

## NCE1520-VB Datasheet

### N-Channel 150 V (D-S) MOSFET

#### PRODUCT SUMMARY

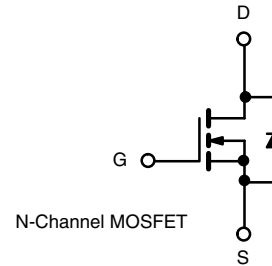
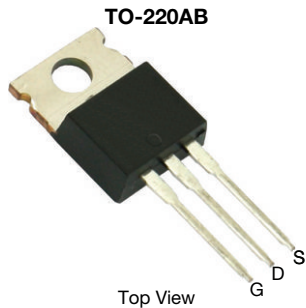
$V_{DS}$ (V)	150
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.075
$I_D$ (A)	20
Configuration	Single
Package	TO-220

#### FEATURES

- Trench power MOSFET
- Package with low thermal resistance
- 100 %  $R_g$  and UIS tested



**RoHS**  
COMPLIANT



#### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		$V_{DS}$	150	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current	$T_C = 25\text{ }^\circ\text{C}$	$I_D$	20	A
	$T_C = 125\text{ }^\circ\text{C}$		14	
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	50	
Pulsed Drain Current <sup>b</sup>		$I_{DM}$	60	
Single Pulse Avalanche Energy	$L = 0.1\text{ mH}$	$I_{AS}$	30	
		$E_{AS}$	45	mJ
Maximum Power Dissipation <sup>b</sup>	$T_C = 25\text{ }^\circ\text{C}$	$P_D$	107	W
	$T_C = 125\text{ }^\circ\text{C}$		35	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$

#### THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-Ambient	PCB Mount <sup>c</sup>	$R_{thJA}$	50	$^\circ\text{C/W}$
Junction-to-Case (Drain)		$R_{thJC}$	1.4	

#### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- When mounted on 1" square PCB (FR4 material).
- Parametric verification ongoing.

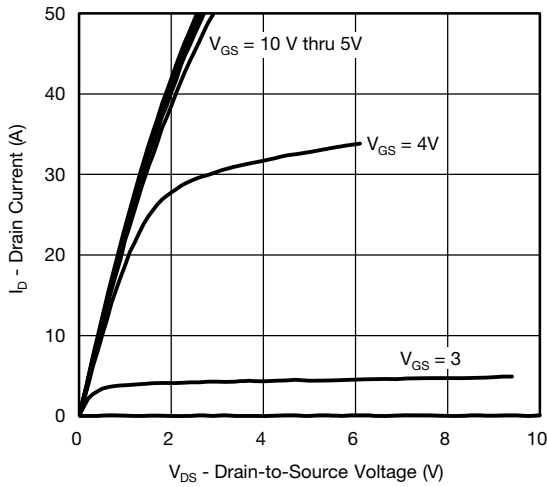
SPECIFICATIONS (T <sub>C</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA		150	-	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		1.5	-	3.5	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 150 V	-	-	1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 150 V, T <sub>J</sub> = 125 °C	-	-	50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 150 V, T <sub>J</sub> = 175 °C	-	-	250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> ≥ 5 V	30	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 12 A	-	0.075	-	Ω
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 12 A, T <sub>J</sub> = 125 °C	-	0.116	-	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 12 A, T <sub>J</sub> = 175 °C	-	0.158	-	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 12 V, I <sub>D</sub> = 15 A		-	33	-	S
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 25 V, f = 1 MHz	-	1090	1660	pF
Output Capacitance	C <sub>oss</sub>			-	165	200	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	82	120	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> = 75 V, I <sub>D</sub> = 20 A	-	27	50	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	7.5	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	10.2	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		0.35	1.0	3.2	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 75 V, R <sub>L</sub> = 3 Ω I <sub>D</sub> ≅ 20A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		-	11	17	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	21	33	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	20	30	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	12	20	
Source-Drain Diode Ratings and Characteristics <sup>b</sup>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	65	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V		-	0.85	1.5	V

**Notes**

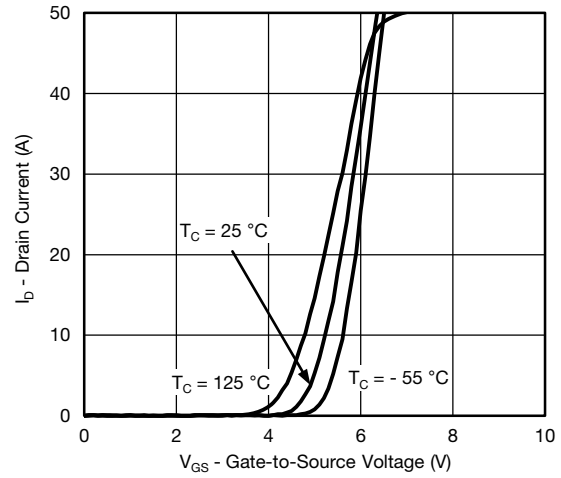
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

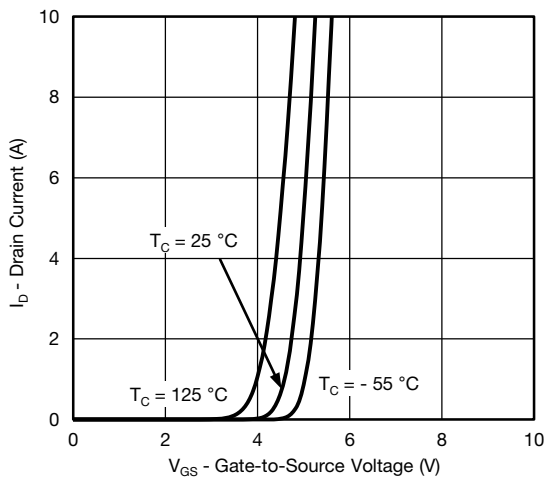
**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



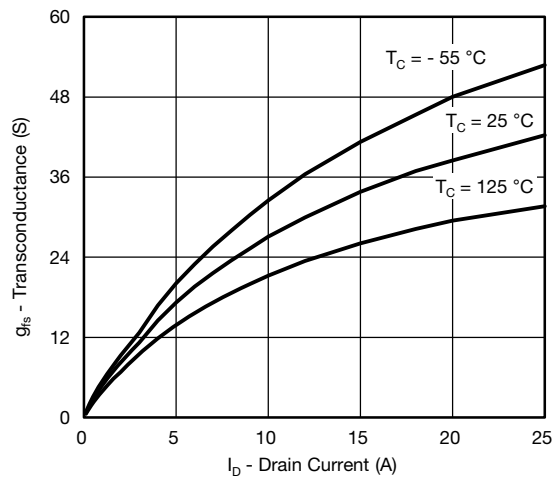
**Output Characteristics**



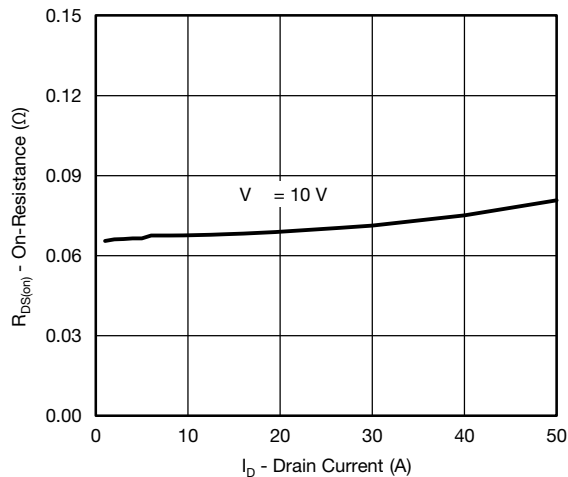
**Transfer Characteristics**



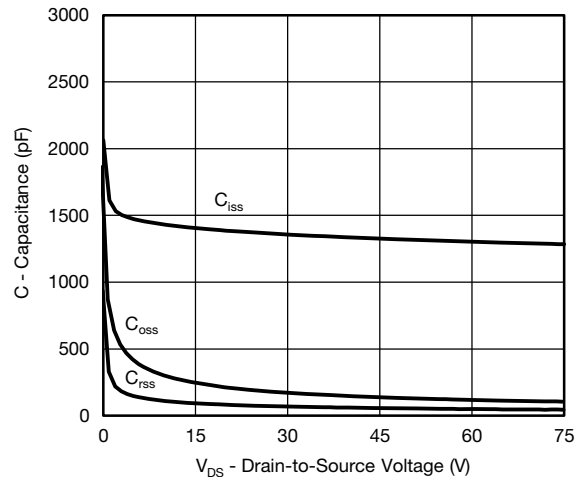
**Transfer Characteristics**



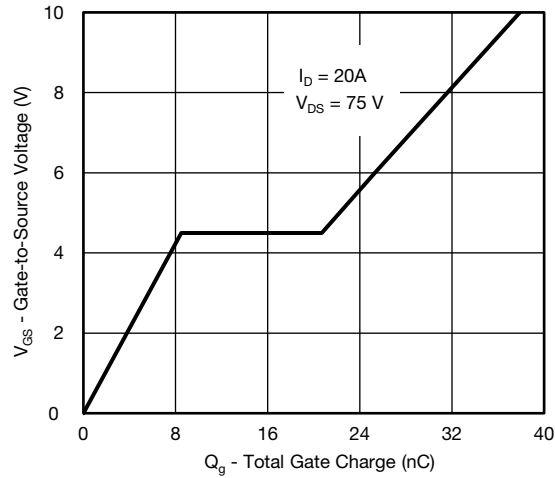
**Transconductance**



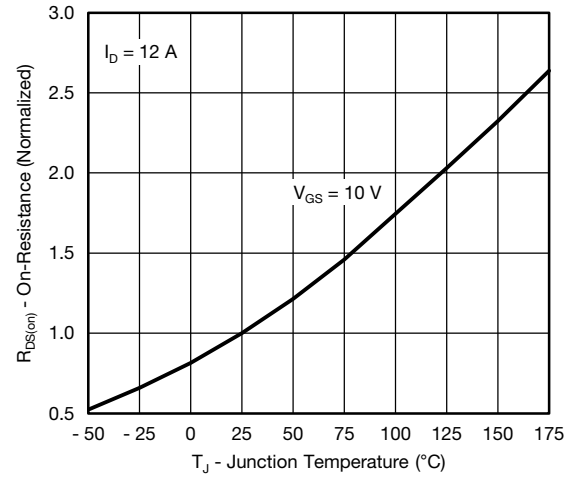
**On-Resistance vs. Drain Current**



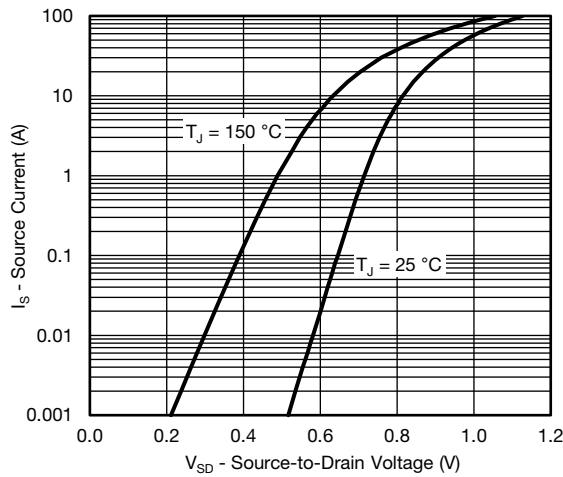
**Capacitance**

**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)


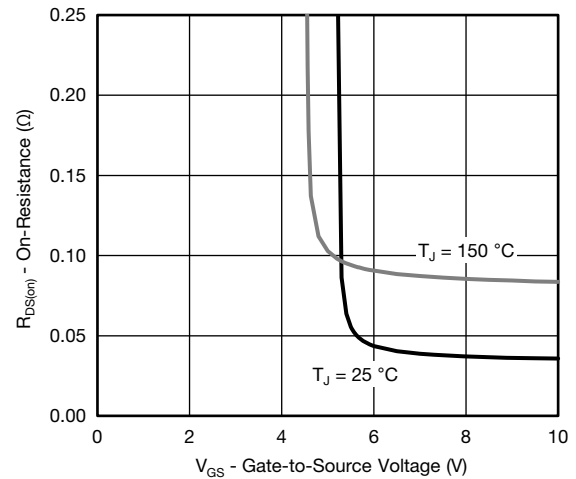
Gate Charge



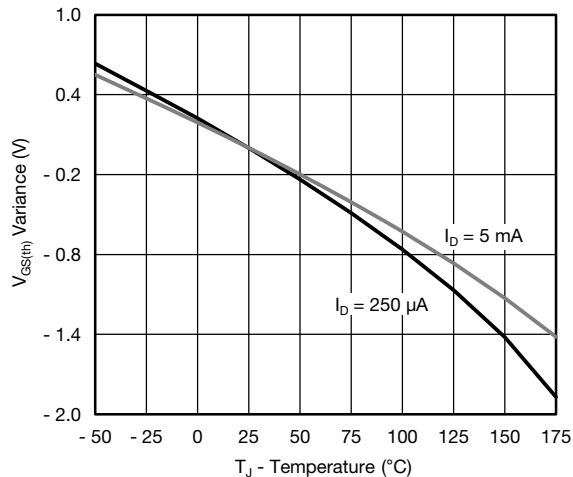
On-Resistance vs. Junction Temperature



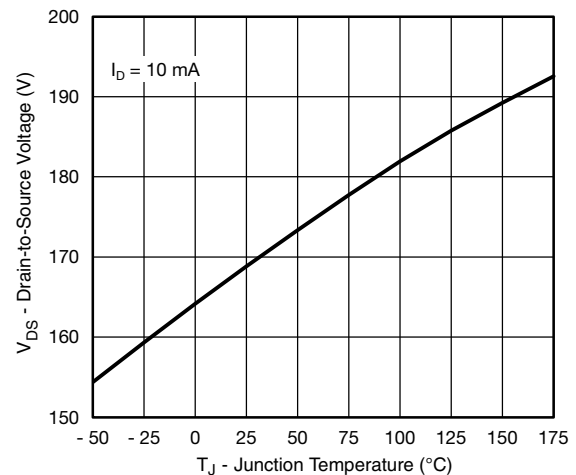
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

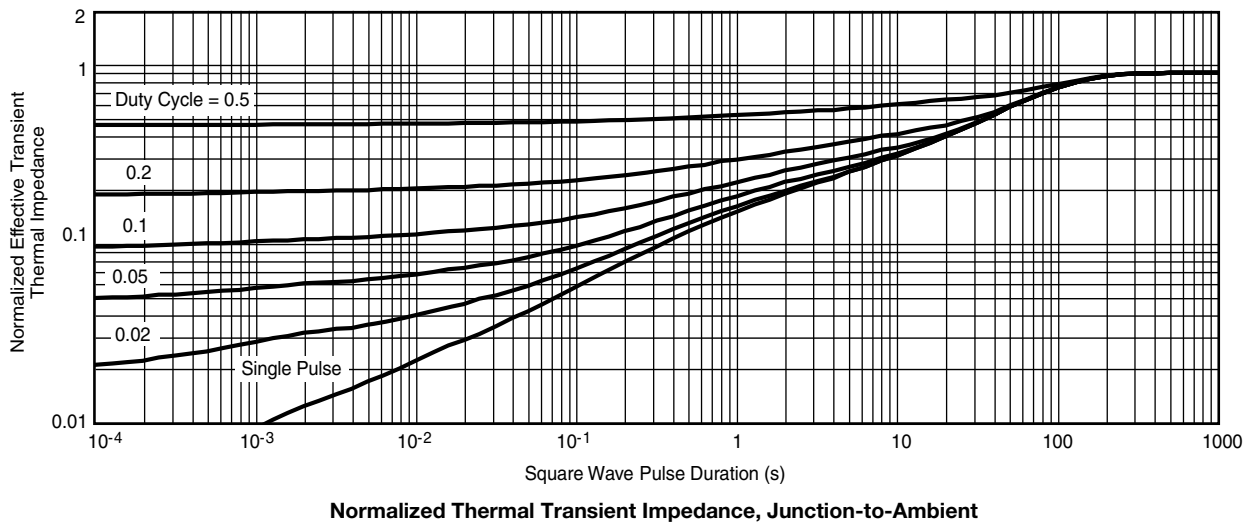
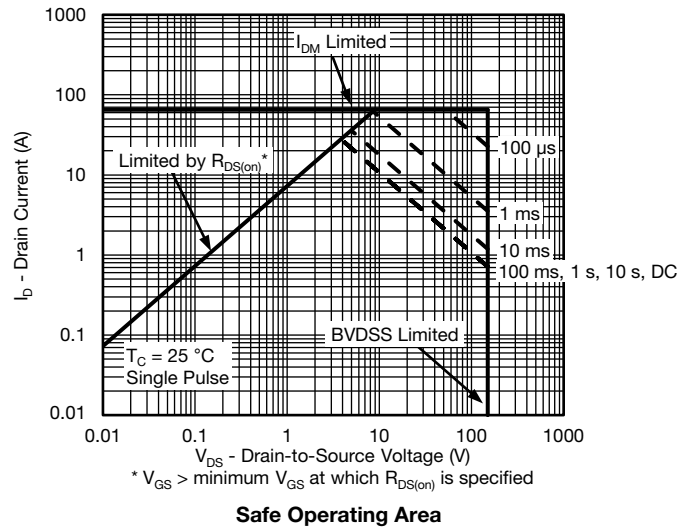


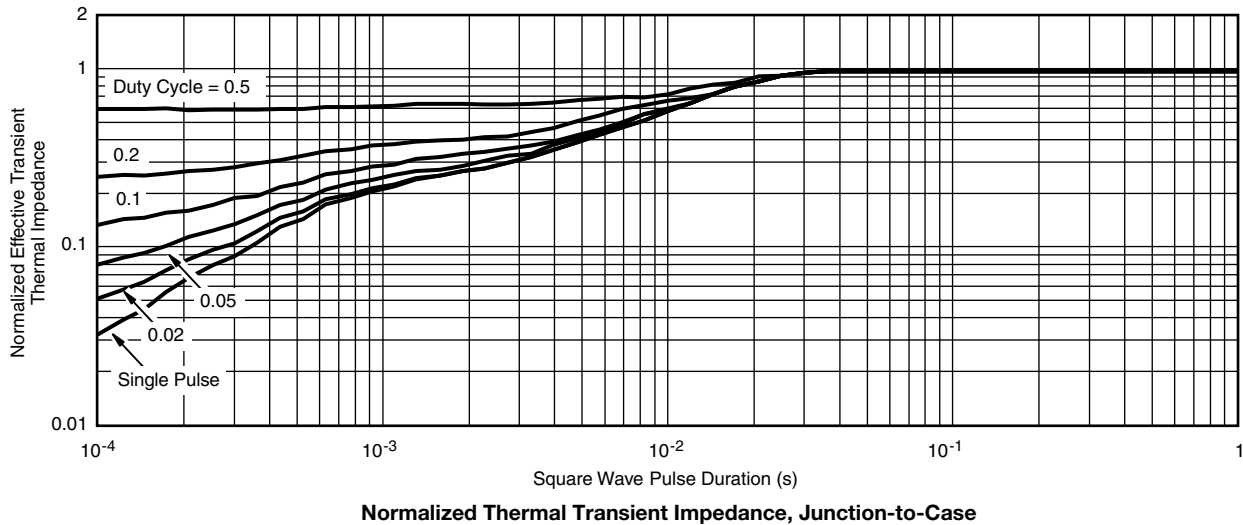
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature

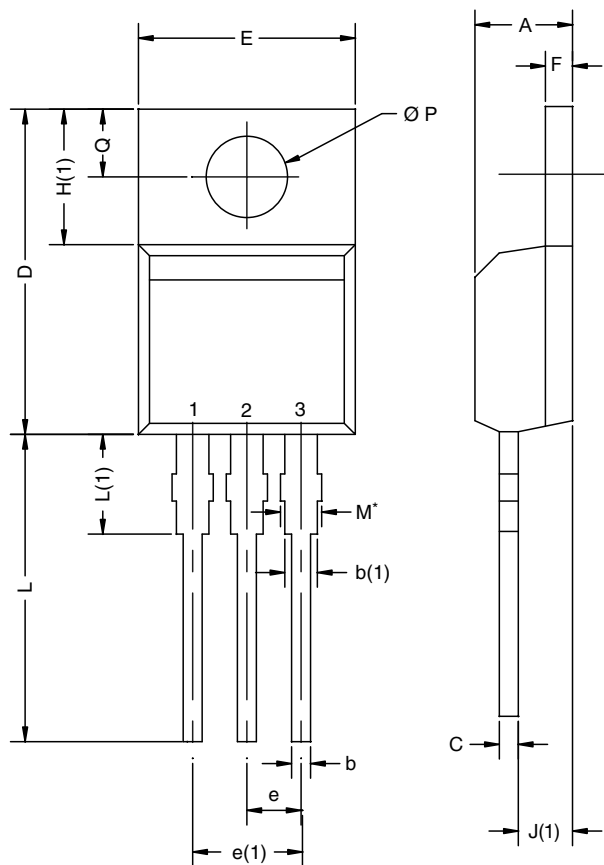
**THERMAL RATINGS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



**THERMAL RATINGS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient ( $25\text{ }^{\circ}\text{C}$ )
  - Normalized Transient Thermal Impedance Junction to Case ( $25\text{ }^{\circ}\text{C}$ )are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

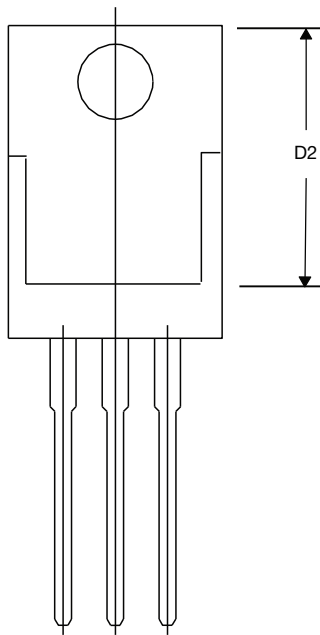
TO-220AB



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.25	4.65	0.167	0.183
b	0.69	1.01	0.027	0.040
b(1)	1.20	1.73	0.047	0.068
c	0.36	0.61	0.014	0.024
D	14.85	15.49	0.585	0.610
D2	12.19	12.70	0.480	0.500
E	10.04	10.51	0.395	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.09	6.48	0.240	0.255
J(1)	2.41	2.92	0.095	0.115
L	13.35	14.02	0.526	0.552
L(1)	3.32	3.82	0.131	0.150
$\varnothing P$	3.54	3.94	0.139	0.155
Q	2.60	3.00	0.102	0.118

ECN: T14-0413-Rev. P, 16-Jun-14  
DWG: 5471

**Note**  
\* M = 1.32 mm to 1.62 mm (dimension including protrusion)  
Heatsink hole for HVM



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