]	V <sub>CB0</sub> V <sub>CES</sub> V <sub>CEV</sub> [V]	I <sub>C</sub> [A]	P <sub>tot</sub> [W]	h <sub>FE</sub> @ I <sub>C</sub> V <sub>CE</sub>				V <sub>CE(sat)</sub> @ I <sub>C</sub> I <sub>B</sub>			Application
NPN	PNP					Min	Max	[A]	[V]	[V]	[A]	[mA]	
HD1530JL*		700	1500	26	200	5.5	9	13	5	2	13	3250	CTVs/monitors
HD1750JL*		800	1700	24	200	5.5	9.5	12	5	3	12	3000	CTVs/monitors

\* Pre-production

## Packages



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