

HIGH-SPEED SWITCHING N-P-N & P-N-P POWER TYPES

f_T to 250 MHz ... I_C to 60 A ... P_T to 140 W

$I_C = 1$ A max. $P_T = 5$ W max. (TO-39) *	$I_C = -1$ A max. $P_T = 7$ W max. (TO-39) *	$I_C = 2$ A max. $P_T = 10$ W max. (TO-39) *	$I_C = -2$ A max. $P_T = 10$ W max. (TO-39) *	$I_C = 2$ A max. $P_T = 25$ W max. (Plastic TO-5)	$I_C = -2$ A max. $P_T = 25$ W max. (Plastic TO-5)	$I_C = 7$ A max. $P_T = 35$ W max. (TO-66) * *	$I_C = 15$ A max. $P_T = 85 - 117$ W max. (Radial)	$I_C = 20$ A max. $P_T = 140$ W max. (TO-3)	$I_C = 20$ A max. $P_T = 175$ W max. (TO-3)	$I_C = 25$ A max. $P_T = 80-125$ W max. (TO-63)	$I_C = 30$ A max. $P_T = 140$ W max. (TO-3)	$I_C = 50$ A max. $P_T = 140$ W max. (Modified TO-3)
30 x 30 ^A	30 x 30	42 x 42	42 x 42	42 x 42	42 x 42	103 x 103	155 x 155	180 x 180	146 x 183	215 x 222	220 x 220	220 x 220 [2 CHIPS]
Family Designation												
2N2102 [N-P-N]	2N4036 [P-N-P]	2N5320 [N-P-N]	2N5322 [P-N-P]	2N6178 [N-P-N]	2N6180 [P-N-P]	2N3879 [N-P-N]	2N6482 [N-P-N]	2N6354 2N5038 [N-P-N]	41012 [N-P-N]	2N3263 [N-P-N]	2N5672 [N-P-N]	2N6033 [N-P-N]
2N3053 $V_{CER(SUS)} = 50$ V $h_{FE} = 50-250$ @ 150 mA $f_T = 100$ MHz min. CT File No. 432E	2N4037 $V_{CER(SUS)} = -60$ V $h_{FE} = 50-250$ @ -150 mA $f_T = 60$ MHz min. CT File No. 216E	2N5321 $V_{CER(SUS)} = 65$ V $h_{FE} = 40-250$ @ 500 mA $f_T = 50$ MHz min. $t_{on} = 80$ ns max. $t_{off} = 800$ ns max. CT File No. 325E	2N5323 $V_{CER(SUS)} = -65$ V $h_{FE} = 40-250$ @ -500 mA $f_T = 50$ MHz min. CT File No. 325E	2N6179 "Plastic 2N5321" $V_{CER(SUS)} = 65$ V $h_{FE} = 40-250$ @ 500 mA $f_T = 50$ MHz min. $t_{on} = 80$ ns max. $t_{off} = 800$ ns max. CT File No. 562	2N6181 "Plastic 2N5323" $V_{CER(SUS)} = -65$ V $h_{FE} = 40-250$ @ -500 mA $f_T = 50$ MHz min. CT File No. 562	2N3878† $V_{CER(SUS)} = 60$ V $h_{FE} = 20$ min. @ 4 A $h_{FE} = 50-200$ @ 0.5 A $f_T = 60$ MHz min. $t_r = 400$ ns max. $t_f = 400$ ns max. File No. 766	2N6479 (Isolated Collector) 2N6481 (Non Isolated Coll.) $V_{CER(sus)} = 80$ V $h_{FE} = 20$ min. @ 12 A $f_T = 100$ MHz typ. Radiation Hard File No. 702	2N5039 $V_{CER(SUS)} = 95$ V $h_{FE} = 20$ min. @ 10 A $h_{FE} = 30-250$ @ 2 A $f_T = 60$ MHz min. $t_{on} = 0.5 \mu s$ max. $t_{off} = 2 \mu s$ max. File No. 698	41012 $P_T = 175$ W $I_C = 30$ A peak $V_{CEO(sus)} = 80$ V $h_{FE} = 20-60$ @ 10 A File No. 660	2N3266 2N3264* $V_{CER(SUS)} = 80$ V $h_{FE} = 20-80$ @ 15 A $f_T = 20$ MHz min. $t_{on} = 0.5 \mu s$ max. $t_{off} = 2 \mu s$ max. File No. 54	2N5671 $V_{CER(SUS)} = 110$ V $h_{FE} = 20$ min. @ 20 A $h_{FE} = 20-100$ @ 15 A $f_T = 50$ MHz min. $t_{on} = 0.5 \mu s$ max. $t_{off} = 2 \mu s$ max. File No. 383	2N6032 $V_{CER(SUS)} = 110$ V $h_{FE} = 10-50$ @ 50 A $f_T = 50$ MHz min. $t_r = 1 \mu s$ max. $t_f = 0.5 \mu s$ max. File No. 462
2N2102 $V_{CER(SUS)} = 80$ V $h_{FE} = 40-120$ @ 150 mA $f_T = 120$ MHz min. CT 106E	2N4036 $V_{CER(SUS)} = -85$ V $h_{FE} = 40-140$ @ -150 mA $f_T = 60$ MHz min. CT 216E	2N5320 $V_{CER(SUS)} = 90$ V $h_{FE} = 30-130$ @ 500 mA $f_T = 50$ MHz min. $t_{on} = 80$ ns max. $t_{off} = 800$ ns max. CT 325E	2N5322 $V_{CER(SUS)} = -90$ V $h_{FE} = 30-130$ @ -500 mA $h_{FE} = 10$ min. @ -1 A $f_T = 50$ MHz min. CT 325E	2N6178 "Plastic 2N5320" $V_{CER(SUS)} = 90$ V $h_{FE} = 30-130$ @ 500 mA $f_T = 50$ MHz min. $t_{on} = 80$ ns max. $t_{off} = 800$ ns max. CT 562	2N6180 "Plastic 2N5322" $V_{CER(SUS)} = -90$ V $h_{FE} = 30-130$ @ -500 mA $h_{FE} = 10$ min. @ -1 A $f_T = 50$ MHz min. CT 562	2N3879 $V_{CER(SUS)} = 90$ V $h_{FE} = 40$ min. @ 0.5 A $h_{FE} = 20-80$ @ 4 A $f_T = 60$ MHz min. $t_r = 400$ ns max. $t_f = 400$ ns max. 766	2N6480 (Isolated Collector) 2N6482 (Non Isolated Coll.) $V_{CER(sus)} = 80$ V $h_{FE} = 20$ min. @ 12 A $f_T = 100$ MHz typ. Radiation Hard 702	2N5038 $V_{CER(SUS)} = 110$ V $h_{FE} = 20$ min. @ 12 A $h_{FE} = 50-250$ @ 2 A $f_T = 60$ MHz min. $t_{on} = 0.5 \mu s$ max. $t_{off} = 2 \mu s$ max. 698	41013 $P_T = 175$ W $I_C = 30$ A peak $V_{CEO(sus)} = 125$ V $h_{FE} = 20-60$ @ 10 A 660	2N3265 2N3263* $V_{CER(SUS)} = 110$ V $h_{FE} = 25-75$ @ 15 A $f_T = 20$ MHz min. $t_{on} = 0.5 \mu s$ max. $t_{off} = 2 \mu s$ max. 54	2N5672 $V_{CER(SUS)} = 140$ V $h_{FE} = 20$ min. @ 20 A $h_{FE} = 20-100$ @ 15 A $f_T = 50$ MHz min. $t_{on} = 0.5 \mu s$ max. $t_{off} = 2 \mu s$ max. 383	2N6033 $V_{CER(SUS)} = 140$ V $h_{FE} = 10-50$ @ 40 A $f_T = 50$ MHz min. $t_r = 1 \mu s$ max. $t_f = 0.5 \mu s$ max. 462
2N4314 $V_{CER(SUS)} = -85$ V $h_{FE} = 50-250$ @ -150 mA $f_T = 60$ MHz min. 216E						2N5202 $V_{CER(SUS)} = 75$ V $h_{FE} = 10-100$ @ 4 A $f_T = 60$ MHz min. $t_r = 400$ ns max. $t_f = 400$ ns max. 766		2N6354 $V_{CER(sus)} = 130$ V $h_{FE} = 20-150$ @ 5 A $h_{FE} = 10-100$ @ 10 A $f_T = 80$ MHz min. $t_r = 0.3 \mu s$ max. $t_f = 0.2 \mu s$ max. $I_C = 12$ A peak 582		* Pellet size—values shown are edge dimensions in thousands-of-an-inch (mils). * Types available out of this family with a. flange for easy heat sinking $R_{\theta JC} = 15^\circ \text{C/W}$ b. free-air radiator $R_{\theta JA} = 50^\circ \text{C/W}$ Type available out of this family with free-air radiator $R_{\theta JA} = 30^\circ \text{C/W}$ † Also available with heat radiator (40375). ‡ Flat radial lead version. File No. (e.g. File No. 432), where shown, relates to the data bulletin. CT—Complementary Type available, see matrix on Complementary-Pair Power Types.		
2N6500 $V_{CER(SUS)} = 110$ V $h_{FE} = 15-60$ @ 3 A $f_T = 60$ MHz min. $t_r = 400$ ns max. $t_f = 500$ ns max. 766						2N6496 $V_{CER(sus)} = 130$ V $h_{FE} = 12-100$ @ 8 A $f_T = 50$ MHz min. $t_r = 0.5 \mu s$ max. $t_f = 0.5 \mu s$ max. $I_C = 30$ A peak 698						

APPLICATION INFORMATION . . .

Power Types [N-P-N & P-N-P] for Inverter/Switching Regulator Service

Frequency Range	Peak Voltage Required	Peak Primary Current Requirement				>20 A
		Up to 0.2 A	0.2 to 1 A	1 to 4 A	4 to 20 A	
60 Hz to 50 kHz	10 to 60V	2N3053 2N4037	2N5321 2N5323 2N6179 2N6181	2N3054 2N5497▲	2N3055 2N3772	-
	60 to 150V	2N1486 2N2102 2N4036	2N1486 2N3441 2N5298 2N5781 2N5784	2N3442 2N3879 2N5293▲ 2N5954●	2N3265 2N3773 2N5039 2N5672 2N6248● 41012 41013	2N5671 2N6032
	150 to 450V	2N3440 2N5416 BFT 19 A,B,C	-	2N3585 2N6212● 40850 40851	2N5805 2N6251 411 423 431 2N6514 BUX 18 2N5840 410 413 40852 40853 40854	-
		BFT 28 A,B,C 2N6177▲				
	Off Line 220V (Rectifier 400-800V)				TA8764 TA8900 2N6513 2N5240 BUX 16,A,B,C BUX 18,C	

●P-N-P types

▲Plastic-packaged types

$V_{PEAK} = V_{CEX}$ value

$V_{PEAK} = 2.2 V (V_{CC})$ for push-pull inverters
 $= 1.1 V (V_{CC})$ for bridge inverters
 $= 1.1 V$ (Source) for switching regulators

DESCRIPTION

2N3771 FAMILY [n-p-n] (silicon) $f_T = 0.8 \text{ MHz min; } P_T \text{ up to } 250 \text{ W max}$

$V_{CEO(sus)}$ V	$V_{CER(sus)}$ V	$V_{CEV(sus)}$ V	h_{FE}	I_C		I_{CEV-mA}		$V_{CE(sat)-V}$		V_{BE-V}			
				I_C A	V_{CE} V	Temp. $^{\circ}C$		I_C A	I_B A	I_C A			
						25	150						
40	45	50	15-75	8	4	4	20	45	1.5	8	0.8	2.2	8
40	45	50	15-60	15	4	2	10	50	2	15	1.5	2.7	15
60	70	80	15-60	10	4	5	10	100	1.4	10	1	2.2	10
75	—	90	15-60	15	2	1	10	100	1.2	15	1.5	3.5	30

▲ At $V_{CE} = 30 \text{ V}$

—	90	—	35-100	4	4	0.5	2	80	0.8	4	0.4	1.2	4
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■ JAN & JAN TX types available. ● I_{CER}

2N3773 FAMILY [n-p-n] (silicon) $f_T = 0.7 \text{ MHz typ; } P_T \text{ up to } 250 \text{ W max}$

120	140	140	15-60	5	4	2	10	120	1	5	0.5	2	5
140	150	160	15-60	8	4	2	10	140	1.4	8	0.8	2.2	8
150	160	170	15-60	8	2	0.2	4	150	1	8	0.8	2	8
140	—	160	15-60	8	4	2	10	140	1.4	8	0.8	2.2	8

2N3879 FAMILY [n-p-n] (silicon) $f_T = 60 \text{ MHz min; } P_T = 35 \text{ W max}$

50	65	—	50-200	0.5	5	4	4	100	2	4	0.5	2.5	4
75	90	—	20-80	4	5	4	4	100	1.2	4	0.4	1.8	4
—	75	—	10-100	4	1.2	10	10	100	1.2	4	0.4	1.9	4
90	110	—	15-60	3	2	5	10	110	1.5	3	0.3	2.5	3

—	70	—	35-175	0.5	5	0.5	2	50	2	2.5	0.25	1.8	2.5
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50	65	—	50-200	0.5	5	4	4	100	2	4	0.5	2.5	4
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* Radiator improves $R_{\theta JA}$ from $70^{\circ}C/W$ to $30^{\circ}C/W$

2N4036 FAMILY [p-n-p] (silicon) $f_T = 60 \text{ MHz min; } P_T \text{ up to } 7 \text{ W max}$

● I_{CER}

-65	-85	-85	40-140	-0.15	-10	-0.02	—	-60	-0.65	-0.15	-0.015	-1.1	-0.15
-40	-60	-60	50-250	-0.15	-10	-0.25	—	-60	-1.4	-0.15	-0.015	-1.5	-0.15
-65	-85	-85	50-250	-0.15	-10	-0.25	—	-60	-1.4	-0.15	-0.015	-1.5	-0.15

2N TYPES

2N6257	High-Current, General Purpose
2N3771	High-Current, General Purpose
2N3772	High-Current, General Purpose
BDY29	High-Current, General Purpose

AUDIO TYPES

40411	Output, 70-W Class AB Amplifier
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2N TYPES

2N4348	High-Current High Voltage, General Purpose
2N3773	High-Current High Voltage, General Purpose
2N6259	High-Current High Voltage, General Purpose
BDY37	High-Current High Voltage, General Purpose

2N TYPES

2N3878	Audio, Ultrasonic Amplifiers and RF
2N3879	High-Current High-Speed Switch
2N5202	High-Current High-Speed Switch
2N6500	High-Current High-Speed Switch

AUDIO TYPES

40364	Output, 20-W Class AB Amplifier
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OTHER TYPES

40375	2N3878-with Heat Radiator*
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2N TYPES

2N4036	PNP Complement of 2N2102
2N4037	PNP Complement of 2N3053
2N4314	Low Cost, High Voltage

